FOUNDATION-II MODULE

2nd Year BDS

Table 1: Themes

S#	Theme	Duration in Weeks
1	Cellular Response to Injury & Drugs	2
2	Health and Oral Well Being	1
3	Foundations of Pre-Clinical Skills	2

Teaching Hours Allocation

Table 2: Hours allocation for different subjects

S. No	Subject	Hours
1	Science of Dental Materials	41
2	Community and Preventive Dentistry	30
3	Pharmacology	26
4	General Pathology & Microbiology	17.5
5	Oral Pathology	1
7	Junior Operative	6
8	Junior Prosthodontics	8
9	Physiology	2
10	General Medicine	1
11	Oral Medicine	1
	Total	133.5

Learning Objectives

By the end of this Module, 2nd year BDS students will be able to:

1. Explain the various cellular adaptations to injury, including atrophy, hypertrophy, hyperplasia, and metaplasia.
2. Differentiate between reversible and irreversible cellular injuries, and describe their biochemical and morphological changes.
3. Compare and contrast apoptosis and necrosis, including their causes, processes, and roles in both health and disease.
4. Identify different types of necrosis and discuss the underlying mechanisms leading to these cellular outcomes.
5. Classify bacteria based on cell wall characteristics, oxygen requirements, and staining properties, and describe their growth patterns.
6. Explain the pathogenesis of bacterial infections, including syphilis, leprosy, tuberculosis, and gonorrhea, and outline their clinical management.
7. Define key pharmacological terms, such as pharmacokinetics, bioavailability, and drug interactions.
8. Explain the process of drug absorption, distribution, metabolism, and excretion, with emphasis on clinical applications like dosing and therapeutic index.
9. Identify and categorize various types of adverse drug reactions, including dose-related and non-dose-related effects.
10. Classify autonomic nervous system drugs and anti-asthmatic drugs, their mechanisim of action, uses, adverse effects and drugs interactions and other pharmacological aspects.
11. Perform essential lab techniques such as gram staining and culture media preparation, interpreting results to identify bacterial infections.
12. Perform and Practice self-protection protocol during laboratory sessions.
13. Perform and practice the self-protection protocol in the clinical skill laboratory.
14. Establish the importance of empathic communication in clinical practice during discussion sessions.
15. Define health and wellbeing, and explain their changing concepts and dimensions.

16. Identify responsibilities and indicators of health, and describe their significance.
17. Define disease and describe the epidemiological triad, risk factors, and prevention levels.
18. Discuss global health goals (MDGs, SDGs) and the application of epidemiology in dental care.
19. Classify dental materials and discuss their properties and selection criteria.
20. Discuss the basics, procedures, and future prospects of operative dentistry and endodontics.
21. Identify and demonstrate the use of dental equipment and instruments.
22. Describe mechanical, physical, chemical, and biological properties of dental materials.
23. Classify and explain composition, properties, and applications of dental impression materials.
24. Identify components and fabrication steps of complete dentures.
25. Recognize and utilize essential dental instruments and equipment.
26. Demonstrate proper chair positioning and instrument handling in operative dentistry and Phantom Head Lab.
27. Classify and describe the principles of epidemiology and the various epidemiological study designs
28. Describe the principles of health promotion and health education and oral education
29. Deliver health education

Table 1: Learning Objectives Theme Wise

Theme I: Cellular Response to Injury & Drugs			
SNo	**Topic**	**Hours**	**Learning objectives**
Physiology			
1.	Functional system of cell	2	1.1 Discuss the function of cellular organelles (endoplasmic reticulum, golgi bodies, mitochondria, lysosomes, peroxisomes, cytoskeleton). 1.2 Describe the mechanism of endocytosis. 1.3 Differentiate between pinocytosis and phagocytosis. 1.4 Explain the steps of phagocytosis. 1.5 Discuss the regression and autolysis mechanism damaged cells by the lysosomes.
General Pathology			
2.	Introduction to the subject	1	2.1 Define Pathology and its different branches. 2.2 Define etiology, disease, pathogenesis, morphology, cell adaptation, cell injury and homeostasis.
3.	Cellular adaptation	1	3.1 Define atrophy, hypertrophy, hyperplasia, and metaplasia with examples. 3.2 Discuss causes of different types of cellular adaptations. 3.3 Describe mechanism of Hypertrophy, Hyperplasia, and atrophy. 3.4 Discuss difference between physiologic and pathologic cellular adaptation.
4.	Cellular injury, cell death	1	4.1 Define cell injury. 4.2 Differentiate between reversible and irreversible cell injury.

			4.3 Discuss the mechanism, morphological, biochemical, and functional alteration in reversible and irreversible cell injury. 4.4 Describe the nature and severity of cell injury with cellular responses. 4.5 Describe the subcellular responses to injury including heterophagy and lysosomal catabolism. 4.6 Discuss process of autophagy.
5.	Necrosis	1	5.1 Define necrosis. 5.2 Discuss different types of necrosis with examples. 5.3 Discuss the mechanism and morphological changes of different types of necrosis. 5.4 Describe morphologically different patterns of necrosis in coagulative necrosis, liquefactive necrosis, gangrenous necrosis, caseous necrosis, Fat necrosis, and fibrinoid necrosis
6.	Apoptosis	1	6.1 Define Apoptosis. 6.2 Discuss cell cycle. 6.3 Enumerate causes of apoptosis 6.4 Enlist the examples of Apoptosis. 6.5 Discuss pathophysiology, morphology, and biochemical features of Apoptosis. 6.6 Describe the intrinsic and extrinsic pathways of apoptosis. 6.7 Discuss difference between apoptosis and necrosis. 6.8 Describe role of apoptosis in health and disease. 6.9 Identify the role of nutritional deficiencies in the process of cell apoptosis.

7.	Pathologic calcification	1.5	7.1 Define Pathologic calcification 7.2 Describe types, morphology, and functional alterations of pathologic calcification with examples. 7.3 Differentiate between dystrophic and metastatic calcification.
8.	Intracellular accumulations		8.1 Discuss all the pathways for abnormal intracellular accumulations. 8.2 Describe causes, morphology mechanism and consequences and nutrition aspects of protein accumulation, glycogen accumulation and lipid accumulation.
9.	Pigmentation	1	9.1 Describe types of pigments. 9.2 Differentiate between endogenous and exogenous pigments. 9.3 Enlist the nutrients causing oral pigmentation.
Oral Pathology			
10.	Oral pigmentation	1	10.1 Classify oral pigmentation. 10.2 Describe the clinical and histological features of oral lesions caused by exogenous and endogenous pigmentation.
General Medicine			
11.	Syphilis, Leprosy, Tuberculosis and Gonorrhea diseases	1	11.1 Define Syphilis, Leprosy, Tuberculosis and Gonorrhea diseases. 11.2 Discuss sign and symptoms of bacterial diseases. 11.3 Discuss management of patients.
General Pathology & Microbiology			
12.	Classification of Bacteria	1	12.1 Classify aerobic and anaerobic bacteria with examples.

			12.2 Discuss classification of bacteria on the basis of nature of cell wall, staining characteristics, spore formation and ability to grow in the presence of oxygen.
13.	Structure of bacterial cell	1	13.1 Describe specialized structures outside the cell wall including capsule, glycocalyx, flagella and pilli. 13.2 Describe structure and function of various parts of the bacterial cell. 13.3 Enlist the differences between Gram Positive and Gram-Negative Bacteria. 13.4 Describe classification and important functions of plasmids 13.5 Describe structure, functions, and medical importance of bacterial spores with examples. 13.6 Describe functions and arrangement of transposons.
14.	Normal Flora and Bacterial growth curve	2	14.1 Describe medically important members of normal flora and their anatomic location. 14.2 Describe various phases of bacterial growth curve. 14.3 Describe the role of probiotics and prebiotics in maintaining gastrointestinal health.
15.	Bacterial genetics	1	15.1 Define mutation 15.2 Discuss causes of mutation. 15.3 Classify different types of mutations. 15.4 Discuss conjugation, transduction, recombination, and transformation in bacteria.

16.	Bacterial pathogenesis	1	16.1 Define the term pathogen, infection, virulence, communicable, endemic, epidemic and pandemic diseases, carrier, pathogens, opportunists, commensals, and colonizers. 16.2 Describe stages/determinants of bacterial pathogenesis 16.3 Describe colonization, invasion, toxins, immune pathogenesis. 16.4 Differentiate between exotoxins and endotoxins. 16.5 Describe the various modes of action of endotoxins and endotoxins produced by gram positive and gram-negative bacteria. 16.6 Describe the four stages of a typical infectious disease and Koch's postulates for establishing the causal role of an organism in the disease.
Pharmacology			
17.	Introduction to basic pharmacology terms	1	17.1 Define basic terms pharmacokinetics, pharmacodynamics, excipient, compounding, and Dispensing. 17.2 Define basic terms like Pharmacology, Clinical Pharmacology, Therapeutics, drug, medicine, pro-drugs, prototype drugs, Materia medica, pharmacopoeia, formulary, national formulary. 17.3 Describe the branches of Pharmacology like Pharmacy, Pharmacognosy, pharmacogenetics, pharmacogenomics, toxicology, and posology. 17.4 Define prescription drugs, OTC drugs, WHO essential drugs, and Orphan drugs with examples.

18.	Nomenclature of drugs	1	18.1 Describe how drugs are named, i.e., chemical, generic, approved, official, and trade names of drugs with examples.
19.	Sources of drugs		19.1 Enlist various sources of drugs. 19.2 Describe the genetic engineering source of drugs with examples
20.	Active principles of drugs		20.1 Enlist important principles of drugs with examples.
21.	Absorption of drugs	1	21.1 Define drug absorption. 21.2 Describe various mechanisms of drug absorption with examples. 21.3 Describe the concept of ionization of drug molecules. 21.4 Discuss clinical significance of ion trapping. 21.5 Enlist factors affecting drug absorption.
22.	Bioavailability	1	22.1 Define bioavailability, bioequivalence, and pharmaceutical equivalence.
23.	Distribution of drugs Volume of Distribution		23.1 Define distribution, redistribution, and volume of distribution drugs. 23.2 Discuss factors affecting drug distribution. 23.3 Enlist drugs with small volume of distribution. 23.4 Enlist drugs with large volume of distribution. 23.5 Describe formula for calculation of volume of distribution. 23.6 Discuss plasma protein binding. 23.7 Discuss its clinical significance in diseased conditions. 23.8 Discuss volume of distribution of drug with its clinical significance. 23.9 Enlist some drugs whereby loading dose is administered.

24.	Pro-drug Biotransformation (metabolism) of drugs	1	24.1 Define biotransformation/Pro-drug. 24.2 Describe the objectives of biotransformation and the fate of drugs after biotransformation. 24.3 Name major sites of biotransformation. 24.4 Describe major drug-metabolizing enzymes, i.e., microsomal (P450) and non-microsomal enzymes. 24.5 Describe phases and reactions of biotransformation. 24.6 Define idiosyncrasy with examples.
25.	Dose and Loading dose	1	25.1 Define dose. 25.2 Classify dose. 25.3 Discuss its significance. 25.4 Discuss loading of dose. 25.5 Discuss its significance. 25.6 Explain calculation of loading dose. 25.7 Describe maintenance dose. 25.8 Describe calculation of maintenance dose. 25.9 Discuss Paediatric dose. 25.10 Describe significance of Paediatric dose. 25.11 Describe calculation of Paediatric dose.
26.	Physiological barriers to transport of drugs	1	26.1 Enlist important physiological barriers to transport of drugs. 26.2 Describe important physiological barriers to transport of drugs and their clinical significance.

27.	Hepatic first-pass effect		27.1 Describe hepatic first-pass effect (Pre-systemic elimination) and its clinical significance.
28.	Enterohepatic circulation		28.1 Define enterohepatic circulation. Describe enterohepatic circulation with examples and its clinical significance.
29.	Excretion of drugs, Steady State Concentration (Css) and Kinetics of Drug Elimination	1	29.1 Define drug excretion and clearance. 29.2 Enlist different routes of drug excretion. 29.3 Discuss different factors affecting excretion of drug. 29.4 Discuss drug clearance and elimination and explain their kinetics 29.5 Explain Css and its clinical application. 29.6 Differentiate between excretion, elimination, and clearance. 29.7 Apply the formula for calculating drug clearance.
30.	Excretion of drug, renal, biliary excretion, lung excretion, drug excreted in milk and saliva		30.1 Define excretion of drug. 30.2 Enumerate different routes of excretion of drug. 30.3 Differentiate between clearance, elimination, and excretion of drug. 30.4 Discuss renal excretion renal, biliary excretion, lung excretion, drug excreted in milk and saliva. 30.5 Define zero order and first order excretion of drug. 30.6 Enumerate drug elimination through first order kinetics. 30.7 Enumerate drug elimination through zero order kinetics. 30.8 Discuss the clinical significance of first- and zero-order kinetics
31.	Plasma half life		31.1 Define plasma half-life. 31.2 Enlist drugs with short half-life and long half-life.

			31.3 Discuss formula for calculation of plasma half-life. 31.4 Describe the clinical significance of half-life.
32.	Pharmacodynamics	2	32.1 Describe intracellular Second-messenger systems and enlist some important second messengers.
33.	Agonist and antagonist		33.1 Discuss agonist. 33.2 Classify agonist. 33.3 Describe clinical use of agonist. 33.4 Discuss antagonist. 33.5 Classify antagonist. 33.6 Describe clinical uses of antagonist.
34.	Drug antagonism		34.1 Define drug antagonism. 34.2 Enlist types of antagonism. 34.3 Describe chemical, physiological (functional), and pharmacological (competitive/surmountable and non-competitive) antagonisms with examples.
35.	Drug interactions	1	35.1 Define drug interaction. 35.2 Define drug incompatibilities with examples. 35.3 Describe pharmacokinetic drug interactions with examples and its clinical significance. 35.4 Define summation, synergism, and potentiation with examples 35.5 Describe pharmacodynamics drug interactions with examples and its clinical significance.

			35.6 Define orphan receptors, serpentine receptors, and spare receptors. 35.8 Define drug selectivity and specificity. 35.9 Describe drug-food interactions and drug-disease interactions with examples. 35.10 Define summation, synergism, and potentiation with examples.
36.	Tolerance and Tachyphylaxis	2	36.1 Define Tolerance, cross tolerance, reverse tolerance (sensitization), innate tolerance, tachyphylaxis and drug resistance. 36.2 Describe the mechanisms of development of tolerance and tachyphylaxis. 36.3 Define drug holidays with example.
37.	Adverse drug reactions		37.1 Define adverse drug effect, secondary effect. 37.2 Define intolerance to a drug. 37.3 Classify adverse drug reactions. 37.4 Describe dose-related adverse effects (side effects and toxic effects) with examples. 37.5 Describe non-dose-related adverse effects with examples. 37.6 Describe causes of adverse drug reactions. 37.7 Enlist drugs causing hepatotoxicity, renal toxicity, and cardio toxic drugs. 37.8 Enlist drugs causing adverse effects on reproduction. 37.9 Describe non-dose-related adverse effects (idiosyncrasy and drug allergy) with examples
38.	Therapeutic index		38.1 Define therapeutic index. 38.2 Define median lethal dose, median toxic dose, and median effective dose.

			38.3 Enlist some drugs with a narrow therapeutic index. 38.4 Enlist some drugs with a broad therapeutic index.
39.	Therapeutic window		39.1 Define the therapeutic window.
40.	Potency and efficacy		40.1 Define potency and efficacy. 40.2 Describe potency and efficacy with examples. 40.3 Describe the clinical importance of efficacy compared to potency. 40.4 Describe graded and quantal dose response curve.
41.	ANS DRUGS (Introduction to autonomic nervous system drugs)	1	41.1 General organization of nervous system with differences between somatic and autonomic nervous system 41.2 Differences with sympathetic and parasympathetic nervous system 41.3 Neurochemical transmission and sites of drug action 41.4 Autonomic neurotransmitters and their receptors with their distribution 41.5 Presynaptic regulation with highlighting autoreceptors and heteroreceptors 41.6 Postsynaptic regulation
42.	Parasympathomimetic drugs	1	42.1. Enlist major autonomic neurotransmitters. 42.2 Describe the organ system distribution of autonomic receptors. Classify cholinomimetic drugs. 42.3 Describe the mechanism of action of directly acting and indirectly acting cholinomimetics. 42.4 Describe the organ system effects of directly acting and indirectly-acting cholinomimetics with special reference to their effects on receptors. 42.5 Describe the clinical uses of cholinomimetics. 42.6 Describe the adverse effects of cholinomimetics. 42.7 Describe the clinical manifestations of organophosphate poisoning.
43.	Parasympatholytic drugs	1	43.1 Classify anticholinergic drugs 43.2 Describe the pharmacokinetics of antimuscarinic drugs with emphasis on metabolism and duration of action. 43.3 Describe the mechanism of action of antimuscarinic drugs. 43.4 Describe the organ system effects of antimuscarinic drugs with special

			reference to their effects on receptors. 43.5 Describe the clinical uses of antimuscarinic drugs. 43.6 Describe atropine fever
44.	Sympathomimetics drugs	2	44.1. Classify sympathomimetic drugs according to the spectrum of adrenoceptors they affect 44.2 Define Catecholamines with examples. 44.3 Describe the pharmacokinetics of sympathomimetic drugs 44.4 Describe the mechanism of action of sympathomimetics. 44.5 Compare the effects of Adrenaline, Noradrenaline, Phenylephrine and Isoprenaline on heart rate and blood pressure. 44.6 Describe the clinical uses of sympathomimetics. 44.7 Describe the drug treatment of Anaphylactic shock. 44.8 Describe the pharmacotherapy of glaucoma 44.9 Describe the adverse effects of sympathomimetics
45.	Sympatholytic drugs	2	45.1 Classify sympatholytic drugs 45.2 classify α-blockers. 45.3 Describe the mechanism of action of α-blockers. 45.4 Describe the organ system effects of α-blockers 45.5 Describe the clinical uses of α- blockers. 45.6. Describe the adverse effects of α-blockers. 45.7 classify the ß-blockers based on receptor activity. 45.8. Enlist the ß-blockers which are relatively safe in chronic stable heart failure. 45.9 Enlist the ß-blockers which are relatively safe in asthmatic patients. 45.10 Describe the pharmacokinetics of propranolol. 45.11 Describe the mechanism of action of ß-blockers. 45.12 Describe the clinical uses of ß- blockers. 45.13 Describe the adverse effects of ß- blockers. 45.14 Describe the limitations of beta- blockers in patients with Diabetes Mellitus, Hyperlipidemias, Bronchial Asthma and peripheral arterial disease.

46.	Anti asthmatic drugs	1	46.1 Discuss types, MOA, uses and S/E of anti asthmatics (Short and long acting beta2 agonists 46.2 Discuss types, MOA, uses and S/E of Antimuscarinics, leukotriene inhibitors and xanthines
Community Dentistry			
47.	Orientation to Community Dentistry	1hr	47.1 Define the scope and importance of community dentistry in improving public health. 47.2 Recognize the role of a dentist in community oral health initiatives. 47.3 Describe the association between community dentistry and public health policies. 47.4 Assess common challenges faced in delivering community dental services.
48.	Principles of Public Health	1hr	48.1 Define and explain the principles of public health 48.2 Identify and explain key principles of public health to dental care. 48.3 Describe how social, economic, and environmental factors affect oral health. 48.4 Compare different public health approaches to disease prevention and health promotion. 48.5 Discuss the role of public health in planning community-based dental care programs.
49.	Concepts of Health and Disease Prevention	4 hrs	49.1 Define health. 49.2 Define and identify the different types of changing concepts of health. 49.3 Explain the holistic concept of health. 49.4 Define and describe the dimensions of health. 49.5 Define the determinants of health. 49.6 Describe how these health determinants affect oral health. 49.7 Define and describe concepts of wellbeing. 49.8 Describe the indicators of health. 49.9 Define healthcare and levels of healthcare. 49.10 Discuss global health goals (MDG's and SDG's).

			49.11 Define and describe the concept of causation. 49.12 Define and describe the concept of disease, the Natural history of the disease. 49.13 Organize and explain the changing pattern of disease, community diagnosis and treatment. 49.14 Define and explain concepts of control. 49.15 Define the concept of prevention. 49.16 Identify the level of prevention and disease process. 49.17 Describe mode of prevention. 49.18 Describe preventive strategies in nutrition for improving community oral health outcomes.
50.	Health Promotion	3hrs	50.1 Explain health promotion 50.2 Discuss methods of public awareness. 50.3 Trace the historical evolution of health promotion 50.4 Recognize key milestones and shifts in health promotion strategies
51.	Health Education and oral Health education	5 hrs	51.1 Define health education. 51.2 Explain the principles of health education 51.3 Discuss the domains and nature of learning 51.4 Discuss the different approaches in dental health education 51.5 Describe different health education theories and models. 51.6 Discuss the methods of health education. 51.7 Enlist types of communication and barriers faces during communication in dental education.

LAB WORK			
Pharmacology			
52.	Lab protocols	1	52.1 Describe the general protocols for working safely and efficiently in lab. 52.2 Describe biosafety procedures and precautions taken in labs.
53.	Solutions (5% dextrose, normal saline)	2	53.1 Identify the ingredients of 5% dextrose solution and normal saline. 53.2 Prepare and dispense 50ml of 5% dextrose solution and normal saline. 53.3 Describe its uses.
54.	Rabbit eye experiments	2	54.1 Perform and observe the effects of parasympathetic / parasympatholytic drug effects on rabbit's eye. 54.2 Perform and observe the effects of sympathomimetic drug effects on rabbit's eye.
General Pathology			
55.	Gram staining	2	55.1 Perform gram staining. 55.2 Interpret the results of gram staining.
56.	Culture media	2	56.1 Identify different types of culture media.
57.	Coagulative necrosis		57.1 Identify the slide of coagulative necrosis under the microscope.
58.	Pathological calcification		58.1 Identify the slide of pathological calcification under the microscope.

59.	Hyperplasia		59.1 Identify the slide of hyperplasia under the microscope.
	Community Dentistry		
60.	Delivery of health education.	4 hrs	60.1 Deliver health education regarding general self-care advice, and for maintenance of oral health on simulated patients 60.2 Demonstrate effective interpersonal communication techniques (verbal, non-verbal, motivational interviewing basics). 60.3 Design Information, Education, and Communication Materials like posters, leaflets, infographics on health education
	Science of Dental Materials		
61.	Introduction to instruments that are used in dental materials laboratory	1	62.1 Identify • Wax knife • Wax carver • Plaster knife • Rubber Bowl (hard & soft) • Mixing spatula (For Plaster) • Mixing spatula (For Alginate) • Cement Spatula • Glass Slab • Dental Flask with Press • Oil Painting Brush • Plain Line Articulator • Round Pliers • Flat Pliers • Cutting Pliers (wire cutter) • Ruler • Spirit Lamp • Ceramic Cup with lid for acrylic mixing • Impression Trays (Plastic & Metal) • Glass Beaker
	Theme 2: Health and Oral Well Being		
S.No	**Topic**	**Hours**	**Learning objectives**
Community Dentistry			

62.	Introduction to Epidemiology	1hr	62.1 Define epidemiology. 62.2 Describe uses of epidemiology. 62.3 Classify epidemiological study designs
63.	Measurements of epidemiology	1hr	63.1 Discuss the measurements in epidemiology. 63.2 Differentiate between rate, ratio and proportion. 63.3 Differentiate between incidence and prevalence.
64.	Descriptive Study	2hrs	64.1 Explain the characteristics of a descriptive study and its role in oral health research. 64.2 Identify the strengths and limitations of descriptive studies. 64.3 Interpret findings from descriptive studies in a population 64.4 Discuss the features of case report and case series.

65.	Cross-sectional study design	1hr	65.1 Differentiate between descriptive and analytical study design. 65.2 Discuss the distinct features of cross-sectional study. 65.3 Discuss the steps in a cross-sectional study. 65.4 Discuss the strengths and weaknesses of cross-sectional studies.

66.	Case control study design	2 hrs	66.1 Discuss the distinct features of case-control study design. 66.2 Discuss the steps in a case-control study design. 66.3 Define matching and its concept in selection of cases and control. 66.4 Discuss the types of bias in a case-control study. 66.5 Discuss the strength and weaknesses of case-control studies. 66.6 Discuss the concept of confounding factor. Calculate odds ratio for a given 2×2 table.
67.	Cohort study design	2 hrs	67.1 Discuss the distinct features of cohort study design. 67.2 Discuss the steps in a cohort study design. 67.3 Differentiate the types of cohort studies. 67.4 Differentiate between case-control and cohort study design. 67.5 Discuss the types of bias in a cohort study. 67.6 Discuss the strength and weaknesses of analytical studies. 67.7 Differentiate between relative risk and attributable risk.
68.	Experimental studies	2 hrs	68.1 Classify experimental studies. 68.2 Define Randomized controlled trial (RCT). 68.3 Discuss the importance of randomization. 68.4 Discuss the steps carried out to conduct an RCT. 68.5 Explain types of blinding. 68.6 Discuss the strengths and weaknesses of a RCT. 68.7 Discuss the bias and ethical considerations in a RCT 68.8 Discuss non-randomized control trials.

69.	Evidence Based Dentistry	1hr	69.1 Define evidence-based dentistry. 69.2 Discuss the importance of evidence-based dentistry in making clinical decisions. 69.3 Describe the Stages of evidence-based dentistry. 69.4 Explain the hierarchy of evidence pyramid.
Science of Dental Materials			
70.	Introduction, Selection & Evaluation of dental materials	2 hrs	70.1 Define the science of dental materials. 70.2 Classify dental materials. 70.3 Describe preventive dental materials. 70.4 Describe Auxiliary Dental Materials. 70.5 Describe Restorative Dental Materials. 70.6 Discuss the criteria for dental material selection and evaluation.

71.	Introduction to the Properties used to Characterize Materials	1 hr	71.1 Discuss the following:- • Properties during storage • Properties during setting/manipulation 71.2 Properties of the set material
72.	Mechanical properties Stress strain graph	2 hrs	72. 1 Describe various properties that are manifested in stress strain graph
73.	Impact strength and fracture toughness	1 hr	73.1 Define impact strength and fracture toughness 73.2 Explain impact strength, fracture toughness and their significance in dental materials 73.3 Explain the test used to evaluate impact strength of dental materials
74.	Wear	1 hr	74.1 Discuss the following terms:- • Abrasion • Attrition 74.2 Discuss Erosion
75.	Hardness	1 hr	75.1 Define hardness of dental materials. 75.2 Discuss various tests used to evaluate the hardness of dental materials.
76.	Viscoelasticity	1 hr	76.1 Define & Discuss the following:- • Elasticity and viscoelasticity • Models used to represent elastic, plastic, viscoelastic materials 76.2 Discuss Creep
77.	Rheological properties of materials	1hr	77.1 Define the following terms:- • Shear stress • Shear rate 77.2 Discuss the following:- • Newtonian fluids • Dilatant

			• Pseudoplastic • Viscosity • Flow • Mixing time • Working time • Setting time

78.	Thermal properties of materials	1hr	78.1 Discuss • Thermal conductivity • Thermal diffusivity • Exothermic Reactions
79.	Adhesion	1	79.1 Discuss • Types of Adhesion a. Factors Affecting Adhesion
80.	Miscellaneous physical properties	1	80.1 Discuss • Dimensional changes • Density • Color
81.	Chemical Properties	1	81.1 Discuss • Solubility • Leaching of constituents • Tarnish and corrosion

82.	Biological Properties	1	82.1 Define biocompatibility, bioinert and bioactive 82.2 Enlist factors affecting biocompatibility of materials 82.3 Differentiate between allergy and toxicity 82.4 Differentiate between carcinogenic and mutagenic 82.5 Identify materials in dentistry which have hazardous ingredients 82.6 Enlist different tests used to evaluate biocompatibility
83.	Synthetic Polymers	1	83.1 Define • Monomer • Polymer • Polymerization 83.2 Classify Polymerization 83.3 Describe various steps of Addition polymerization 83.4 Discuss Factors affecting properties of resulting polymer) 83.5 Describe Chain branching or crosslinking (Factors affecting properties of resulting polymer) 83.6 Describe Condensation polymerization 83.7 Differentiate between thermosetting and thermoplastic polymers

84.	Structure and properties of synthetic polymers	1	84.1 Discuss physical changes occurring during polymerization • Phase changes • Temperature changes • Dimensional changes • Factors which control properties of polymers • Glass transition temperature • Softening temperature 84.2 Discuss • Methods of fabricating polymers • Dough moulding • Injection moulding • Thermoplastic polymers 84.3 Enlist advantages and disadvantages of synthetic polymers

Junior Operative (Operative Dentistry and Endodontics)				
85.	Introduction to Operative Dentistry	1	85.1	Discuss operative dentistry and its historical background.
			85.2	Discuss the indications, considerations, dynamics of operative dentistry.
			85.3	Discuss the future prospects in operative dentistry.
			85.4	Discuss about endodontics.
86.	Isolation	3	86.1	Define isolation in operative procedures and explain its rationale in terms of moisture control, cross-infection prevention, operator efficiency and patient safety.
			86.2	Discuss different isolation methods for operative procedures.
			86.3	Describe the components, indications and contraindications of commonly used isolation methods: rubber dam, cotton rolls, saliva ejectors and high-volume suction, gingival retraction chords.
			86.4	Explain the effects of inadequate isolation on operative procedures with specific reference to rubber dam its placement in maxillary and mandibular teeth via direct and indirect method.
87.	Introduction to equipment and instruments used in operative procedures	2	87.1	Identify the equipment used in a dental operatory.
			87.2	Identify hand instruments used in restorative procedures.
			87.3	Identify rotary cutting instruments used in restorative procedures.
			87.4	Identify different parts of the dental chair.
			87.5	Demonstrate how to operate the dental chair.
Junior Prosthodontics				

88.	Deteriorating adult dentition	1hr	88.1 88.2 88.3	Discuss the causes of deteriorating dentition. Discuss the sequelae of tooth loss. Define the partially dentate and complete edentulous conditions.
89.	Introduction to Prosthodontics	1hr	89.1 89.2 89.3 89.4	Define Prosthodontics. Define Pre- Clinical Prosthodontics. Discuss branches of Prosthodontics. Explain the choice of treatment options according to patient-specific needs
90.	Complete Dentures	1hr	90.1 90.2 90.3 90.4	Define Complete Denture. Discuss its role in rehabilitation of edentulous patients. Enlist the parts and surfaces of complete dentures. Enlist the fabrication steps of complete dentures.
Lab work Dental Materials				
91.	Wire bending exercise	3hrs	91.1	Perform stainless steel wire bending according to the alphabetical shapes of A, B, F, G, S and K.
Theme 3: Foundations of Pre-Clinical Skills				
S.No	**Topic**	**Hours**	**Learning objectives**	
Oral Medicine				
92.	Approach to patient management	1hr	92.1 Discuss the approach to patient management in dentistry. 92.2 Describe the overall process of patient management with a brief explanation of each component, i.e., history, examination, laboratory investigation, imaging, diagnosis, treatment plan and counselling.	
Science of Dental Materials				

93.	Impression material requirements	1	93.1	Define dental impression.
			93.2	Describe significance of impression.
			93.3	Discuss ideal requirements of dental impression materials.
			93.4	Identify various types of impression trays
			93.5	Explain the uses of different impression trays
			93.6	Describe various impression making techniques

94.	Dental impression materials classification	1	94.1 Classify impression materials on the basis of • Elasticity/rigidity • Viscosity • Setting reaction • Uses • Applied stress
95.	Non-elastic impression materials - Impression Compound	1	95.1 Describe the composition of impression Compound. 95.2 Describe the manipulation of impression Compound 95.3 Describe the setting reaction of impression Compound 95.4 Describe the properties of impression Compound 95.5 Describe the application of impression Compound 95.6 Describe the advantages and disadvantages of impression Compound
96.	Non-elastic impression materials - Zinc Oxide eugenol Impression	1	96.1 Describe the composition of Zinc Oxide eugenol Impression material. 96.2 Describe the manipulation of Zinc Oxide eugenol Impression material. 96.3 Describe the setting reaction of Zinc Oxide eugenol Impression material. 96.4 Describe the properties of Zinc Oxide eugenol Impression material. 96.5 Describe the application of Zinc Oxide eugenol Impression material. 96.6 Describe the advantages and disadvantages of Zinc Oxide eugenol Impression material.
97.	Elastic impression materials – Hydrocolloids – Agar	1	97.1 Describe hydrocolloid. 97.2 Describe the composition of Agar.

			97.3	Describe the manipulation of Agar.
			97.4	Describe the setting reaction of Agar.
			97.5	Describe the properties of Agar.
			97.6	Describe the application of Agar.
			97.7	Describe the advantages and disadvantages of Agar.

98.	Elastic impression materials – Hydrocolloids – Alginate	2	98.1	Describe the composition of Alginate.
			98.2	Describe the manipulation of Alginate.
			98.3	Describe the setting reaction of Alginate.
			98.4	Describe the properties of Alginate.
			98.5	Describe the application of Alginate.
			98.6	Describe the advantages and disadvantages of Alginate.
99.	Synthetic elastomers – Polysulphides	1	99.1	Discuss synthetic elastomers.
			99.2	Describe the composition of Polysulphides.
			99.3	Describe the manipulation of Polysulphides.
			99.4	Describe the setting reaction of Polysulphides.
			99.5	Describe the properties of Polysulphides.
			99.6	Describe the application of Polysulphides.
			99.7	Describe the advantages and disadvantages of Polysulphides.
100.	Synthetic elastomers – Condensation silicones	1	100.1	Describe the composition of Condensation silicones.
			100.2	Describe the manipulation of Condensation silicones.
			100.3	Describe the setting reaction of Condensation silicones.
			100.4	Describe the properties of Condensation silicones.
			100.5	Describe the application of Condensation silicones.
			100.6	Describe the advantages and disadvantages of Condensation silicones

101.	Synthetic elastomers – Addition silicones	1	101.1	Describe the composition of Addition silicones.
			101.2	Describe the manipulation of Addition silicones.
			101.3	Describe the setting reaction of Addition silicones.
			101.4	Describe the properties of Addition silicones.
			101.5	Describe the application of Addition silicones.
			101.6	Describe the advantages and disadvantages of Addition silicones.
102.	Synthetic elastomers – Polyether	1	102.1	Describe the composition of Polyether.
			102.2	Describe the manipulation of Polyether.
			102.3	Describe the setting reaction of Polyether.
			102.4	Describe the properties of Polyether.
			102.5	Describe the application of Polyether.
			102.6	Describe the advantages and disadvantages of Polyether.
103.	Clinical considerations of dental materials regarding cross infection control	1	103.1	Define cross-infection
			103.2	Define disinfection and sterilization
			103.3	Discuss various methods of disinfection and sterilization used in dentistry.
Lab work of Dental Materials				

104.	Manipulation of Impression materials	8	104.1 Manipulations of various impression materials as per practical logbook (8 hours). 104.2 Perform Impression taking with alginate and model pouring with gypsum products (4 hours). 104.3 Perform Manipulation of impression compound (2 hours). 104.4 Demonstrate manipulation of zinc oxide eugenol and silicone impression materials (2 hours).

Junior Prosthodontics LGF				
105.	Dental Impressions and tray selection	1hr	104.1	Define a dental impression and related key terms. (impression material, impression tray)
			104.2	Explain the principles of impression making (accuracy, retention, stability, support and extension)
			104.3	Classify impression trays based on materials, design and clinical use.
			104.4	Identify clinical situations requiring special tray.
			104.5	Explain the significance of choosing an appropriate impression tray in fabrication of CD.
106.	Denture bearing areas	2hrs	105.1	List the major anatomical landmarks of the maxillary and mandibular arches relevant to complete dentures. (STRESS BEARING AREAS, LIMITING AREAS AND RELIEF AREAS).
			105.2	Define stress bearing area, relief area and limiting area.
			105.3	Describe the functional significance of maxillary landmarks (e.g., hamular notch, incisive papilla, vibrating line) in denture extension and retention.
			105.4	Describe the functional significance of mandibular landmarks (e.g., retromolar pad, buccal shelf, lingual flange area) in denture support and stability
107.	Impressions for complete denture	2hrs	107.1	Define initial (primary) and final (secondary) impressions and their purpose in complete denture fabrication.
			107.2	Discuss the clinical steps involved in making an initial impression and the rationale behind each step.
			107.3	Discuss how initial impressions are used to fabricate custom trays.
			107.4	Discuss the clinical steps involved in making a final impression and the rationale behind each step.
			107.5	Explain the importance of final impression

INFLAMMATION, INFECTION & AUXILIARY DENTAL MATERIALS MODULE

2nd Year BDS

Table 1: Themes

S.NO	Theme	Duration in Weeks/hours
1.	Pain and fever	1.5 weeks (54 hours)
2.	Inflammation of Oral Tissues	1.5 weeks (52 hours)
3.	Ulcers, Vesicle and Discoloration	2.5 weeks (80 hours)
4.	Lymphadenopathy and generalized malaise	0.5 week (14 hours)
	Total	6 weeks (199 hours)

Teaching Hours Allocation

Table 2: Hours allocation for different subjects

S. No	Subject	Hours
1.	Physiology	1
2.	General Pathology	46
3.	Pharmacology	34
4.	Community & Preventive dentistry	28
5.	Science of Dental Materials	46
6.	Periodontology	09
7.	Oral Pathology	16
8.	Oral Medicine	13
9.	Pre-Clinical Operative Dentistry	03
10.	Pre-Clinical Prosthodontics	03
	Total	**199**

***7 Hours per day for 5 days (Monday to Friday) = 35 hours/ week**

Learning Objectives

By the end of this Module, 2nd year BDS students will be able to:

1. Define inflammation, describe cellular and vascular events during inflammation, and differentiate between acute and chronic inflammation.
2. Discuss the various cell and plasma-derived mediators and the role they play in inflammation.
3. Explain the role of the immune system in inflammation.
4. Describe different types of hypersensitivity reactions and their clinical significance.
5. Identify different microbial agents through various lab techniques including staining, culture, and biochemical tests.
6. Discuss the pathogenesis and histo-pathological features of different types of infections including bacteria, virus & fungi, and their oral manifestations
7. Discuss the initiation and progression of dental caries, etiological factors, classification, and diagnosis.
8. Distinguish between reversible and irreversible pulpitis based on clinical and histological features
9. Classify and discuss different periodontal diseases.
10. Classify and describe the mechanism of action, uses, adverse effects, indications, and contraindications of NSAIDs and COX inhibitor
11. Classify and describe the mechanism of action, uses, adverse effects, indications, and contraindications of antibiotics, anti-mycobacterial antivirals, and antifungals.
12. Classify and describe the mechanism of action, uses, adverse effects, indications, and contraindications of corticosteroids.
13. Classify and describe the mechanism of action, adverse effects, uses, indications, and contraindications of DMARDs.
14. Enlist the ideal properties of dental liners and bases used in treating inflamed pulpal tissues and their application.
15. Discuss various auxiliary materials used during the fabrication of prosthesis.
16. Explain the different concepts of Biostatistics
17. Describe screening of diseases
18. Describe prevention of infection and methods of sterilization and disinfection
19. Discuss waste disposal methods.
20. Describe the epidemiology of Dental caries with risk assessment
21. Describe the epidemiology and prevention of periodontal disease

22. Discuss various polymers used in dentistry.
23. Define and explain factors related to common oral diseases and their prevention.
24. Explain the infection control in Prosthodontics
25. Fabrication of temporary denture bases.
26. Discuss the role of commonly used medicaments in the prevention and treatment of oral infections.
27. Write prescriptions for various oral and dental infectious disease.

Table 1: Learning Objectives Theme Wise

Theme 1: Pain and Fever

S. No	Topic	Hours	Learning Objectives
Physiology			
1.	Normal Host Defense	1 hour	1.1. Describe Specific and nonspecific defense (Innate and acquired immunity. Active & passive Immunity). 1.2. Define and discuss Antigen, antibodies and complement with significance. 1.3. Discuss the role of nutrition in immunity.
General pathology			
2.	Acute Inflammation	1 hour	2.1 Define acute inflammation and its causes. 2.2 Describe the cellular events of inflammation particularly process of chemotaxis, opsonization and phagocytosis. 2.3 Describe the vascular events and morphological changes related to inflammation. 2.4 Discuss the outcomes of acute inflammation. 2.5 Discuss the systemic manifestation of inflammation.
3.	Mediators (Cell Derived and Plasma Derived)	2 hours	3.1 Describe the important chemical mediators (cell & plasma derive) of inflammation. 3.2 Describe the pathway particularly the complement & coagulation pathways, Arachidonic Acid metabolism/ Derivatives.

			3.3 Describe the mechanism for development of fever, with reference to exogenous and endogenous pyrogens.
4.	Major Histocompatibility Complex	1 hour	4.1 Describe MHC Class 1 and MHC Class 2. 4.2 Describe Transplants and transplant rejection.
5.	Hypersensitivity	1 hour	5.1 Define Hypersensitivity reactions. 5.2 Describe its Type and examples. 5.3 Enlist common food allergies and intolerances.
6.	Immunodeficiency and autoimmunity disorders	1 hour	6.1 Define and Classify immunodeficiency disorders. 6.2 Define Autoimmunity & self-tolerance. 6.3 Describe the role of nutrition in autoimmune disorders.
7.	Streptococcus	2 hours	7.1 Discuss each bacterium in detail in reference to, Spectrum of diseases, important properties, pathogenesis, clinical features, lab diagnosis, prevention, and treatment.
8.	Introduction to Parasitology	1 hour	8.1 Define and classify parasites in detail. 8.2 Describe different types of Hosts.
9.	Malaria	1.5 hour	9.1 Discuss Malaria in detail in reference to: Spectrum of diseases, important properties, pathogenesis, clinical features, lab diagnosis, prevention, and treatment. 9.2 Discuss the nutritional management of patients with malaria.
10.	Dengue	1.5 hour	10.1Discuss dengue in detail in reference to: Spectrum of diseases, important properties, pathogenesis, clinical features, lab diagnosis, prevention, and treatment. 10.2 Discuss the nutritional management of patients with dengue.
Pharmacology			

11.	Anti-inflammatory drugs	2 hours	11.1 Classify anti-inflammatory drugs. 11.2 Describe the role of DMARDs and glucocorticoids as anti-inflammatory agents. 11.3 Classify DMARDS 11.4 Discuss uses, adverse effects and MOA of DMARDS. 11.5 Classify anti-inflammatory drugs. 11.6 Describe the role of DMARDs and glucocorticoids as anti-inflammatory agents. 11.7 Discuss the drug nutrient interaction.
12.	NSAIDs	1 hours	12.1 Classify, describe clinical uses and the adverse effects NSAIDS. 12.2 Differentiate between non-selective COX inhibitors and selectiveCOX-2 inhibitors based on mechanism of action. 12.3 Enlist the prototype non-selective COX inhibitor. 12.4 Describe the mechanism of action of aspirin. 12.5 Discuss Aspirin poisoning and its management. 12.6 Give the dose of Aspirin as anti-platelet, analgesic/antipyretic, and as anti-inflammatory drug. 12.7 Describe the pharmacokinetics of Diclofenac, Ibuprofen, Indomethacin, Mefanamic acid and Piroxicam. 12.8 Relate pharmacokinetics and pharmacodynamics of NSAIDs to their clinical applications.

13.	Selective COX-2 Inhibitors and Acetaminophen (Paracetamol)	1 hour	13.1 Describe the mechanism of action of selective COX-2 inhibitors. 13.2 Describe the clinical uses of selective COX-2 inhibitors. 13.3 Describe the adverse effects of selective COX-2 inhibitors. 13.4 Describe the merits and demerits of selective COX-2 inhibitors and non-selective COX-2 inhibitors. 13.5 Describe the pharmacokinetics of Paracetamol. 13.6 Describe the mechanism of action of Paracetamol. 13.7 Describe the clinical uses of Paracetamol. 13.8 Describe the adverse effects of Paracetamol. 13.9 Give therapeutic and fatal doses of Paracetamol. Describe the drug treatment of Paracetamol poisoning.
14.	Antihistamines	1 hour	14.1 Classify anti-histamines. 14.2 Differentiate between first- and second-generation anti-histamines – 14.3 Describe the pharmacologic effects of H1-receptor antagonists. 14.4 Describe the clinical uses of H1-receptor antagonists. 14.5 Enlist the adverse effects of H1-receptor antagonists. 14.6 Enlist anti-histamines antagonists.
15.	Serotonin agonist and antagonist	1 hour	15.1 Enlist serotonin agonists. 15.2 Classify serotonin antagonists. 15.3 Describe the mechanism of action of serotonin. 15.4 Describe the organ system effects of serotonin. 15.5 Describe the clinical uses of serotonin agonists and antagonists.

			15.6 Enlist the drugs used for migraine.
16.	Opioids	1 hours	16.1 Identify common opioids used in dentistry. 16.2 Classify opiods. 16.3 Explain opioid mechanisms of action in pain relief. 16.4 Recognize adverse effects like sedation, constipation, and addiction risk. 16.5 Discuss safe prescribing practices, including dosage and duration. 16.6 Identify alternatives to opioids (e.g., NSAIDs, acetaminophen). 16.7 Discuss safe opioid use, storage, and disposal with patients. 16.8 Recognize signs of opioid misuse or dependence. 16.9 Monitor and adjust opioid use to minimize risks.
Community & Preventive Dentistry			
17.	Prevention of Infection	1.5 hour	17.1 Describe the Dynamics of Disease Transmission. 17.2 Explain Different Modes of Disease Transmission. 17.3 Describe Different Stages of Infectious Diseases. 17.4 Explain the infectious diseases terms (Epidemic, endemic, pandemic). 17.5 Describe the role of nutrition in strengthening immune system and infection prevention.
18.	Screening of Diseases	2 hours	18.1 Define Screening. 18.2 Differentiate between screening and diagnostic test. 18.3 Distinguish between the types of screening. 18.4 Describe the uses of screening. 18.5 Outline the principles of screening. 18.6 Describe The Criteria for Screening Tests. 18.7 Differentiate between specificity and sensitivity of screening tests. 18.8 Evaluate the Screening Tests. 18.9 Describe the types of biases in screening.

19.	Introduction to Biostatistics	1 hour	19.1 Define Biostatistics. 19.2 Define description statistics and inferential statistics 19.3 Classify types of data 19.4 Classify types of variables 19.5 Differentiate between data and variable 19.6 List the uses of biostatistics in community dentistry
20.	Descriptive Statistics	2 hour	20.1 Explain measures of central tendency (mean, median and mode), and measures of dispersion (range, mean deviation, variance, standard deviation) 20.2 Explain normal distribution curve.
21.	Inferential statistics	1 hour	21.1 Briefly discuss correlation and regression models. 21.2 Explain standard error 21.3 Explain rules of probability Confidence level, Confidence interval and p value 21.4 Briefly discuss Chi Square, T test and Anova. 21.5 Define hypothesis and discuss its types. 21.6 Differentiate between types of errors in hypothesis. 21.7
22.	Data Presentation	1 hour	22.1 Discuss types of data. 22.2 State the different methods to depict quantitative and qualitative data. 22.3 Describe pie chart, bar chart and histogram.
23.	Sampling Technique	2 hours	23.1 Define sampling technique. 23.2 Describe sampling techniques namely simple random, systematic, stratified, cluster, multistage, quota, snowball, convenience, consecutive, purposive. 23.3 Classify sampling techniques. 23.4 Differentiate between probability and non-probability techniques.
Science of Dental Material			

24.	Composition, setting and manipulation of gypsum products	2 hours	24.1 Discuss • Composition of gypsum products • Setting Reaction of gypsum in dentistry • Manipulation and Setting characteristics • Water/Powder ratio • Gauging water • Fluidity tests

			• Setting process • Initial and final setting time • Setting expansion • Factors affecting setting time
25.	Properties and applications of gypsum products	1 hour	25.1 Describe • Properties of set material • Applications • Advantages and Disadvantages • Differentiate between alpha and beta hemihydrate
26.	Introduction to dental waxes	1 hour	26.1 Define wax and wax pattern 26.2 Explain role of blending various waxes for dental applications 26.3 Explain various methods of softening dental waxes 26.4 Describe Lost wax technique Direct and indirect wax patterns. 26.5 Discuss ideal requirements of wax pattern materials 26.6 Discuss composition of waxes 26.7 Classify dental waxes 26.8 Discuss applications of various dental waxes
27.	Properties and applications of dental waxes	1 hour	27.1 Discuss • Thermal properties • Mechanical properties 27.2 Describe 27.2.1 Denture modelling waxes 27.2.2 Inlay waxes 27.3 Differentiate between direct and indirect techniques
Oral Pathology			
28.	Periapical Abscess	1 hour	28.1 Describe periapical abscess its clinical features, histopathology, and complications. 28.2 Describe progression of pulpitis to periapical abscess.

29.	Spread of Infection	1 hour	29.1 Identify the facial planes involved in the spread of infections. 29.2 Describe routes of spread of infection. 29.3 Define cellulitis and describe its complications. 29.4 Differentiate between abscess and cellulitis. 29.5 Discuss the nutritional management of patients with severe facial space infection.
Oral Medicine			
30.	Orofacial pain	1 hour	30.1 Enumerate conditions that can cause facial pain 30.2 Briefly discuss referred and projected pain. 30.3 Define important neurological terms such as allogenic, allodynia, analgesia, anesthesia, dysesthesia, hyperalgesia, neuropathic pain
Junior Operative (Operative Dentistry and Endodontics)			
31.	Hypersensitivity and pain	1 hour	31.1 Discuss hypersensitivity and pulpal pain.
Junior Prosthodontics			
32.	Basics of infection control in prosthodontics	1hr	32.1 Discuss infection control in prosthodontics. 32.2 Identify Potential Hazards in Prosthodontic department. 32.3 Describe Standard Precautions. 32.4 Enlist steps to disinfect impressions, laboratory tools, dental chairs, countertops, and other surfaces in the prosthodontics ward
Lab Work			
Science of Dental Materials			

33.	Fabrication of model/ cast using gypsum products	2 hours	33.1 Manipulate hard plaster and soft plaster for pouring into impression/silicon mold. 33.2 Perform mixing of soft plaster and make base of the model.
34.	Making of C- clasp	4 hours	34.1 Perform making of C- clasp over the model using stainless steel wire.
35.	Manipulation of Modelling wax	3 hours	35.1 Perform making of wax pattern for partial denture.
General Pathology			
36.	Bacterial motility	1 hour	36.1 Identify motile bacteria.
37.	Plasmodium	2 hours	37.1 Identify the different species of Plasmodium.
38.	Acute inflammation	2 hours	38.1 Identify the cells involved in acute inflammation under the microscope.
THEME 2: INFLAMMATION OF ORAL TISSUES			
Oral Pathology			
39.	Dental Caries	2 hours	39.1 Discuss in detail the role of Dental Plaque, Microorganisms, Carbohydrates, and other variables in the development of dental caries. 39.2 Classify dental caries. 39.3 Describe the enamel and dentin caries. 39.4 Explain the clinical and histopathological features of enamel and dentin caries.
40.	Pulpitis	1 hour	40.1 Describe and distinguish between reversible and irreversible pulpitis. 40.2 Discuss pulp necrosis.

41.	Periapical Periodontitis	1 hour	41.1 Define periapical Periodontitis, its clinical features and histopathology. 41.2 Describe the complications of acute and chronic periapical periodontitis.
Periodontology			
42.	Classification of periodontal diseases	2 hours	42.1 Recall the Classification of Periodontal Diseases and Conditions from the 1999 International Workshop for a Classification of Periodontal Diseases and Conditions. 42.2 Describe the types of Gingival Diseases. 42.3 Differentiate between Chronic and Aggressive forms of periodontitis with respect to history, clinical and radiographic findings. 42.4 Identify Periodontitis as a Manifestation of Systemic Diseases. 42.5 Enlist types of abscesses of periodontium. 42.6 Classify Periodontitis Associated with Endodontic Lesions. 42.7 Explain Developmental or Acquired Deformities and Conditions.
43.	Gingival inflammation and pathogenesis	3 hours	43.1 Define a Biofilm. 43.2 Describe dental plaque as biofilm. 43.3 Appraise the clinical significance of Dental Plaque in the initiation of gingivitis. 43.4 Explain salient features of the initial, early, established, advanced lesion of gingivitis. 43.5 Classify different types of Gingivitis. 43.6 Describe gingival bleeding on probing.

44.	Acute Gingival conditions & Abscesses of periodontium	4 hours	44.1 Explain the clinical features, pathogens involved, diagnosis, treatment, and complications of peri-coronitis. 44.2 Explain the clinical features, microbiology involved, diagnosis and treatment of Primary Herpetic Gingivostomatitis. 44.3 Explain the etiology, clinical features, pathogens involved, diagnosis and treatment of Necrotizing ulcerative Gingivitis. 44.4 Explain etiology, clinical features, pathogen involved, diagnosis and treatment of Necrotizing ulcerative periodontitis. 44.5 Identify and distinguish between gingival, periapical, and peri-coronal abscess. 44.6 Describe the effect of compromised nutritional well-being on disorders of oral mucosa and periodontium
Community & Preventive Dentistry			
46.	Dental Caries	1 hour	46.1 Define and classify dental caries. 46.2 Explain Theories of Dental Carries
47.	Epidemiology of Dental caries	1 hour	47.1 Discuss Epidemiological factors Of Dental Caries.
48.	Role of saliva and Diet in dental Caries	2 hours	48.1 Explain the Role of Saliva and diet In Dental Caries. 48.2 Discuss Stephan curve. 48.3 Discuss various interventions in dietary practices to prevent dental caries. 48.4 Discuss factors affecting cariogenicity of food.

49.	Caries Risk Assessment	1.5 hours	49.1 Define Caries Risk Assessment. 49.2 Enlist Factors Relevant Assessment of Caries Risk. 49.3 Enlist oral nutrition risk assessment tools.

50.	Carioghram	1 hour	50.1 Discuss components and uses of cariogram.
51.	Caries Activity Tests	1 hour	51.1 Classify Caries Activity Tests. 51.2 Explain Different Types of Caries Activity Tests.
52.	Epidemiology of periodontal diseases.	1 hour	52.1 Discuss the epidemiology of periodontal diseases. 52.2 Explain local and systemic factors for periodontal diseases. 52.3 Discuss the chemical and mechanical plaque control.
53.	Prevention Of Periodontal Diseases	1 hour	53.1 Discuss the prevention of periodontal diseases. 53.2 Discuss chemical and mechanical plaque control.
General Pathology			
54.	Sterilization and disinfection	1 hour	54.1 Define sterilization 54.2 Define disinfection 54.3 Discuss the various methods of sterilization and disinfection.
Pharmacology			
55.	Local anesthetics	1 hour	55.1 Explain mechanism of action of Local anesthetics 55.2 Differentiate types of local anesthetics (e.g., esters and amides) based on properties and applications. 55.3 Identify clinical indications for local anesthetic use in dental procedures. 55.4 Determine appropriate dosages and routes of administration for patients. 55.5 Recognize potential side effects and complications of local anesthetics.

56.	Antiseptics antimicrobials & Disinfectants	1 hour	56.1 Define common terms related to chemical and physical killing of microorganisms including antisepsis, decontamination, disinfection, Sanitization, sterilization. 56.2 Identify commonly used antiseptics (e.g., chlorhexidine) and antimicrobials (e.g., metronidazole). 56.3 Recognize their clinical indications (e.g., infections, periodontal disease) and prescribe its dosage. 56.4 Identify potential side effects and resistance risks. 56.5 Identify common disinfectants (e.g., alcohol, bleach, iodine). 56.6 Explain the role of disinfectants in clinical and laboratory settings 56.7 Explain proper dilution, application, and safety practices. 56.8 Recognize microbial resistance and how to reduce it.
57.	Desensitizing agents	1 hour	57.1 Describe mechanism of action. 57.2 Describe different types of commonly used agents e.g, potassium nitrate, calcium phosphate, glut aldehyde, NaF Compounds, acidulated phosphate fluoride. 57.3 Enlist indications and contraindications.
58.	Mouth rinses and mouth washes	1 hour	58.1 Enlist different types of Mouth rinses and mouthwashes. 58.2 Describe their mechanism of action. 58.3 Discuss their dosage and clinical indications for use. 58.4 Discuss Adverse effects of mouth washes
59.	Dentifrices	1 hour	59.1 Define dentrifice. 59.2 Discuss the composition and ideal properties of dentrifices. 59.3 Discuss the pharmacological role of each component in oral health. 59.4 Discuss recommendations for choosing appropriate dentifrices based on patient needs (e.g. caries risk, sensitivity, inflamed oral tissues, tooth whitening).
Science of Dental Materials			
60.	Introduction to investment materials	1 hour	60.1 Define • Investment • Refractory die material

			60.2 Discuss ideal requirements of investments for alloy casting procedures
61.	Gypsum bonded and silica bonded investment material	2 hours	61.1 Discuss • Composition of gypsum bonded investments • Types of gypsum bonded investments • Silica • Inversion phenomena • Hygroscopic expansion • Setting reaction of gypsum bonded investments • Properties of gypsum bonded investments • Applications of gypsum bonded investments • Advantages/ disadvantages of gypsum bonded investments 61.2 Discuss • Composition of silica bonded investment material • Setting reaction of silica bonded investment material • Properties of silica bonded investment material • Applications of silica bonded investment material • Advantages/ disadvantages of silica bonded investment material
62.	Phosphate bonded investment material	1 hour	62.1 Discuss • Composition of Phosphate bonded investment material • Setting reaction of Phosphate bonded investment material • Colloidal solution • Types of phosphate bonded investment of Phosphate bonded investment material • Applications of Phosphate bonded investment material • Advantages and disadvantages of Phosphate bonded investment material 62.2 Explain:

			• Curing Investment • Sagging Investment • Casting Investment • Soldering Investment
Junior Operative (Operative Dentistry and Endodontics)			
63.	Caries classification	1 hours	63.1 Define caries classification based on the location and activity. 63.2 Differentiate between affected and infected dentin. 63.3 Discuss the diagnosis of Dental Caries. 63.4 Differentiate between caries white spots and idiopathic white spots.
64.	Principles of cavity prep	1 hour	64.1 Discuss line angles, point angles, cavity walls and floors. 64.2 Describe the outline form and steps required to achieve it. 64.3 Discuss the resistance form and retention form and how both can be achieved. 64.4 Describe the convenience form. 64.5 Describe how to eliminate infected and softened dentin 64.6 Describe how to finish cavity walls. 64.7 Describe how to clean the cavity.
Junior Prosthodontics			
65.	Dental cast	1hr	65.1 Define dental cast. 65.2 Discuss the parts of dental cast. 65.3 Explain different types of dental cast. 65.4 Discuss step by step pouring of impressions for fabricating dental cast.

Lab Work			
Oral Pathology			
66.	Dental caries	2 hours	66.1 Interpret histopathological section of dental caries.
Community & Preventive Dentistry			
67.	Brushing techniques	2 hours	67.1 Perform brushing techniques in skill lab on a given model.
68.	Flossing techniques	2 hours	68.1 Perform flossing techniques in skill lab.
69.	Disinfection and sterilization	2 hours	69.1 Describe the infection control procedure in a dental care setting. 69.2 Describe disinfection and sterilization in dental care setting.
70.	Waste segregation and disposal	2 hours	70.1 Describe the various types of waste in health care. 70.2 Categorize the biomedical waste according to the color-coding system. 70.3 Discuss the management of mercury spill.
Pharmacology			
71.	Gingivitis	2 hours	71.1 Prescription writing for gingivitis, acute odontogenic infection (periapical abscess), periodontitis, Postoperative Pain, and Inflammation Following Tooth Extraction.

General pathology			
72.	Sterilization and disinfection	2 hours	72.1 Identify various means of sterilization and Disinfection 72.2 Recognize the methods to detect their efficacy
Science of Dental Material			
73.	Articulation	3 hours	73.1 Perform articulation of waxed dental models using hinge/hanau articulator.
THEME 3: ULCERS, VESICLE AND DISCOLORATION			
General pathology			
74.	Staphylococci	1 hour	74.1 Explain the pathogenesis of the bacterium. 74.2 Explain clinical features, lab diagnosis and prevention of bacteria.
75.	Spore forming gram positive rods	1 hour	75.1 Enumerate spore forming GP rods 75.2 Describe the important properties, pathophysiology, clinical features, and lab diagnosis of spore forming GP rods
76.	Non spore forming gram positive rods	1 hour	76.1 Enumerate non-spore forming GP rods 76.2 Describe the important properties, pathophysiology, clinical features and lab diagnosis of non-spore forming GP rods
77.	Treponema Pallidum	1 hour	77.1 Explain the pathogenesis of the bacterium. 77.2 Explain clinical features, lab diagnosis and prevention of bacteria.

78.	Actinomycosis	1 hour	78.1 Explain the pathogenesis of the bacterium. 78.2 Explain clinical features, lab diagnosis and prevention of bacteria.
79.	Human Herpes virus Human papilloma virus, Ebstain barr virus.	1 hour	79.1 Explain the pathogenesis of the virus. 79.2 Explain clinical features, lab diagnosis and prevention of virus.
80.	Measles Mumps	1 hour	80.1 Discuss Spectrum of diseases, Important properties, Pathogenesis, Clinical features, Lab diagnosis, Prevention and treatment.
81.	Rubella Rabies	1 hour	81. 1 Discuss Spectrum of diseases, Important properties, Pathogenesis, Clinical features, Lab diagnosis, Prevention and treatment.
82.	HIV	1 hour	82.1 Discuss Spectrum of disease, Important properties, Pathogenesis, Clinical features, Lab diagnosis, Prevention and treatment.
83.	CMV	1 hour	83.1 Discuss Spectrum of disease, Important properties, Pathogenesis, Clinical features, Lab diagnosis, Prevention and treatment.
84.	Leshmania	1 hour	84.1 Discuss Spectrum of diseases, Important properties, Pathogenesis, Clinical features, Lab diagnosis, Prevention, and treatment.
85.	Toxoplasma	1 hour	85.1 Discuss Spectrum of diseases, Important properties, Pathogenesis, Clinical features, Lab diagnosis, Prevention, and treatment.
86.	Mycology	1 hour	86.1 Discuss the general characteristics, pathogenesis & lab diagnosis of fungi. 86.2 Discuss candida spp general characteristics, pathogenesis & lab diagnosis. Aspergillus, Mucor and Rhizopus
Pharmacology			

87.	Introduction to chemotherapeutics	1 hour	87.1 Define basic terms like chemotherapy, antibiotic, antimicrobial, MIC, MBC, chemoprophylaxis, empirical therapy and post-antibiotic effect, bacteriostatic and bactericidal antimicrobials. 87.2 Explain advantages of drug combinations. 87.3 Describe various mechanisms of bacterial resistance against antibiotics. 87.4 Differentiate between concentration and time dependent killing with examples. 87.5 Classify antimicrobials on the basis of mechanism of action (MOA).
88.	Penicillin	1 hours	88.1 Classify beta-lactam antibiotics. 88.2 Enlist narrow and broad-spectrum Penicillin. 88.3 Enlist anti-pseudomonal, anti- staphylococcal/ beta lactamase resistant Penicillin. 88.4 Enlist long- and short-acting Penicillin. 88.5 Describe anti-bacterial spectrum of Penicillin. 88.6 Describe pharmacokinetics in respect of emphasis on route of administration and excretion of Penicillin. 88.7 Describe mechanism of action and resistance of Penicillin. 88.8 Describe clinical uses of Penicillin. 88.9 Describe adverse effects of Penicillin. 88.10 Describe contraindications of Penicillin. 88.11 Describe principal mechanism of bacterial resistance to Penicillin. 88.12 Describe drug interactions of Penicillin.

			88.13 Apply formula for interconversion of milligrams and units of Penicillin G. 88.14 Relate pharmacokinetics and pharmacodynamics of Penicillin with their clinical applications / uses.
89.	Cephalosporins	1 hour	89.1 Classify Cephalosporins. 89.2 Discuss MOA and MOR of cephalosporins 89.3 Describe anti-bacterial spectrum of Cephalosporins. 89.4 Describe pharmacokinetics of Cephalosporins with special emphasis on route of administration and excretion. 89.5 Describe clinical uses of Cephalosporins. 89.6 Describe the adverse effects of Cephalosporins. 89.7 Describe drug interactions of Cephalosporins with Ethanol. 89.8 Describe the principal bacterial mechanism of resistance to Cephalosporins. 89.9 Relate pharmacokinetics and pharmacodynamics of Cephalosporin with their clinical applications / uses.
90.	Beta lactamase inhibitors, Monobactams & Carbapanem	1 hour	90.1 Enlist beta-lactamase inhibitors. 90.2 Explain the rationale for using beta lactamase inhibitors in combination withß-lactam antibiotics. 90.3Describe the antibacterial spectrum of Monobactams and Carbapanem. 90.4Describe the clinical uses of Monobactams and Carbapanem.

91.	Vancomycin, Fosfomycin Bacitracin & Cycloserine	1 hour	91.1 Describe the MOA and resistance of Vancomycin. 91.2 Describe clinical uses of Vancomycin. 91.3 Describe the use of vancomycin in MRSA (Methicillin-resistant Staph aureus). 91.4 Describe adverse effects of Vancomycin 5. Describe "Red man/Red neck" syndrome. 91.5 Enlist clinical uses of Fosfomycin, Bacitracin & Cycloserine.
92.	Protein Synthesis Inhibitors & Tetracycline	1 hour	92.1 Classify bacterial protein synthesis inhibitors. 92.2 Classify Tetracyclines. 92.3 Describe anti-bacterial spectrum of Tetracyclines. 92.4 Describe the pharmacokinetics of Tetracycline with special emphasis on absorption of Tetracyclines. 92.5 Describe mechanism of action and resistance of Tetracyclines. 92.6 Describe the principal mechanism of resistance to Tetracyclines. 92.7 Describe clinical uses of Tetracyclines. 92.8 Describe adverse effects of Tetracyclines. 92.9 Describe the teratogenic effects of Tetracyclines. 92.10 Describe drug interactions of Tetracyclines. 92.11 Describe the adverse effect related to the use of outdated (expired) Tetracycline products. 92.12 Relate pharmacokinetics and pharmacodynamics of Tetracycline with their clinical applications.

93.	Aminoglycosides	1 hour	93.1 Enlist Aminoglycosides. 93.2 Describe anti-bacterial spectrum of Aminoglycosides. 93.3 Describe the pharmacokinetics of Aminoglycosides with special emphasis on route of administration, concentration-dependent killing, and post-antibiotic effect. 93.4 Describe mechanism of action of Aminoglycosides. 93.5 Describe the principal mechanism of resistance to Aminoglycosides. 93.6 Describe clinical uses of Aminoglycosides. 93.7 Describe adverse effects of Aminoglycosides. 93.8 Describe the drug interactions of Aminoglycosides. 93.9 Relate pharmacokinetics and pharmacodynamics of Aminoglycosides with their clinical applications / uses.
94.	Macrolides	1 hour	94.1 Enlist Macrolides. 94.2 Describe anti-microbial spectrum of Macrolides. 94.3 Describe pharmacokinetics of Macrolides. 94.4 Describe the mechanism of action of Macrolides. 94.5 Describe the principal mechanism of resistance to Macrolides. 94.6 Describe clinical uses of Macrolides. 94.7 Describe adverse effects of Macrolides. 94.8 Describe drug interactions of Macrolides. 94.9 Differentiate the salient features of Erythromycin, Clarithromycin and Azithromycin in respect of dosing and clinical use. 94.10 Relate pharmacokinetics and pharmacodynamics of Macrolides with their clinical applications / uses.

95.	Linezolid and clindamycin	1 hour	95.1 Describe mechanism of action of Linezolid. 95.2 Describe clinical uses of Linezolid with special emphasis on methicillin-resistant staphylococci and vancomycin-resistant enterococci. 95.3 Describe mechanism of action of Clindamycin. 95.4 Enumerate clinical uses of Clindamycin. 95.5 Describe antibiotic-associated (pseudomembranous) colitis.
96.	Streptogramins and Chloramphenicol	1 hour	96.1 Enumerate Streptogramins. 96.2 Describe clinical use of Quinupristin- Dalfopristin in VRE (Vancomycin-resistant enterococci. 96.3 Describe anti-microbial spectrum and mechanism of action of action of Chloramphenicol. 96.4 Enlist clinical uses of Chloramphenicol and reason for obsoleting the systemic use. 96.5 Enlist adverse effects of Chloramphenicol.
97.	Quinolones	1 hour	97.1 Classify Quinolones. 97.2 Describe the pharmacokinetics of Fluroquinolones with special emphasis on half-life of Moxifloxacin. 97.3 Enlist respiratory Quinolones. 97.4 Describe anti-microbial spectrum of Fluoroquinolones. 97.5 Describe mechanism of action and resistance of Fluoroquinolones. 97.6 Describe clinical uses of Fluroquinolones. 97.7 Describe adverse effects of Fluroquinolones. 97.8 Describe drug interactions of Fluroquinolones.

			97.9 Relate pharmacokinetics and pharmacodynamics of Fluoroquinolones with their clinical applications / use.

98.	Sulfonamides	1 hour	98.1 Classify Sulfonamides. 98.2 Describe anti-microbial spectrum of Sulfonamides. 98.3 Describe mechanism of action of Sulfonamides and Trimethoprim. 98.4 Describe mechanism of resistance to Sulfonamides. 98.5 Describe clinical uses of Sulfonamides and Trimethoprim. 98.6 Describe adverse effects of Sulfonamides and Trimethoprim. 98.7 Describe the advantages of combining sulfamethoxazole with trimethoprim (Co-Trimoxazole). 98.8 Describe the drug interaction of Sulphonamides with Phenytoin.
99.	Antifungals	1 hour	99.1 Classify Antifungal drugs. 99.2 Describe the pharmacokinetics of Amphotericin B and Ketoconazole. 99.3 Describe the advantages of liposomal preparation of Amphotericin B. 99.4 Describe mechanism of action of Azoles, Amphotericin B, Griseofulvin, Turbinafine, and Nystatin. 99.5 Describe clinical uses of Azoles, Amphotericin B, Griseofulvin, Turbinafine, and Nystatin. 99.6 Describe adverse effects of Azoles,Amphotericin B, Griseofulvin, Turbinafine, and Nystatin. 99.7 Describe drug interactions of Ketoconazole and Amphotericin B. 99.8 Recognize clinical indications of antifungals in dental practice (e.g., oral candidiasis). 99.9 Follow appropriate dosing regimens for oral fungal infections. 99.10 Identify potential adverse effects and drug interactions relevant to

			dental care.

100	Antivirals	2 hours	100.1	Classify antivirals.
			100.2	Describe the role of antiviral drugs in managing oral viral infections (e.g., herpes simplex, varicella-zoster).
			100.3	Identify key antiviral agents used in dentistry (acyclovir, valacyclovir, famciclovir).
			100.4	Explain antiviral mechanisms of action in inhibiting viral replication in oral tissues.
			100.5	Recognize clinical indications and dosage for prescribing antivirals in dental practice (e.g., oral herpes, herpetic gingivostomatitis).
			100.6	Identify potential adverse effects and drug interactions relevant to dental care.
			100.7	Describe antiviral prophylaxis for immunocompromised dental patients.
			100.8	Apply evidence-based antiviral therapy for managing oral health in dentistry

Oral Pathology			
101.	Oral Ulcers	1 hour	101.1 Classify the different types of oral ulcers based on their etiology and differentiate between different ulcers (aphthous ulcers and herpetic ulcers). 101.2 Discuss the role of B-complex and other nutrients in oral ulcers.
102.	Viral Infections	4 hours	102.1 5Describe the histopathology, oral manifestation, and laboratory diagnosis of Herpes Simplex virus infection. 102.2 Describe the pathogenesis, oral manifestation, and laboratory diagnosis of Varicella Zoster virus infection. 102.3 Describe the oral manifestation, and laboratory diagnosis Epstein-bar virus infection. 102.4 Describe the oral manifestation and laboratory diagnosis and clinical features of Cytomegalovirus infection. 102.5 Describe the oral manifestation, and laboratory diagnosis Paramyxovirus infection. 102.6 Describe the oral manifestation, and laboratory diagnosis Coxsackie virus infection. 102.7 Describe the histopathology, oral manifestation, and laboratory diagnosis of Human Papilloma virus infection. 102.8 Describe the histopathology, oral manifestation, and laboratory diagnosis of Retrovirus (HIV) infections.

103.	Bacterial Infections	2 hours	103.1Define, classify & identify the virulent organism's, interpret the histopathology of Necrotizing Ulcerative gingivitis and Noma. 103.2Define, classify & identify the virulent organism's, interpret the histopathology of Tuberculosis. 103.3Define, classify & identify the virulent organism's, interpret the histopathology and laboratory diagnosis of Syphilis. 103.4 Define, classify & identify the virulent organism's, interpret the histopathology of oral cervicofacial Actinomycosis.
104.	Fungal Infections	1 hour	104.1 Define, classify & identify the virulent organism's, interpret the histopathology of Oral Candidiasis.
Oral Medicine			
105.	Oral Ulcer	1 hour	105.1Define ulcer. 105.2Enlist principal causes of oral ulcer 105.3Define traumatic ulcer 105.4Discuss etiology of traumatic ulcer
106.	Viral, Fungal and Bacterial Infections	11 hour	106.1Define vesiculoulcerative lesions. 106.2Enumerate vesiculoulcerative lesions of oral cavity 106.3Enumerate bacterial infections of oral cavity 106.4Describe in detail the mode of spread, clinical features, complications, diagnosis and management of tuberculosis. 106.5Describe in detail the mode of spread, clinical features, complications, diagnosis and management of actinomycosis. 106.6Describe in detail the mode of spread, clinical features, complications, diagnosis and management of syphilis. 106.7Describe in detail the mode of spread, clinical features, complications, diagnosis and management of gonorrhoea.

			106.8 Enumerate STI (sexually transmitted infections) of oral cavity 106.9 Enumerate viral infections of oral cavity 106.10 Describe in detail the mode of spread, clinical features, complications, diagnosis and management of primary and secondary herpes simplex virus infection. 106.11 Describe in detail the mode of spread, clinical features, complications, diagnosis and management of varicella-zooster virus infection. 106.12 Describe in detail the mode of spread, clinical features, complications, diagnosis and management of herpes zoster, postherpetic neuralgia and Ramsay Hunt syndrome. 106.13 Describe in detail the mode of spread, clinical features, complications, diagnosis and management of Epstein-Barr virus infection. 106.14 Describe in detail the mode of spread, clinical features, complications, diagnosis and management of cytomegalovirus infection. 106.15 Describe in detail the mode of spread, clinical features, complications, diagnosis and management of HIV and AIDS. 106.16 Describe in detail the mode of spread, clinical features, complications, diagnosis and management of paramyxovirus infection. 106.17 Describe in detail the mode of spread, clinical features, complications, diagnosis and management of Coxsackie virus infection (herpangina and hand, foot and mouth disease) 106.18 Describe in detail the mode of spread, clinical features, complications, diagnosis and management of measles and herpangina. 106.19 Enlist common oral fungal infections. 106.20 Discuss predisposing conditions that can lead to oral fungal infections. 106.21 Describe in detail the mode of spread, clinical features, complications, diagnosis and management of primary oral candidiasis (acute and chronic) 106.22 Discuss secondary oral candidiasis as oral manifestation of systemic candidiasis. 106.23 Discuss in detail the clinical features, diagnosis and management of Candida-associated lesions: Candida-associated denture-induced

			stomatitis, angular cheilitis and median rhomboid glossitis.

Science of Dental Materials			
107.	Denture Base Polymers	1 hour	107.1 Describe • Denture base polymers • Dough molding technique • Requirements of denture base polymers 107.2 Classify Acrylic denture base materials 107.3 Discuss Composition of type 1 and 2 materials
108.	Manipulation of acrylic resin	1 hour	108.1 Discuss Suspension polymerization 108.2 Describe • Mixing • P/L ratio • Stages through acrylic material pass • Doughing time • Dough time • Working time • Trial closure • Bench curing • Flash • Different curing cycles
109.	Porosities in acrylic	1 hour	109.1 Describe • Granular porosity • Contraction porosity • Gasesous porosity
110.	Properties, uses and modifications	1 hour	110.1 Discuss • Properties of acrylic resin • Applications of acrylic resin • Advantages/ disadvantages of acrylic resin 110.2 Define Fatigue and differentiate between static and dynamic fatigue

			110.3 Discuss significance of fatigue with respect to denture base materials 110.4 Enlist Modifications • Acrylic elastomer • Carbon fibers • Aramid fibers • Kevlar • Glass fibers • Bromine containing monomers 110.5 Enlist Alternative polymers
111.	Finishing and polishing of acrylic resin	1 hour	111.1 Define finishing and polishing 111.2 Discuss the significance of finishing and polishing of materials 111.3 Describe abrasives and factors affecting abrasives 111.4 Enlist different materials that are used for finishing and polishing of acrylic resins
112.	Denture Lining Materials	1 hour	112.1Discuss the Uses of Denture Lining Materials 112.2Classify Denture Lining Materials 112.3Differentiate between relining and rebasing 112.4Describe Hard reline materials P/L auto polymerizing system in in terms of their composition, manipulation and properties.
113.	Tissue conditioners	1 hour	113.1 Discuss • Tissue conditioner • Applications of tissue conditioners • Functional impression materials • Requirements of tissue conditioners • Composition of tissue conditioners • Manipulation of tissue conditioners • Properties of tissue conditioners • Permanent soft lining materials • Temporary soft lining materials

			• Self-administered relining materials
114.	Artificial Teeth	1 hour	114.1 Discuss • Artificial teeth • Requirements of artificial teeth • Available materials • Acrylic resins • Porcelain • Properties of artificial teeth 114.2 Compare properties of acrylic and porcelain artificial teeth
115.	Temporary crown and bridge resins	1 hour	115.1 Discuss the use of Temporary crown and bridge 115.2 Enlist the ideal requirements for the temporary crown and bridge material 115.3 Explain in detail acrylic crown and bridge resins
Junior Prosthodontics			
116.	Temporary denture bases	1hr	116.1Define temporary denture bases. 116.2List the materials commonly used for making temporary denture bases. 116.3Discuss a step-by-step protocol for the fabrication of temporary denture bases. 116.4Discuss fabrication of wax occlusal rims on temporary denture bases
Lab work			
Pharmacology			
117.	Oral ulcer and candidiasis	1 hour	117.1 Prescription writing for oral ulcer and candidiasis.
General pathology			

118.	Parasites Leshmaniasis	2 hours	118.1 Identify eggs under microscope. 118.2 Identify the slide of leshmania under light microscope.
119.	Biochemical tests (Catalase, coagulase, oxidase)	2 hours	119.1 Differentiate between streptococcus and staphylococcus.
Science of Dental Materials			
120.	Teeth Setup	2 hours	120.1 Perform teeth setup on the articulated models
121.	Packing and dewaxing	2 hours	121.1 Perform the making of split mold by using dental flask. 121.2 Perform dewaxing
122.	Separating Media	2 hours	122.1 Identification and application of separating media over the model
123.	Acrylic packing	2 hours	123.1 Perform mixing of heat cure acrylic resin 123.2 Identify different physical stages through which acrylic resin passes 123.3 Perform packing of acrylic resin into the mold as per compression molding technique

124.	Acrylic curing	3 hours	124.1 Perform curing of the heat cure acrylic in water
125.	Deflasking	2 hours	125.1 Retrieve the cured acrylic partial denture from the flask
126.	Finishing and polishing of denture	3 hours	126.1 Perform finishing and polishing of the acrylic partial denture
THEME 4: LYMPHADENOPATHY AND GENERALIZED MALAISE			
General Pathology			

127.	Chronic inflammation/Granuloma	2 hours	127.1 Describe causes and morphological features of chronic inflammation. 127.2 Define granuloma, its type, and causes. 127.3 Discuss the relationship between nutrition and chronic inflammation.
128.	TB/Leprosy	2 hours	128.1 Discuss Mycobacteria in detail in reference to: Spectrum of diseases, Important properties, Pathogenesis, Clinical features, Lab diagnosis, Prevention, and treatment. 128.2 Discuss the role of nutrition in prevention and management of TB.
129.	Trichomonas Tenax parasite	1 hour	129.1 Discuss the parasite in detail in reference to: Spectrum of diseases, Important properties, Pathogenesis, Clinical features, Lab diagnosis and its Prevention
Pharmacology			
130.	Antituberculosis drugs	1 hour	130.1 Identify first-line anti-TB drugs and their mechanisms of action and mechanism of resistance (e.g., Isoniazid, Rifampin). 130.2 Identify 2nd-line anti-TB drugs and their mechanisms of actions and mechanism of resistance 130.3 Recognize key adverse effects of TB drugs, such as hepatotoxicity and neurotoxicity. 130.4 Describe the importance of drug regimens for preventing drug resistance. 130.5 Enlist drug nutrient interactions of ATT.
131.	Corticosteroids	1 hour	131.1 Explain the mechanism of action of corticosteroids in reducing inflammation. 131.2 Identify clinical indications for corticosteroid use in dentistry (e.g., oral lesions, allergic reactions). 131.3 Enlist drug nutrient interactions of Corticosteroids.

			131.4	Differentiate between types of corticosteroids (e.g., hydrocortisone, prednisone) and their formulations.
			131.5	Discuss appropriate dosing regimens for acute vs. chronic corticosteroid use.
			131.6	Recognize potential local and systemic adverse effects, including delayed healing and systemic effects.
			131.7	Develop strategies to manage complications associated with corticosteroid therapy.
			131.8	Identify contraindications and precautions for corticosteroid use in dental patients.
			131.9	Formulate treatment plans incorporating corticosteroids for anti- inflammatory therapy.
			131.10	Explain the benefits and risks of corticosteroid therapy to patients

Lab work			
General Pathology			
132.	ZN staining	2 hours	132.1 Stain and differentiate acid fast bacilli.
133.	Chronic Inflammation	2 hours	133.1 Identify the cells of chronic inflammation under Light microscope
134.	Granuloma	2 hours	134.1 Identify the granuloma under Light microscope.
Pharmacology			
135.	Tuberculosis	1 hour	135.1 Prescription writing for Tuberculosis.

MODULE- 03
PRE-CLINICAL DENTISTRY I (Healing, Repair & Dental Restorations -I)

2nd Year BDS

Themes

Table 1: Themes

S.NO	Theme	Duration in Weeks/hours
1.	**Discolored Tooth/Teeth**	49 hrs
2.	**Damaged Anterior Tooth/Teeth**	29 hrs
3.	**Damaged Posterior Tooth/Teeth**	76 hrs
	Total hours	154 hrs

Teaching Hours Allocation

Table 2: Hours allocation for different subjects

S. No	Subject	Hours
1.	General Pathology	25
2.	Pharmacology	20
3.	Chemistry of Dental Materials	49
4.	Community & Preventive Dentistry	37 (20 school visit hours)
5.	Oral Pathology	07
6.	Oral Biology	02
7.	Oral Medicine	02
8.	Pre-Clinical Operative Dentistry	04
9.	Pre-Clinical Prosthodontics	04
9.	Pediatric Dentistry	04
	Total	**154**

***7 Hours per day for 5 days (Monday to Friday) = 35 hours/ week**

Learning Objectives

By the end of this Module, 2nd year BDS students will be able to:

1. Describe the classification, composition, setting reaction, properties, applications, advantages, and disadvantages of direct restorative materials.
2. Explore metals and alloy systems to improve performance, biocompatibility and esthetic properties of various direct and indirect restorations.
3. Describe the composition, classification, setting reaction, properties, indications, and advantages/disadvantages of composite.
4. Discuss the enamel bonding system & dentine bonding system in detail.
5. Describe dental Amalgam's composition, classification, setting reaction, properties, indications, and advantages/disadvantages.
6. Discuss the composition, classification, setting reaction, properties, indications, and advantages/disadvantages of GIC.
7. Describe the Resin-modified glass ionomer, compomer, giomer, & cermets in detail.
8. Define & classify veneers, describe their fabrication methods and clinical techniques for placement, and highlight recent advancements in veneers.
9. Describe all aspects of fluorosis in detail.
10. Discuss the epidemiology and prevention of anterior teeth trauma.
11. Describe in detail all aspects of Atraumatic Restorative Treatment.
12. Discuss dental indices in detail.
13. Discuss the importance of school dental health for the community.
14. Describe wound healing and the process of repair by scarring, discuss steps and mediators involved in scarring.

15. Describe the cell cycle, discuss cells capable of entering the cell cycle, and the proliferative capabilities of various cells.
16. Enlist various factors and mechanisms by which these factors affect wound healing, discuss the formation of keloid and hypertrophic scars.
17. Discuss the medically important enterobacteriaceae diseases, important properties, clinical findings, laboratory diagnosis, and prevention.
18. Discuss the medically important entameba spp diseases, important properties, clinical findings, laboratory diagnosis and prevention.
19. Discuss minimal invasive dentistry.
20. Identify the types and ingredients of dentifrice.
21. Recognize drugs causing teeth discoloration.

Theme -01 (Discolored Tooth/teeth)			
Topic	**Learning Objectives**	**Hours**	
Oral Biology			
1. Introduction & Etiology of tooth discolouration	1.1 Identify the causes of tooth discoloration 1.2 Differentiate between extrinsic and intrinsic discoloration 1.3 Discuss the developmental process of amelogenesis & Dentinogenesis in relation to discoloration	02 hrs	
Oral Pathology			
2. Systemic causes of discolored teeth	2.1 Enlist systemic causes of discolored teeth. e.g. (Sickle Cell Anemia, B12 deficiency & Celiac Disease) 2.2 Discuss the role of iron in tooth discoloration.	02 hrs	

3. Amelogenesis Imperfecta.	3.1 Define **Amelogenesis Imperfecta**. 3.2 Explain its genetic basis. 3.3 Identify the various types of Amelogenesis Imperfecta (hypoplastic, hypocalcified, and hypomaturation forms). 3.4 Describe the clinical features of Amelogenesis Imperfecta, 3.5 Discuss the complications associated with this condition	01 hrs	
4. Dentinogenesis imperfecta.	4.1 Define **Dentinogenesis Imperfecta**. 4.2 Describe the genetic inheritance pattern of Dentinogenesis Imperfecta. 4.3 Differentiate between the three types of Dentinogenesis Imperfecta (Type I, Type II, and Type III). 4.4 Recognize the clinical presentation of Dentinogenesis Imperfecta 4.5 Discuss the histopathological characteristics of abnormal dentin and the associated structural defects.	01 hrs	
5. Enamel Hypoplasia	5.1 Define **Enamel Hypoplasia**	02 hrs	

	5.2Differentiate Enamel Hypoplasia from other enamel defects. 5.3Explain the etiological factors leading to Enamel Hypoplasia. 5.4Describe the clinical manifestations of Enamel Hypoplasia, 5.5Explian how Enamel Hypoplasia affects tooth structure, strength, and long-term prognosis. 5.6Identify the diagnostic methods used to differentiate Enamel Hypoplasia from other conditions like fluorosis or amelogenesis imperfecta. 5.7Discuss the treatment options for Enamel Hypoplasia.		
Oral Medicine			
6. Discoloration of teeth related to enamel and dentin	6.1 Discuss causes of discoloration of teeth 6.2 Discuss causes of discoloration of teeth related to disturbance in structure of enamel and dentin 6.3Discuss dietary modification to avoid tooth discoloration	2 hr	
Community Dentistry			
7. Fluoride	7.1Describe different types of fluorides.	1 hr	

	7.2 Discuss the mechanism of action of fluoride in prevention of dental caries. 7.3 Briefly describe the history of fluoride in dental public health. 7.4 Discuss water fluoridation and defluoridation. 7.5 Discuss methods of fluoride delivery.		
8. Fluorosis	8.1 Define Fluorosis 8.2 Describe types of fluorosis 8.3 Describe the Etiology of fluorosis. 8.4 Describe the different types of fluoride toxicity.	01 hrs	
Pharmacology			
9. Anti-Plaque Agents	9.1 Define dental plaque. 9.2 Describe the mechanism of action of pharmacological agents used to remove dental plaque including: • Antibacterial agents • Triclosan • Chlorhexidine • Fluorides • Xylitol • Pyrophosphate and Bicarbonates	01 hr	

10. Bleaching Agents & Drugs causing tooth discoloration	10.1 Define bleaching agents. 10.2 Describe types of bleaching agents. 10.3 Enlist different types of bleaching agents for special stains. 10.4 Enlist the adverse effects of bleaching agents 10.5 Enlist the drugs causing teeth discoloration.	01 hr	
Dental Materials			
11. Requirements of cavity lining, base and luting	11.1 Enlist the requirements of dental cements for lining, base and luting 11.2 Differentiate between cement thickness and film thickness 11.3 Describe types of cavity lining materials. 11.4 Discuss requirements of cavity linings and intermediate restorative materials.	2 hrs	
12. Zinc Phosphate Cements	12.1 Enlist various cements based on phosphoric acid. 12.2 Describe the composition and properties of zinc phosphate cement. 12.3 Explain the importance of proper mixing and handling techniques when working with zinc phosphate cement.	1 hr	

	12.4 Explain the setting reaction of zinc phosphate cement in detail. 12.5 Enlist the applications of zinc phosphate cement.		
13. Silicate Cements	13.1 Describe the composition and properties of silicate cement. 13.2 Explain the importance of proper mixing and handling techniques when working with silicate cement. 13.3 Explain the setting reaction of silicate cement. 13.4 Enlist the applications of silicate cement.	1hr	
14. Silicophosphate & Copper Cements	14.1 Describe the composition and properties of silicophosphate & copper cement. 14.2 Explain the setting reaction of silicophosphate & copper cement. 14.3 Enlist the applications of silicophosphate & copper cements.	1hr	
15. Zinc Oxide Eugenol Cement and its modifications	15.1 Enlist various cements based on organometallic chelate compounds. 15.2 Describe the composition and properties of zinc oxide eugenol cement.	2 hrs	

	15.3 Explain the importance of proper mixing and handling techniques when working with zinc oxide eugenol cement. 15.4 Explain the setting reaction of zinc oxide eugenol cement in detail. 15.5 Enlist the applications of zinc oxide eugenol cement. 15.6 Discuss the modifications in zinc oxide eugenol cement with respect to • Composition • Manipulation • Setting Reaction • Properties • Applications		
16. Calcium Hydroxide Cement	16.1 Describe the composition and properties of calcium hydroxide cement. 16.2 Explain the importance of proper mixing and handling techniques when working with calcium hydroxide cement. 16.3 Explain the setting reaction of calcium hydroxide cement in detail. 16.4 Enlist the applications of using calcium hydroxide cements.	1 hrs	

17. Mineral Trioxide Aggregate (MTA)	17.1 Describe the composition, setting reaction and properties of Mineral Trioxide Aggregate. 17.2 Recognize the various clinical applications of MTA in endodontics and restorative dentistry. 17.3 Describe the benefits of using MTA, including its biocompatibility and sealing ability.	1 hr	
18. Polycarboxylate cement.	18.1 Describe the composition and properties of polycarboxylate cement. 18.2 Explain the importance of proper mixing and handling techniques when working with polycarboxylate cement. 18.3 Explain the setting reaction of polycarboxylate cement in detail. 18.4 Enlist the applications of polycarboxylate cement.	1 hr	
General Pathology & microbiology			
19. Gram negative rods related to	19.1 Introduction to entrobacteriace and related organism	02	

enteric tract (E. Coli, Sallmonella, shigella & h. pylori)	19.2 Discuss the diseases, important properties, clinical findings, laboratory diagnosis and prevention of E. coli	01	
	19.3 Discuss diseases, important properties, clinical findings, laboratory diagnosis and prevention of Salmonella	01	
	19.4 Discuss the diseases, important properties, clinical findings, laboratory diagnosis and prevention of Shigella	01	
	19.5 Discuss the diseases, important properties, clinical findings, laboratory diagnosis and prevention of H. pylori		
	19.6 Discuss the food safety practices to prevent bacterial infection.	01	

Junior Prosthodontics			
20. Maxilla-mandibular relation:	20.1 Define maxillo-mandibular relation and explain its importance in complete denture construction. 20.2 Define the three types of jaw relations: vertical, horizontal, and orientation. 20.3 Explain the importance of accurate maxillomandibular relations for retention, stability.	01 hr	
Junior conservation			
21. Contacts and Contours	21.1 Describe the different tooth contacts Explain the different wedging techniques.	01 hr	
LAB WORK			
General Pathology			
22. Study of Various pathology lab instruments, machines, and rapid diagnostic devices	22.1 Analyze different aspects of Laboratory instruments and machines. 22.2 Demonstrate the proper use. 22.3 Summarize the proper care	02 hrs	

23. Preparation of blood film	23.1 Demonstrate different techniques of blood film and smear preparation	02 hrs	
24. Elisa	24.1 Analyze and interpret ELISA results in diagnosing infections like HIV and hepatitis	02 hrs	
Pharmacology			
25. Dosage forms	25.1 Identify different pharmaceutical dosage forms	01 hrs	
26. Prescription order	26.1 Identify the parts of the prescription order. 26.2 Discuss the significance of nutritional instruction while writing a prescription and counsel a patient on dietary modifications after a dental procedure	01 hrs 0.5 hrs	
27. Prescription writing of diseases	27.1 Write the prescription for acute tonsillitis 27.2 Write the prescription for pharyngitis	01 hrs	
Dental Materials			
28. Manipulation of zinc phosphate cement	28.1 Manipulate zinc phosphate cement according to manufacturer's guidelines. 28.2 Analyze the following characteristics of zinc phosphate cement: a. Working consistency b. Working time c. Setting time d. Properties	2 hr	
29. Manipulation of polycarboxylate cement	29.1 Manipulate polycarboxylate cement according to manufacturer's guidelines. 29.2 Analyze the following characteristics of zinc polycarboxylate cement: a. Working consistency	2 hr	

	b. Working time c. Setting time d. Properties		
30. Manipulation of zinc oxide eugenol cement	30.1 Manipulate zinc oxide eugenol cement according to manufacturer's guidelines. 30.2 Analyze the following characteristics of zinc oxide eugenol cement: a. Working consistency b. Working time c. Setting time d. Properties	2 hr	
31. Manipulation of calcium hydroxide cement	31.1 Manipulate calcium hydroxide cement according to manufacturer's guidelines. 31.2 Analyze the following characteristics of calcium hydroxide cement: a. Working consistency b. Working time c. Setting time d. Properties	2 hr	

Theme- 02 (Damaged anteriorTooth/teeth)			
Oral Pathology			
32. Pulpitis	32.1 Define pulpitis 32.2 Explain the etiology of pulpitis. 32.3 Describe the clinical signs and symptoms of pulpitis. 32.4 Discuss the histopathological changes that occur during pulpitis. 32.5 Explain the biological mechanisms involved in pulp healing. 32.6 Identify factors that influence the healing process of dental pulp.	01 hrs	
Pediatric Dentistry			
33. Sequalae of displacement injuries	33.1 Enumerate the different possible sequelae of Displacement injuries 33.2 Discuss the dietary instructions and modifications following dentoalveolar injuries.	02 hr	

	33.2 Define root resorption and discuss different types of root resorption. 33.3 Explain the physiological and pathological processes involved in root resorption. 33.4 Identify the common causes and risk factors associated with root resorption. 33.5 Discuss the role of trauma, and systemic conditions in the development of root resorption.		
Dental Materials			
34. Glass Ionomer Cements - introduction	34.1 Discuss the historical context and development of glass Ionomer cement (GIC). 34.2 Classify GIC on the basis of a. Clinical applications. b. Compositional modifications 34.3 Discuss cermets. 34.4 Describe the composition of GIC. 34.5 Explain the setting reaction of GIC in detail.	1 hr	

35. Glass Ionomer Cements – properties	35.1 Describe the properties of GIC. 35.2 Discuss the adhesion of GIC with tooth structure.	1 hr	
36. Glass Ionomer Cements – manipulative techniques	36.1 Describe following manipulative techniques of GIC with respect to clinical applications. • Matrix techniques • Atraumatic restorative technique (ART) 36.2 Sandwich technique	1 hr	
37. Requirements for direct filling materials	37.1 Define direct filling materials. 37.2 Enumerate reasons to restore tooth. 37.3 Explain various ideal requirements for direct filling materials. 37.4 Discuss historical perspectives of using direct filling materials.	2 hrs	

38. Resin based filling materials	38.1 Discuss • Resin based filling materials • Acrylic resins o Chemical Composition o Setting reaction o Applications o Properties o Advantages and disadvantages o Current status	1 hour	
39. Composites	39.1 Define composite and dental composites. 39.2 Describe the composition of the composite 39.3 Explain different types of resins and resin's properties. 39.4 Discuss the fillers and their role in composite.	1 hour	
40. Composites	40.1 Classify composite on base of filler, curing method, viscosity (flowable packable), and indications (core build-up, luting, anterior and posterior). 40.2 Explain polymerization reaction. 40.3 Discuss the depth of cure. 40.4 Discuss C – Factor. 40.5 Describe different light-curing units.	1 hour	
41. Composites	41.1 Describe the properties of dental composites.	1 hour	

	41.2 Discuss polymerization shrinkage, reasons, effects, and methods to reduce it. 41.3 Discuss advantages & disadvantages of composites in association with clinical scenarios.		
42. RMGIC and related materials	42.1 Define hybrid materials/products. 42.2 Classify hybrid products that involve blending of GIC and dental composites. 42.3 Compare glass ionomer cements, and dental composites. 42.4 Discuss modified composites in terms of composition, setting reaction, properties, and advantages /disadvantages. 42.5 Discuss resin modified glass ionomer cements in terms of composition, setting reaction, properties, and advantages /disadvantages.	1 hrs	
43. Giomers and compomers	43.1 Discuss giomers in terms of composition, setting reaction, properties, and advantages /disadvantages. 43.2 Discuss compomers in terms of composition, setting reaction, properties, and advantages /disadvantages.	1 hrs	
44. Adhesion and enamel bonding	44.1 Define adhesion 44.2 Describe three main mechanisms of adhesion of resins with the tooth structure. 44.3 Explain the enamel bonding system. 44.4 Explain acid etch technique and factors which affect success and failure of acid-etch bonding system. 44.5 Explain uses of acid etch technique.	1 hrs	

45. Dentine bonding	45.1 Describe dentine bonding system 45.2 Discuss smear layer in relation to bonding. 45.3 Explain dentine priming and hybrid layer. 45.4 Understand current concepts in dentine bonding.	1 hr	
46. Evolution of bonding systems	46.1 Discuss the total etch and self-etch method. 46.2 Discuss evolution of bonding system including polymerizable luting agent.	2 hr	
47. Bonding of resins to materials and bond strength	47.1 Discuss bonding resins to alloys, amalgam and ceramics. 47.2 Discuss bond strength and leakage measurements.	1 hrs	
Community Dentistry			
48. Epidemiology & Prevention of Trauma in anterior teeth of school-going children	48.1 Discuss the Epidemiology of anterior teeth trauma. 48.2 Enlist the causes & risk factors of anterior teeth trauma. 48.3 Discuss the prevention of trauma to anterior teeth.	1 hour	
Prosthodontics			
49. Articulators	49.1 Define an articulator and explain its purpose in complete denture fabrication. 49.2 Enlist its uses in Prosthodontics.	01 hr	

	49.3 List the different types of articulators based on its adjustability.		
LAB WORK			
General Pathology			
50. Collecting and transporting specimen	50.1 Identify Common Types of Clinical Specimens. 50.2 Demonstrate the appropriate techniques for collecting various clinical specimens. 50.3 Analyze and compare different techniques used for the transportation of various forms of specimen.	02 hrs	
Pharmacology			
51. Tyrode's solution	51.1 Prepare Tyrode's solution.	01 hrs	
52. Tissue organ bath and Kymograph	52.1 Identify the parts of kymograph and tissue organ bath assembly.	01 hrs	
Dental Materials			
53. Manipulation of glass ionomer cement	53.1 Manipulate glass ionomer cement according to manufacturer's guidelines. 53.2 Analyze the following characteristics of glass ionomer cement a. Working consistency b. Working time c. Setting time d. Properties	2 hr	
54. Manipulation of dental composites	54.1 Identify various components which needed for proper restoration with dental composites. 54.2 Manipulate dental composites according to manufacturer's guidelines	2 hr	

Theme- 03 (Damaged Posterior Tooth/teeth)			
Dental Materials			
56. Introduction to Metals and Alloys	56.1 Define metallurgy. 56.2 Define metals and alloys. 56.3 Enumerate steps by which metals are extracted. 56.4 Explain with examples methods by which shaping of metals and alloys can be accomplished.	1 hr	
57. Structure and Properties of Metals and Alloys	57.1 Explain the concept of crystal structure. 57.2 Describe the arrangement of atoms within a crystal lattice and its importance in determining material properties. 57.3 Identify alloys on the basis of elements present in the mixture. 57.4 Describe different types of solid solutions. 57.5 Explain the relationship between the composition and structure of solid solutions and their properties.	1 hr	

58. Cooling Curves and Phase Diagrams	58.1 Interpret cooling curves to determine the solidification behavior of metals and alloys. 58.2 Explain the effects of cooling rate on the microstructure and properties of alloys. 58.3 Interpret phase diagrams to determine the equilibrium phases present in an alloy system. 58.4 Interpret eutectic phase diagrams to predict the properties of alloys. 58.5 Explain the effects of composition and temperature on the phase behavior of alloys.	1 hr	
59. Amalgam	59.1 Define amalgam and dental amalgam. 59.2 Describe the composition of conventional and copper enriched alloy and identify function of each component of alloy used for dental amalgam. 59.3 Discuss manufacturing of different dental amalgam alloys. 59.4 Explain the setting reactions of conventional and copper-enriched alloys. 59.5 Describe the properties of dental amalgam and factors which have effects on these properties.	2 hrs	

60. Amalgam – Toxicity, manipulation and advantages/disadvantages	60.1 Discuss the importance of mercury toxicity and possible hazards. 60.2 Explain the steps of manipulations of amalgam. 60.3 Discuss pros and cons of amalgam. 60.4 Discuss the dietary instructions and modifications following dentoalveolar injuries.	2 hrs	
61. Direct Gold Restorations	61.1 Describe the properties and characteristics of pure gold that make it suitable for dental restorations. 61.2 Define cohesive and non-cohesive gold. 61.3 Explain the manipulative technique required for direct gold restorations, including: - Correct handling and condensation of gold foil - Shaping and adapting gold to the tooth preparation Sandwich Technique	2 hrs	
General Pathology			

62. Overview to tissue healing and repair	62.1 Differentiate between regeneration and repair 62.2 Describe various steps involved in the process of tissue healing and repair 62.3 Discuss the role of nutrition in healing and repair	01 hr	
63. Tissue regeneration	63.1 Define regeneration 63.2 Enlist organs capable of regeneration 63.3 Describe the process and mediators involved in regeneration	01 hr	
64. Cell Cycle and its role in repair	64.1 Define cell cycle 64.2 Describe the initiation, various phases, and proteins involved in the cell cycle 64.3 Discuss cells capable of entering the cell cycle 64.4 Describe the proliferative capabilities of various cells	01 hr	
65. Selected Clinical Examples of Tissue Repair and fibrosis	65.1 Describe the Healing of Skin Wounds both primary and secondary 65.2 Explain the mechanism of Fibrosis in Parenchymal Organs	01 hr	
66. Repair by scarring	66.1 Describe the various steps involved in the process of repair by scarring 66.2 Describe the various mediators involved in the steps of scarring	01 hr	

67. Growth factors and receptors	67.1 Enumerate various growth factors and their receptors 67.2 Describe the most common pathways by which growth factors affect tissue repair and regeneration	01 hr	
68. ECM	68.1 Classify various components of ECM 68.2 Describe the role and importance of ECM in tissue repair	01 hr	
69. Factors affecting wound healing/abnormal scarring	69.1 Enlist the various factors that influence wound healing 69.2 Describe the mechanism by which these factors affect wound healing 69.3 Describe the abnormalities of repair and their consequences 69.4 Describe the formation of keloid and hypertrophic scar	01 hr	
70. Amyloid	70.1 Analyze the role amyloid in health and disease 70.2 Evaluate the diagnostic approaches	01 hr	
Community Dentistry			
71. Atraumatic Restorative Technique (ART)	71.1 Define Atraumatic Restorative Treatment 71.2 Discuss its indications, contraindications, and method of application 71.3 Explain the procedure of ART. 71.4 List the advantages and disadvantages of ART.	01 hr	

72. Minimal invasive dentistry	72.1 Define MID. 72.2 Discuss its indication, contraindications and method of application.	1hour	
73. Dental Indices	73.1 Define an index 73.2 Explain the properties of an ideal index, 73.3 Discuss the purpose and uses of an index 73.4 Discuss the various indices such as dental caries and fluorosis (DMFT, DMFS, deft, dmfs, Dean's FI, CFI), gingival (GI, GBI, SBI), oral hygiene (Plaque Index, OHI, OHI-S, PHP) and periodontal (PI, CPITN) indices in detail 73.5 Discuss the advantages and limitations of different indices	04 hrs	
74. School dental health programmes and outreach programmes	74.1 Define the concept of school health programs and describe their importance in community health (WHO initiative). 74.2 Explain the aims of school dental health and the role it plays in preventing oral diseases among children. 74.3 Discuss the importance of early detection and the prevention of dental diseases in the school setting. 74.4 Critically assess the challenges and limitations of implementing comprehensive dental care in schools 74.5 Develop effective communication skills tailored to interacting with children and their caregivers about oral health.	20 hrs	

	74.6 Propose strategies for integrating dental health education into existing school health curricula to enhance long-term dental care among children		
Pharmacology			
75. Anesthetics -II (General Anesthetics)	75.1 Enumerate drugs used for pre-anesthetic medication. 75.2 Classify general anesthetics. 75.3 Describe the pharmacokinetics of general anesthetics. 75.4 Describe the mechanism of action, adverse effects, and drug interactions of inhalational anesthetics: • Nitrous oxide • Halothane • Isoflurane • Desflurane • Sevoflurane	02 hrs	

	75.5 Describe the pharmacokinetics of intravenous anesthetics. 75.6 Describe the mechanism of actions, adverse effects, and drug interactions of intravenous anesthetics: • Propofol • Ketamine • Etiomide • Barbiturates • Benzodiazepines • Opioids		
76. Neuromuscular blocking agents	76.1 Classify neuromuscular blocking agents 76.2 Describe the mechanism of action, pharmacological actions, therapeutic uses, adverse effects, contraindications, and drug interactions of depolarizing & non depolarizing agents.	02 hrs	
77. Anxiolytics-I (Benzodiazepines)	77.1 Classify Benzodiazepines 77.2 Describe the pharmacokinetics of benzodiazepines. 77.3 Describe the mechanism of action, pharmacological actions, adverse effects, and drug interactions of benzodiazepines	02 hrs	

	77.4 Enlist the therapeutic uses of benzodiazepines. 77.5 Describe benzodiazepine antagonist (Flumazenil)		
78. Anxiolytics-II (Antidepressants)	78.1 Classify antidepressants 78.2 Describe the pharmacokinetics of antidepressants 78.3 Describe the mechanism of action, pharmacological actions, therapeutic uses, adverse effects, contraindications, and drug interactions of: • SSRI's • SNRIs • Tricyclic Antidepressants • Atypical Antidepressants • MAOIs	02 hrs	
79. Antiepileptics	79.1 Classify antiepileptics 79.2 Describe the pharmacokinetics of antiepileptics 79.3 Describe the mechanism of action, pharmacological actions, therapeutic uses, adverse effects, contraindications, and drug interactions of: • Carbamazepine, • Phenytoin • Gabapentin and pregabalin • Valproic acid 79.4 Discuss the role of the ketogenic diet in epileptic patients	03 hrs	

	79.5 Enlist seizure-triggering foods for epileptic patients		

Pediatric Dentistry			
80. Scientific basis of caries prevention	80.1 Appreciate the role of dental health education 80.2 Enlist the aims in providing dietary advice and diet modification to reduce caries. 80.3 Explain oral hygiene instructions to the child and parents 80.4 Communicate the current messages in prevention of caries in children 80.5 Explain prevention of caries by increasing the resistance of the tooth and role of fissure sealants 80.6 Enlist various types of fissure sealants 80.7 Differentiate between various types of sealant materials 80.8 Describe their properties, advantages, and disadvantages of different fissure sealant materials 80.9 Decide why, who, when and where apply the fissure sealants 80.10 Explain how fissure sealants can be applied efficiently (step by step) on young children	02 hrs	

	80.11 Explain the mechanism of action of pits and fissure sealant in prevention of caries.		
Junior Operative			
81. Restoration of Class 2 Cavity	81.1 Explain the different features of class 2 cavity for amalgam and composite restorations 81.2 Explain the advantages and disadvantages of amalgam and composite restorations in class 2 cavity.	1 Hrs	
82. Matrix & Retainer System	82.1 Define & classify matrix and retainer systems 82.2 Enlist indications for the use of matrix systems 82.3 Enlist advantages of using matrix systems 82.4 Plan use of different matrix systems according to different clinical situations	01 hrs	
83. Pulp Protecting Agents	83.1 Classify liners and bases 83.2 Describe their composition and properties 83.3 Enlist their indications and advantages 83.4 Demonstrate application liners & bases	01 hr	
Prosthodontics			
84. Tooth setup	84.1 Explain positioning of anterior teeth as seen in frontal, lateral and incisal/ occlusal view. 84.2 List the anatomical and esthetic guidelines for positioning maxillary and mandibular anterior teeth 84.3. Define key terms used in anterior tooth setup (midline, incisal edge position, labial inclination, cervical prominence, overjet, overbite). 84.4. Explain the ideal positioning of anterior teeth as viewed from the frontal, lateral, and incisal/occlusal perspectives.	2hrs	

	84.5 Describe how lip support, esthetics, phonetics, and occlusion influence the placement of anterior teeth.		
LAB WORK			
General Pathology			
85. Healing by connective tissue-	85.1 Enlist the components of granulation tissue	02 hrs	

ulcer-Granulation tissue	85.2 Identify the gross and microscopic picture of granulation tissue		
Pharmacology			
86. IV setup	86.1 Identify the parts and working of basic IV setup	02hrs	
Community Dentistry			
87. Atraumatic restorative treatment	87.1 Demonstrate the application of atraumatic restorative procedures in a community/ simulated environment.	02 hrs	
88. Dental Indices	88.1 Demonstrate the measurement of different indices on study models 88.2 Discuss the merits and demerits of different oral disease indices	04 hrs	
89. Fluorosis index	89.1 Explain fluorosis Index. 89.2 Calculate dean's fluorosis index on the given model.	2 hr	
Dental Materials			
90. Manipulation of dental amalgam	90.1 Manipulate dental amalgam according to manufacturer guidelines.	02 hr	

Reviewed on 21-02-2026

MODULE- 04
PRE-CLINICAL DENTISTRY II
(Neoplasia & Dental Rehabilitation)

2nd Year BDS

KMU (IHPER) - Dental Central Curriculum Committee
Pre-Clinical I

Themes

Table 1: Themes

S.NO	Theme	Duration in Weeks/hours
1.	Lumps, Bumps & its triggers	2.5 weeks (84 hrs)
2.	Repair/Rehabilitate	1.5 weeks (56 hrs)
3.	A patient with Chest Pain & Shortness of Breath requiring extraction	1 weeks (24 hrs)
	Total hours	5 weeks (164 hrs)

Teaching Hours Allocation

Table 2: Hours allocation for different subjects

S. No	Subject	Hours
1.	General Pathology	70
2.	Pharmacology	19
3.	Chemistry of Dental Materials	44
4.	Community & Preventive Dentistry	13
5.	Oral Pathology	4
6.	Physiology	2
7.	Oral Medicine	2
8.	Oral & Maxillofacial Surgery	1
9.	Periodontology	4
10.	Pre-Clinical Prosthodontics	5
	Total	**164**

***7 Hours per day for 5 days (Monday to Friday) = 35 hours/ week**

Learning Objectives

By the end of this module the students of 2nd year BDS will be able to;

1. Define neoplasia and oncology, Classify the tumors with respect to their tissue of origin and nature
2. Discuss the common tumor terminology for benign epithelial tumors and enlist the basic components of tumors
3. Define differentiation and anaplasia, compare invasion and metastasis and discuss the main pathways of spread of a cancer.
4. Define various benign oral epithelial tumors, Compare the characteristics of benign and malignant tumors
5. Relate the genetic alteration to pathogenesis of neoplastic disorders
6. Relate the role of carcinogenic agents to neoplastic disorders
7. Describe the sequence of events leading to hemostasis, roles of the platelets, coagulation factors, endothelium in hemostasis, and compare hyperemia and congestion.
8. Discuss the pathophysiology of edema and shock and differentiate between inflammatory and non-inflammatory edema, exudate, and transudate.
9. Describe diagnosis and prognosis of squamous cell carcinoma, basal cell carcinoma and malignant melanoma
10. Define, enlist and briefly describe precancerous lesions & conditions
11. Define grading of tumors and its significance, define staging of tumors, discuss basis of TNM system
12. Discuss and classify anti-cancer drugs and describe the pharmacology of anti-tumor drugs
13. Discuss Primary Healthcare
14. Explain healthcare delivery systems.
15. Discuss planning and evaluation
16. Explain the steps and roles of oral health surveys
17. Explain the principles of oral health nutrition and diet counselling
18. Discuss the role of dental auxiliaries in dentistry
19. Discuss classifications, pharmacological actions, MOAs, uses and adverse effects of CVS Drugs
20. Discuss, chelating agents and Anti-dirhearial agents' types, applications, MOA, adverse effects
21. Discuss Immunosuppressant drugs and endocrine drugs; types, applications, MOA, adverse effects
22. Discuss and classify anti-cancer drugs and describe the pharmacology of anti-tumor drugs
23. Discuss classifications, pharmacological actions, MOAs, uses and adverse effects of CVS Drugs
24. Discuss, chelating agents and Anti-dirhearial agents' types, applications, MOA, adverse effects

25. Discuss Immunosuppressant drugs and endocrine drugs; types, applications, MOA, adverse effects
26. Define and discuss various terms like narcosis, analgesics and opiates, Classify and identify various opioids agonist.
27. Discuss and classify drug used for treatment of amebiasis and Anthelminitics
28. Explain health education and health promotion, discuss methods of public awareness and shifts in health promotion strategies
29. Discuss epidemiology of oral cancers and Prevention of Oral cancers .
30. Define Occupational Hazards, discuss Occupational hazards, discuss relationship between dentistry and associated health hazards
31. Explore metals and alloy systems to improve performance, biocompatibility and esthetic properties of various indirect restorations.
32. Explore ceramic compositions, processing techniques, and technologies to improve durability, esthetics, and biocompatibility.
33. Define Base metal alloys, Describe the composition, manipulation, properties, biocompatibility of alloys.
34. Describe the composition and Properties of steel and stainless steel, describe the method for fabrication of stainless-steel denture bases and discuss their importance.
35. Discuss Dental wires with special reference to its Requirements and available materials.
36. Describe morphology, transmission, clinical findings, and diagnosis of Entamoeba histolytica, Free-Living Amoebae, Taenia & Echinococcus, Ascaris, Ankylostoma & Enterobius

TABLE OF SPECIFICATIONS

THEME 1: Lumps, Bumps & its triggers		
Topic	Hr	Learning Outcome
General Pathology		
1. Intro to neoplasia with nomenclature	2	1.1 Define neoplasia and oncology 1.2 Classify the tumors with respect to their tissue of origin and nature/ behavior 1.3 Discuss the common tumor terminology for benign epithelial tumors 1.4 Enlist the basic components of tumors 1.5 Differentiate choristoma and hemartoma from the tumors
2. Characteristics of Benign and malignant tumors	3	2.1 Define differentiation and anaplasia 2.2 Compare invasion and metastasis 2.3 Discuss the main pathways of spread of a cancer 2.4 Compare the characteristics of benign and malignant tumors
3. Effects of tumors on host	2	3.1 Define cancer cachexia 3.2 Explain the cancer cachexia with malnutrition 3.3 Discuss the effects of tumors on the host. 3.4 Define the paraneoplastic syndromes 3.5 Define the paraneoplastic syndromes with examples and its underlying tumors.
4. Predisposing Conditions	1	4.1Discuss the interaction between environmental factors, age, acquired predisposing conditions and genetic factors in cancer development 4.2 Discuss dietary intake as predisposing condition to oral cancer development.
5. The Genome	3	5.1 Discuss the role of protein coding and Non-coding DNA 5.2 Discuss the role of epigenetics changes in diseases 5.3 Describe the role of Micro-RNA and Non-coding RNA in diseases 5.4 Discuss the gene editing
6. Genetic Diseases	2	6.1 Define the terms hereditary, familial and congenital diseases 6.2 Discuss the various genetic changes that can affect the structure and function of proteins contributing to diseases.
7. Cancer Genes: Genetic lesions in cancers	3	7.1 Define cancer genes 7.2 Enlist the four major functional classes of cancer genes 7.3 Give the inherited predisposition to cancers 7.4 Define driver and passenger mutation

		7.5 Define the terms point mutation, gene rearrangement, deletion, gene amplification, aneuploidy, microRNAs
8. Carcinogenesis: A multistep process	4	8.1 Enumerate the hall marks of carcinogenesis 8.2 Discuss the control of cell cycle 8.3 Define proto-oncogenes and discuss its significance 8.4 Give the therapeutic targeting of hall marks of cancers
9. Carcinogenesis: Tumors suppressor genes	1	9.1 Discuss the role of RB genes in regulation of cell cycle 9.2 Describe the role of Tp53 in maintaining the integrity of the genome
10. Chemical carcinogens and radiation carcinogens	1	10.1 Classify the chemical carcinogens 10.2 Enlist common chemical carcinogens with their corresponding cancers 10.3 Discuss the oncogenic properties of the radiations
11. Viral and microbial carcinogens	2	11.1 Enlist the oncogenic viruses and bacteria with their corresponding cancers
12. Laboratory diagnosis of cancers	2	12.1 Enumerate the various lab. Modalities (including morphologic, biochemical and molecular) available for tumor diagnosis 12.2 Define tumor markers 12.3 Discuss the significance of tumor markers 12.4 Explain the importance of molecular profiling of tumors.
13. Grading and staging of cancers	1	13.1 Define grading of tumors and its significance 13.2 Define staging of tumors 13.3 Give basis of TNM system 13.4 Give significance of staging of cancer
Oral Pathology		
14. Benign Epithelial Tumors	1	14.1 Define Squamous cell papilloma, condyloma acuminatum & melanocytic naevi 14.2 Describe their etiology and risk factors 14.3 Explain their clinical features 14.4 Describe their histopathological features
15. Precancerous Lesions & Conditions	3	15.1 Describe the Architectural and Cellular features of Epithelial Dysplasia and its various grades. 15.2 Define, enlist and briefly describe precancerous lesions & conditions • Oral submucous fibrosis • Oral lichen planus • Actinic keratosis • Discoid Lupus Erythematosus (DLE) • Sideropenic Dysphagia (Plummer-Vinson Syndrome) 15.3 Describe role of vitamin A and iron in precancerous lesions and condition.
Oral Medicine		

16. Malignant Transformation of Oral potentially malignant disorders OPMD & Clinical features of suspicious malignant lesions	1	16.1 Discuss transformation of OPMDs into malignancy. 16.2 Discuss clinical features of malignant lesions.
17. Oral Cancer	1	17.1 Define Oral Carcinoma 17.2 Discuss etiology of oral carcinomas 17.3 Discuss TNM staging for oral cancers
Periodontology		
18. Gingival enlargement	2	18.1 Enlist classification of gingival enlargement 18.2 Describe inflammatory/idiopathic/drug induced gi ngival enlargement 18.3 Discuss the Enlargement associated with systemic diseases/conditions/false enlargement 18.4 Management of gingival enlargement (Non-surgical and surgical)
Oral and Maxillofacial Surgery		
19. Identification of suspicious lesions	1	19.1 Evaluate suspicious oral lesions, including ulcers, masses, and discolorations. 19.2 Enlist the type of biopsies of suspicious lesions to obtain tissue samples for histological examination. 19.3 Enlist various imaging techniques to assess the extent of tumor growth and involvement of surrounding structures
Community Dentistry		
20. Occupational Hazards	1	20.1 Define Occupational Hazards 20.2 Discuss Occupational hazards 20.3 Discuss relationship between dentistry and associated health hazards 20.4 Discuss Recommendations
21. Epidemiology of oral cancers	2	21.1 Discuss the burden of oral cancers in a global scenario. 21.2 Discuss the etiological risk factors of oral cancers 21.3 Describe the steps of smoking cessation using 5A's. 21.4 Discuss the role of dentist in prevention of oral cancers. 21.5 Discuss the protective dietary factors in the prevention of oral cancer.
Dental Materials		
22. Overview of Dental waxes	1	22.1 Understand the fundamental principles and applications of dental waxes in dentistry.
23. Overview of Investment Materials	1	23.1 Compare various investment materials. 23.2 Understand the fundamental principles and applications of investment materials in dentistry.
24. Introduction to Gold and Noble Metal Alloys	2	24.1 Describe properties of gold. 24.2 Differentiate between carat and fineness.

		24.3 Describe pure gold fillings with respect to properties, and advantages in clinical dentistry.
25. Traditional Casting Gold Alloys	2	25.1 Classify dental casting gold alloys according to ISO 1562:1995. 25.2 Explain typical composition of casting gold alloys 25.3 Differentiate various dental casting gold alloys with respect to properties.
26. Hardening Heat Treatments	3	26.1 Describe different types of hardening heat treatments of alloys. 26.2 Describe the effects of hardening heat treatments of the microstructure and properties of silver-copper system and gold-copper system. 26.3 Discuss the clinical importance of heat treatments. 26.4 Describe low gold-content alloys and silver-palladium alloys
27. Soldering and Brazing	2	27.1 Define soldering and brazing. 27.2 Enlist steps of soldering technique 27.3 Explain factors affecting the result of soldering 27.4 Describe the clinical significance soldering and brazing.
Junior Prosthodontics		
28. Premolars Teeth Setup:	1hr	28.1 Explain positioning of maxillary and mandibular premolars as seen in frontal, lateral and incisal/ occlusal view. 28.2 List the anatomical and functional guidelines for arranging maxillary and mandibular premolars in complete dentures. 28.3 Define key terms such as buccal corridor, cusp angulation, central fossa position, and compensating curve. 28.4 Explain the correct positioning of premolars when viewed from the frontal, lateral, and incisal/occlusal perspectives, including the desired angulation and buccolingual position. 28.5Describe the role of premolars in esthetics, occlusion, mastication, and denture stability.
General Pathology & Microbiology (Parasitology)		
29. Entamoeba histolytica & dispar	1	29.1 Describe morphology, transmission, clinical findings, and lab diagnosis of Entamoeba histolytica (amoebiasis) & Dispar.
30. Entamoeba gingivalis	1	30.1 Describe morphology, transmission, clinical findings, and lab diagnosis of Entamoeba gingivalis
31. Porphyromonas gingivalis	1	31.1 Describe morphology, transmission, clinical findings, and lab diagnosis of Porphyromonas gingivalis

32. Giardia spp	1	32.1 Describe morphology, life cycle, transmission, clinical findings, and lab diagnosis of Giardia spp
33. Taenia spp	1	33.1 Describe morphology, transmission, clinical findings, and diagnosis of Taenia saginata and Taenia solium
34. Echinococcus spp	1	34.1 Describe morphology, transmission, clinical findings, and diagnosis of Hydatid cysts
35. Introduction to Nematodes	1	35.1 Discuss the general characteristics of nematodes
36. Ascaris	1	36.1 Describe morphology, transmission, complications, and diagnosis of Ascaris infections.
37. Ankylostoma	1	37.1 Describe morphology, life cycle, and lab diagnosis of Ankylostoma (hookworm)
38. Enterobius	1	38.1 Describe morphology, life cycle, and lab diagnosis of Enterobius (pinworm).
39. Trematodes/ Schistosoma	1	39.1 Describe morphology, transmission, complications, and diagnosis of Schistosoma
Pharmacology		
40. Drug treatment of amebiasis	2	40.1 Classify anti amebic drugs on chemical and therapeutic basis 40.2 Describe the MOA, antimicrobial spectrum, clinical uses, ADRs, drug interactions of: • Metronidazole • Diloxanide furoate • Ipodoquinol • Emetine • Dehydroemetine • Chloroquine
41. Anthelminitics	1	41.1 Classify anthelmintics on the basis of type of parasite 41.2 Describe the MOA, anthelmintic spectrum, clinical uses, ADRs, drug interactions of: • Praziquantel • Niclosamide • Benzimidazoles • Albendazole • Mebendazole
42. Anti diarrheal drugs	1	42.1 Describe the Classifications, uses, MOA and adverse effects of antidiarrheal drugs
43. Chelating agents	1	43.1 Describe the Classifications, MOA, adverse effects and application of common chelating agents like dimercaprol, DMSA, EDTA, unithiol, penicillamine, deferoxamine, deferasirox
Lab Work		
Pharmacology		
44. Prescription writing	1	44.1 Construct prescriptions for tapeworm infestation and ascariasis.
General Pathology		

45. Ascaris	2	45.1 Identify the egg of the parasite
46. Ankylostoma	2	46.1 Identify the egg of the parasite
47. Tenia	2	47.1 Identify the egg of the parasite
48. Hydatid cyst	2	48.1 Identify the specimen
49. Enterobius	2	49.1 Identify the egg of the parasite
50. Squamous cell carcinoma	2	50.1 Identify the slide of squamous cell carcinoma under light microscope
51. Basal Cell carcinoma	2	51.1 Identify the slide of basal cell carcinoma under light microscope
52. Pleomorphic adenoma	2	52.1 Identify the slide of pleomorphic adenoma under light microscope
THEME 2: REPAIR / REHABILITATE		
Dental Materials		
53. Base Metal Alloys – Cobalt Chromium	2	53.1 Describe Cobalt-chromium alloys with respect to • Composition • Manipulation • Properties • Biocompatibility • Applications
54. Base Metal Alloys – Nickle Chromium	2	54.1 Describe Nickle-chromium alloys with respect to • Composition • Manipulation • Properties • Biocompatibility • Applications
55. Comparison of Base Metal and Casting Gold Alloys	2	55.1 Compare base metal alloys with casting gold alloys with respect to • Physical Properties • Mechanical Properties • Biocompatibility
56. Casting	3	56.1 Define casting and investment mold 56.2 Describe various components of a typical investment mold. 56.3 Explain the importance of investment mold for Casting procedure. 56.4 Discuss Casting machines.

		56.5 Explain the Faults produced during casting procedure.
57. Wrought Alloys – Steel & Stainless Steel	2	57.1 Define wrought alloys and give examples. 57.2 Define steel and stainless steel. 57.3 Describe the composition and properties of steel and stainless steel.
58. Applications of Stainless Steel	2	58.1 Describe the method for fabrication of stainless-steel denture bases and discuss their importance. 58.2 Discuss dental wires with special reference to its requirements and available materials.
59. Dental Porcelain – Composition, manufacturing, Properties and Types	3	59.1 Differentiate between ceramics and porcelain 59.2 Describe compositions of Dental Porcelain 59.3 Enlist various types of dental porcelains according to fusion temperature 59.4 Explain Manufacturing and Properties Porcelain with special reference to its composition.
60. All ceramic Restorations	3	60.1 Explain methods for strengthening ceramics 60.2 Explain all ceramic restorations with reference to materials used
61. CAD-CAM Restorations & Porcelain Veneers	2	61.1 Describe CAD-CAM restorations in dentistry. 61.2 Illustrate Porcelain Veneers
62. Porcelain Fused to Metal	2	62.1 Explain the requirements of alloys with respect to Porcelain fused to metal (PFM) restorations 62.2 Discuss the alloys that are currently available for porcelain bonding 62.3 Comprehend the fundamental principles of tooth preparation for PFM restorations including biomechanical considerations and esthetic requirements 62.4 Describe Capillary technology with respect to PFM restorations
J. Prosthodontics		
63. Molar Teeth Setup	1hr	63.1 Explain positioning of maxillary and mandibular, molars as seen in frontal, lateral and incisal/ occlusal view 63.2 List the functional and anatomical guidelines for arranging maxillary and mandibular molars in complete dentures. 63.3 Define key terms such as central fossa position, compensating curve, curve of Wilson, and buccolingual inclination. 63.4 Explain the correct positioning of molars as seen from the frontal, lateral, and incisal/occlusal views, including cusp alignment, fossa

		relationships, and occlusal plane orientation. 63.5 Describe the role of molars in mastication, occlusal balance, denture stability, and load distribution.
64. Guidelines and compensating curves	1hr	64.1 Explain the Basic Guidelines for Tooth Setup. 64.2 Define Compensating Curves 64.3 List the basic guidelines for arranging teeth in complete dentures, including esthetics, phonetics, occlusion, and anatomical considerations. 64.4 Define the term Compensating Curves and related concepts (Curve of Spee, Curve of Wilson). 64.5 Explain the purpose of following standardized tooth setup guidelines in achieving esthetics, stability, and functional occlusion. 64.6 Describe how compensating curves contribute to balanced occlusion during functional movements (protrusive and lateral excursions).
65. Rehabilitation of function	2hrs	65.1 List the Laboratory Steps After Tooth Setup and Wax-Up. 65.2 Identify the basic trimming and finishing steps. 65.3 Describe the steps involved in polishing of final denture.
G.Pathology		
66. Overview of healing and repair	1	66.1 Define tissue repair 66.2 Enlist its two main reactions 66.3 Define the healing in terms of regeneration, fibrosis, resolution and organization. 66.4 Enlist the steps of scar formation.
67. Gram Negative rods related to respiratory tract (Haemophilus, Bordetella and Legionella)	3	67.1 Discuss the diseases, important properties, pathogenesis, Clinical findings, laboratory diagnosis and prevention Gram Negative rods related to respiratory tract
Community Dentistry		
68. Primary Health Care	2	68.1 Define Primary Healthcare. 68.2 Discuss declaration of Alama Ata. 68.3 Enlist and explain the principles of primary healthcare. 68.4 Describe the core elements of Primary Healthcare. 68.5 Enlist the requirements of Primary Healthcare (8 A's and 3C's). 68.6 Assess the integration of dental services within primary health care systems.
69. Introduction to healthcare systems	2	69.1 Discuss the health care systems. 69.2 Define and explain the structure of the healthcare system in Pakistan, with a focus on oral health services. 69.3 Identify challenges in delivering oral health care within the public health system. 69.4 Compare Pakistan's healthcare system to other countries of oral health outcomes.

70. Planning And Evaluation	1	70.1 Define plan. 70.2 Discuss planning cycle. 70.3 Discuss rational planning model 70.4 Define evaluation and discuss its types and steps.
71. Oral health survey	1	71.1 Define surveying and its role in dentistry. 71.2 Describe the steps of survey. 71.3 Describe pathfinder survey.
72. Oral Health and nutrition	1	72.1 Discuss the effect of nutritional deficiencies on oral health. 72.2 Describe the steps in dietary counselling. 72.3 Enlist WHO dietary goals.
73. Dental Auxiliaries	1	73.1 Define dental auxiliaries. 73.2 Classify dental auxiliaries. 73.3 List the role of dental auxiliaries. 73.4 Explain about their importance in community dental health.
Pharmacology		
74. Anticancer Drugs	2	74.1 Discuss and classify anti-cancer drugs. 74.2 Discuss & identify indications and adverse effects of alkylating agents. 74.3 Describe the pharmacology of anti-tumor drugs. 74.4 Summarize the regimens in the treatment of individual cancers 74.5 Describe the drug used in chemotherapy induced nausea and vomiting and other antitussive drugs
75. Anti-emetic drugs	1	75.1 Describe the Classification, pharmacological actions, MOA and adverse effects of Anti-emitics
Lab Work		
Community Dentistry		
76. Dietary counseling in a dental care setting	2	76.1 Assess patient's dietary habits and identify potential oral health risks by using FFQ and 24hrs dietary recall. 76.2 Provide personalized dietary advice to patient's specific needs and oral health status. 76.3 Apply oral health education principles to provide comprehensive dietary counseling. 76.4 Calculate and interpret Dental Health Score from patient's food diary
Periodontology		
77. Manual SRP/ Ultrasonic scaling	2	77.1 Identify the basic manual and ultrasonic scaling instruments.
Dental Materials		
78. Fabrication of Porcelain fused to Metal Prosthesis	10	78.1 Observe the steps during fabrication of Porcelain fused to Metal Prosthesis. 78.2 Recognize various materials and equipment

		used during fabrication of porcelain fused to metal prosthesis.
Theme 03: A patient with Chest Pain & Shortness of Breath requiring extraction		
General Pathology		
79. Hemostasis	1	79.1 Describe the sequence of events leading to hemostasis at a site of vascular injury 79.2 Discuss the roles of the platelets, coagulation factors, and endothelium in hemostasis
80. Hyperemia, congestion, Hemorrhage	1	80.1 Compare hyperemia and congestion 80.2 Describe the classification and pathophysiology of Hemorrhage
81. Edema	1	81.1 Define edema 81.2 Discuss the major pathophysiologic 81.3 Discuss the categories of edema 81.4 Distinguish between inflammatory and non-inflammatory edema. 81.5 Differentiate between exudate and transudate 81.6 Enlist the important clinical states associated with generalized or localized edema and the factors that underlie each condition
82. Shock	2	82.1 Describe the pathophysiology and types of shock 82.2 Describe the stages of shock 82.3 Define sepsis and septic shock 82.4 Discuss causes, pathogenesis, and laboratory findings in shock 82.5 Discuss Disseminated intravascular coagulation-DIC
83. Thrombosis	2	83.1 Describe the mechanism and pathogenetic mechanisms of vascular thrombosis 83.2 Enumerate hypercoagulable states
84. Embolism	2	84.1 Define embolism. 84.2 Enumerate the types of thromboembolism 84.3 Describe the clinical manifestations and consequences of pulmonary thromboembolism
85. Infarction	1	85.1 Define infarction 85.2 Discuss the pathogenesis and its various types.
Physiology		
86. Autonomic nervous system	2	86.1 Differentiate between the anatomical origin, neurotransmitters, and physiological functions of the sympathetic and parasympathetic divisions of the autonomic nervous system 86.2 Classify the major adrenergic (α1, α2, ß1, ß2, ß3) and cholinergic (nicotinic and muscarinic) receptors based on their location and functional response.

		86.3 Explain the mechanism of action of drugs that stimulate (agonists) or inhibit (antagonists) adrenergic and cholinergic receptors
Pharmacology		
87. CVS Drugs	5	87.1 Describe the Classification, pharmacological actions, MOA and adverse effects of • Antihypertensives • Diuretics • Antiarrhythmics • Drugs for CCF • Antianginal/MI
88. Drugs used in Bleeding disorders	3	88.1 Describe the Classification, Pharmacological actions, MOA and adverse effects of 1. Thrombolytics 2. Anticoagulants 3. Antiplatelets 4. Antihyperlipidemic
LAB WORK		
Pathology		
89. Lipid profile	2 hr	89.1 Identify lipemic serum 89.2 Learn and apply the techniques for accurately measuring serum lipid levels (Cholesterol, triglycerides HDL, and LDL)
Pharmacology		
90. Prescription writing	2	90.1 Construct Prescription for hypertension, angina/MI and CCF with dietary guidelines

KHYBER MEDICAL UNIVERSITY

PRIME MODULE
2nd YEAR BDS

Introduction

The PRIME (Professionalism, Research, Identity formation, Management and leadership, and Ethics) curriculum, devised by the Institute of Health Professions Education & Research at Khyber Medical University, is a forward-thinking approach aimed at nurturing future doctors with a profound sense of societal care and empathy. This comprehensive module spans all four years of BDS training, encompassing disciplines such as behavioral sciences, medical education, research, management, leadership, and ethics. Furthermore, it incorporates essential subjects like Islamic studies and Pakistan studies, intended to foster a strong sense of Muslim and Pakistani identity, laying a foundational groundwork before professional identity formation within medicine.

The provided document outlines the module's topics, learning objectives, their sequential placement over the course of 2nd year BDS, . allocation, and assessment strategies. The initial segment of the module study guide elucidates general learning outcomes, while the subsequent portion delves into detailed learning objectives and a comprehensive table of specifications.

In addition to emphasizing professional competency, the PRIME curriculum underscores the significance of broader societal

awareness, cultural identity, and ethical grounding in medical practice. This holistic approach aims to produce well-rounded medical professionals capable of navigating the complexities of healthcare with integrity and compassion.

GENERAL LEARNING OBJECTIVES :

By the end of 2nd year BDS, students will be able to:

Professionalism:
1. Demonstrate effective communication and counseling skills for managing sensitive patient interactions.
2. Discus different techniques of giving feedback
Research:
1. Define research.
2. Discuss the steps of research.
3. Conduct literature search and reviews.
4. Formulate research questions, and objectives.
5. Demonstrate the use of referencing software (EndNote, Mendeley, Zotero etc).
6. Describe different types of research.

Identity Formation:
1. Reflect on personal and professional identity formation, creating development plans.
2. Balance personal and professional life using time management strategies and self-awareness.
Management & Leadership:
1. Demonstrate leadership in managing clinical teams and healthcare resources.
Ethics:
1. Address complex ethical challenges, consent taking and resource allocation.

S. No.	Content	Learning Objectives (LOs)	Module	Teaching Method	Time Allocation (hours)	Assessment Method
A) Professionalism and Behavioral sciences						
1.	Power Dynamics (Power dynamics, bullying, harassment, its influences on interrelationships)	1.1 Define and explain the concept of power dynamics, including its impact on interrelationships in professional settings. 1.2 Identify and discuss various forms of misuse of power, including bullying and harassment, and their effects on individuals and organizations. 1.3 Analyze strategies for avoiding the misuse of power for personal gains	Pre-clinical Dentistry I	LGIS/SGD	2	MCQs/ OSPE
2.	Dealing with patients: Culture, Life style, and Belief System in the society	2.1 Serve the patient as an individual, considering lifestyle, beliefs and support system	Foundation-II	Lecture	2	MCQs/ OSPE
3.	Mental illness	3.1 Define mental illness, its importance, impact, and prevention	Infection and Inflammation	Lecture/ Small group Teaching	1	MCQs/ OSPE
4.	Social psychology , oral health & terrorism	4.1 Describe social psychology, and its relation on oral health and terrorism	Pre-clinical Dentistry II	Lecture	1	MCQs/ OSPE
5.	Stigma and reactions to illness	5.1 Describe Stigma and reactions to illness, and how not to be judgmental	Pre-clinical Dentistry II	Lecture	1	MCQs/ OSPE
B) Communication Skills						

6.	Verbal and non-verbal communication skills	6.1 Develop and Demonstrate effective verbal and non-verbal communication skills	Foundation II	Role play, Group Discussion	0.5	MCQs/ OSPE
7.	Listening skills	7.1 Develop and demonstrate active listening skills for learning purposes and to the patient's problems	Infection and Inflammation	Role play, Group Discussion	0.5	MCQs/ OSPE
8.	Reading skills	8.1 Develop and demonstrate effective reading skills	Pre-clinical Dentistry I	Role play, Group Discussion	0.5	MCQs/ OSPE
9.	Effective Feedback	9.1 Define feedback in professional development. 9.2 Identify different types of feedback (e.g., constructive, positive, negative). 9.3 Discuss techniques for giving and receiving feedback effectively. Practice giving and receiving feedback in clinical scenarios.	Pre-clinical Dentistry I	Lecture/Case Studies/ Role Play	2	MCQs/ OSPE
C. Research						
10	Introduction	10.1 Describe the background andpurpose of research.	Foundation II	LGIS/SGD	1	Assignment/ MCQs
11	Literature Search	11.1 Describe techniques of literature search and review. 11.2 Conduct literature search to finalize the research question using Booleanlogic.	Foundation II	SGD/ Hands-on Workshop	2	Assignment/ MCQs
12	Referencig software (EndNote,	12.1 Enumerate the different softwaresused for references.	Foundation II	Lecture/Hands-on Workshop	1	Assignment/ MCQs

	Mendeley, Zotero)	12.2 Demonstrate the use of referencing software.				
13	Types ofResearch	13.1 Explain different types of research.	Foundation II	Lecture/SGD	1	Assignment/ MCQs
14	Formulation of Research Question	14.1 Formulate research question. 14.2 Describe how to develop a researchquestion.	Foundation II	Lecture/SGD/ hands on	1	Assignment/ MCQs
15	Sample size	15.1 Calculate sample size for a specific research project.	Infection and Inflammation	Lecture and Hands on Exercise in Computer lab	1	Assignment/ MCQs
16	Sampling techniques and sample selection:	16.1 Describe various sampling techniques. 16.2 Justify sampling techniques chosen for a specific research project. 16.3 Select sample for a specific research project	Infection and Inflammation	Lecture/SGD/ hands on	2	Assignment/ MCQs
IDENTITY FORMATION						
17	Work-Life Balance in Dentistry	17.1 Define work-life balance. 2. Identify challenges in balancing personal and professional life. 17.2 Develop strategies for maintaining balance.	Pre-clinical Dentistry II	Lecture/SGD	1	Reflective Assignment
MANAGEMENT & LEADERSHIP						
18	Models of leadership & management	18.1 Compare different models of leadership and management	Pre-clinical Dentistry II	Lecture /group discussion	1	MCqs/ OSPE
ETHICS						
19	Informed Consent	19.1 Define informed consent. 19.2 Explain the components of informed consent.	Infection and Inflammation	Lecture/SGD	1	MCqs/ OSPE

		19.3 Discuss the ethical implications of obtaining consent. 19.4 Apply informed consent principles in clinical cases.				

BDS PRIME Module – 2nd

Learning Resources for 2nd Year BDS PRIME Module (Weeks 1–24)	
PRIME Topic	**Learning Resource**
Professionalism	**"Medical Professionalism: Best Practices" by Jill A. Thistlethwaite** https://doi.org/10.1201/9781315377933 **Badshah, A., Mahboob, U., & Yousaf, A. (2022). How to teach professionalism in a clinical context?** *Journal of the College of Physicians and Surgeons Pakistan, 32*(3), 275–277. https://doi.org/10.29271/jcpsp.2022.03.275
Ethics	**100 Cases in Medical Ethics" by Conrad Fischer**
Leadership and Teams	**"Leadership in Healthcare: Essential Values and Skills" by Carson Dye**
Professional Burnout	**"Burnout: The Cost of Caring" by Christina Maslach** https://doi.org/10.4324/978131589416
Advanced Search Engines and Literature Review	**"How to Conduct a Literature Review in Healthcare" by Elizabeth Wager**
Informed Consent and Refusal	**"Medical Ethics: Accounts of Ground-Breaking Cases" by Gregory Pence.** **100 Cases in Medical Ethics" by Conrad Fischer**
Time and Resource Management	**"Time Management for Healthcare Professionals" by Donald Wetmore**
End-of-Life or withdrwal of treatment Ethics	**"100 Cases in Medical Ethics" by Conrad Fischer**

BDS PRIME Module – 2nd

Professionalism in Handling Medical Errors	**"100 Cases in Medical Ethics" by Conrad Fischer**
Continuous Professional Development (CPD) and Lifelong Learning	**"The Reflective Practitioner: How Professionals Think in Action" by Donald Schön**

KHYBER MEDICAL UNIVERSITY

LOGBOOK FOR COMMUNITY AND PREVENTIVE DENTISTRY

2nd YEAR BDS

CERTIFICATE

Name of Institution:

Full Name of Student:

Roll Number:

Class:

It is certified that _____ has fulfilled the requirement of practical work in Department of Community and Preventive Dentistry.

_____

Signature of Teacher

Table of Contents

Contents

Practicals / Lab Work List

SNO	PRACTICALS / LAB WORK NAME	BLOCK & MODULE NAME	COMPLETION STATUS	SIGNATURE OF TEACHER
1	Delivery of health education	D, Foundation II	☐Yes ☐No	
2	Brushing Techniques	E, Infection and Inflammation and Auxiliary Dental Materials	☐Yes ☐No	
3	Flossing Techniques	E, Infection and Inflammation and Auxiliary Dental Materials	☐Yes ☐No	
4	Disinfection and Sterilization	E, Infection and Inflammation and Auxiliary Dental Materials	☐Yes ☐No	
5	Waste Segregation and Disposal	E, Infection and Inflammation and Auxiliary Dental Materials	☐Yes ☐No	
6	Atraumatic Restorative Treatment	F, Pre-Clinical Dentistry I: Healing, Repair & Dental Restorations	☐Yes ☐No	
7	Dental Indices	F, Pre-Clinical Dentistry I: Healing, Repair & Dental Restorations	☐Yes ☐No	
8	Fluorosis Index	F, Pre-Clinical Dentistry I: Healing, Repair & Dental Restorations	☐Yes ☐No	
9	School Dental Health Programmes and outreach programmes	F, Pre-Clinical Dentistry I: Healing, Repair & Dental Restorations	☐Yes ☐No	
10	Dietary counseling in a dental care setting	G, Pre-Clinical Dentistry II: Neoplasia & Dental Rehabilitation	☐Yes ☐No	

General Learning Outcomes

1. Describe the principles of health promotion and health education and oral education
2. Deliver health education
3. Describe prevention of infection and methods of sterilization and disinfection
4. Discuss waste disposal methods.

5. Define and explain factors related to common oral diseases and their prevention.
6. Describe in detail all aspects of Atraumatic Restorative Treatment.
7. Discuss dental indices in detail.
8. Discuss the importance of school dental health for the community.
9. Explain the principles of oral health nutrition and diet counselling

Block D Module 1: Foundation II Practical List

1. Delivery of Health Education

Block D

Module 1: Foundation II

Delivery of Health Education

Number of hours: 4

Learning Outcomes:

1. Deliver health education regarding general self-care advice, and for maintenance of oral health on simulated patients
2. Demonstrate effective interpersonal communication techniques (verbal, non-verbal, motivational interviewing basics).
3. Design Information, Education, and Communication Materials like posters, leaflets, infographics on health education

Materials Required:

1. Pen, pencil, and paper

2. Computers with internet access

3. Whiteboard with marker

4. Simulated or Actual Patient

Date:

Health Education Definition – WHO

Process of providing information and advice related to healthy lifestyle and encouraging the development of knowledge, attitudes and skills (practice) aimed at behaviour change of individuals or communities.

AIMS OF HEALTH EDUCATION (WHO):

1. To ensure that health is valued as an asset in the community.

2. To equip the people with skills, knowledge & attitudes to enable them to solve their health problems by their own actions & efforts.

3. To promote the development & proper use of health services.

OBJECTIVES OF HEALTH EDUCATION

1. **Informing people (impart knowledge)**

   - Clear the barriers of ignorance, prejudice & misconceptions.
   - Assuming more responsibility towards one's health care.
   - Induce awareness about health needs, minimizing the gap between needs & demands.

2. **Motivating people:**

- Choose his own alternatives about the health actions (cafeteria approach).

3. **Guiding into action:**

- The suggested technology must be available, culturally acceptable & economically affordable.

4. **Seek help when needed**

10 PRINCIPLES OF HEALTH EDUCATION

1. **Interest:** people are unlikely to listen to those who are not of interest to them. Felt needs.

2. **Participation:** based on active learning - how? Group discussion, workshops, panel discussions. Have participants gain practical experience. Start from the known & lead the people to the unknown, i.e. Knowledge. This will enable the community to develop an in-depth insight into their own health problems.

3. **Comprehension:** Make the learner understand what you are saying now? Adjust your level as a teacher with the educational background of the learner. "Teaching should be within the mental capacity of the audience". "Speak in the language they speak and use words they understand" Give simple explanation and avoid technical words.

4. **Reinforcement:** By repetition of the information in the same session or during subsequent sessions.

5. **Remember:** few people can learn all that is new in a single sitting. Use various methods.

6. **Motivation:** By creating the desire in a person to learn through incentives like praise, love, rivalry, rewards, etc.

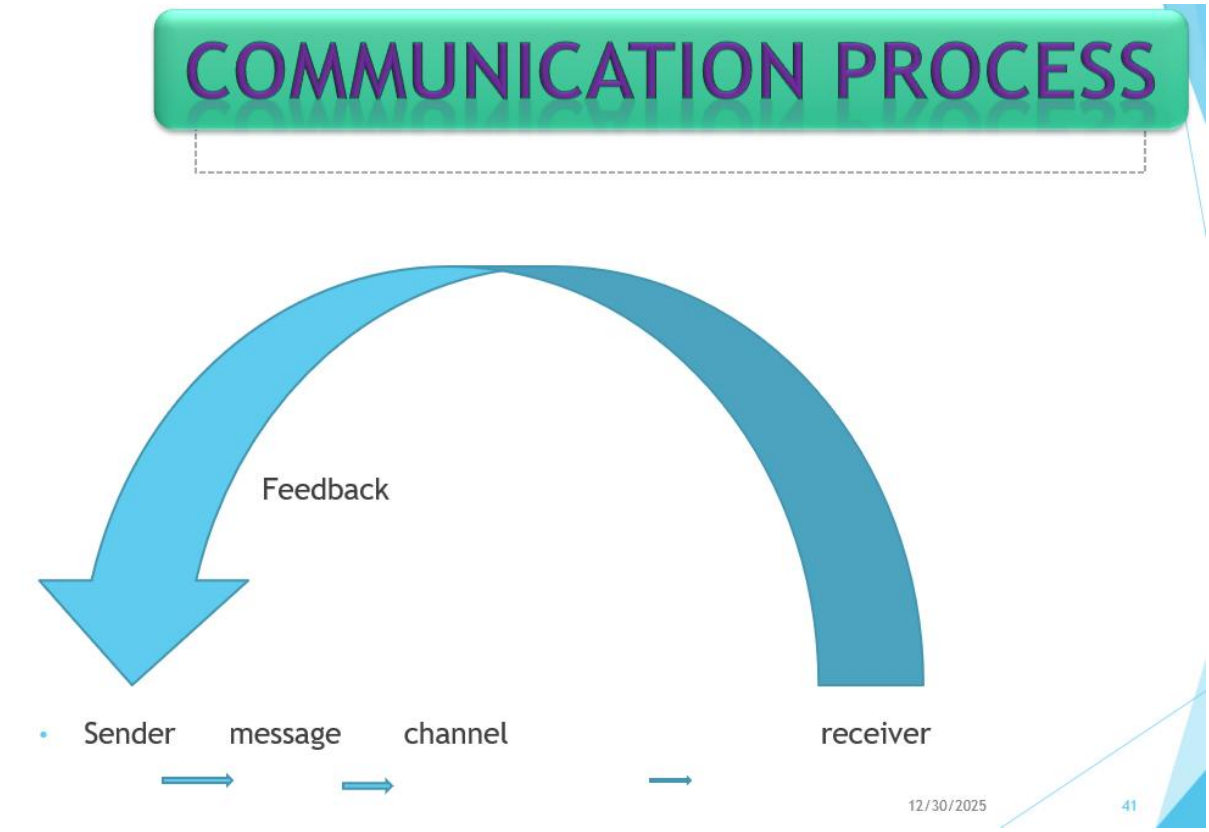
7. **Learning by doing:** Usually leaves a lasting imprint & leads towards positive action. Participant will do what he/she has learnt or understood and give instant feedback. Participants gain confidence in performing such tasks without supervision. "If I hear, I forget, if I see I remember, if I do I know." Chinese proverb.

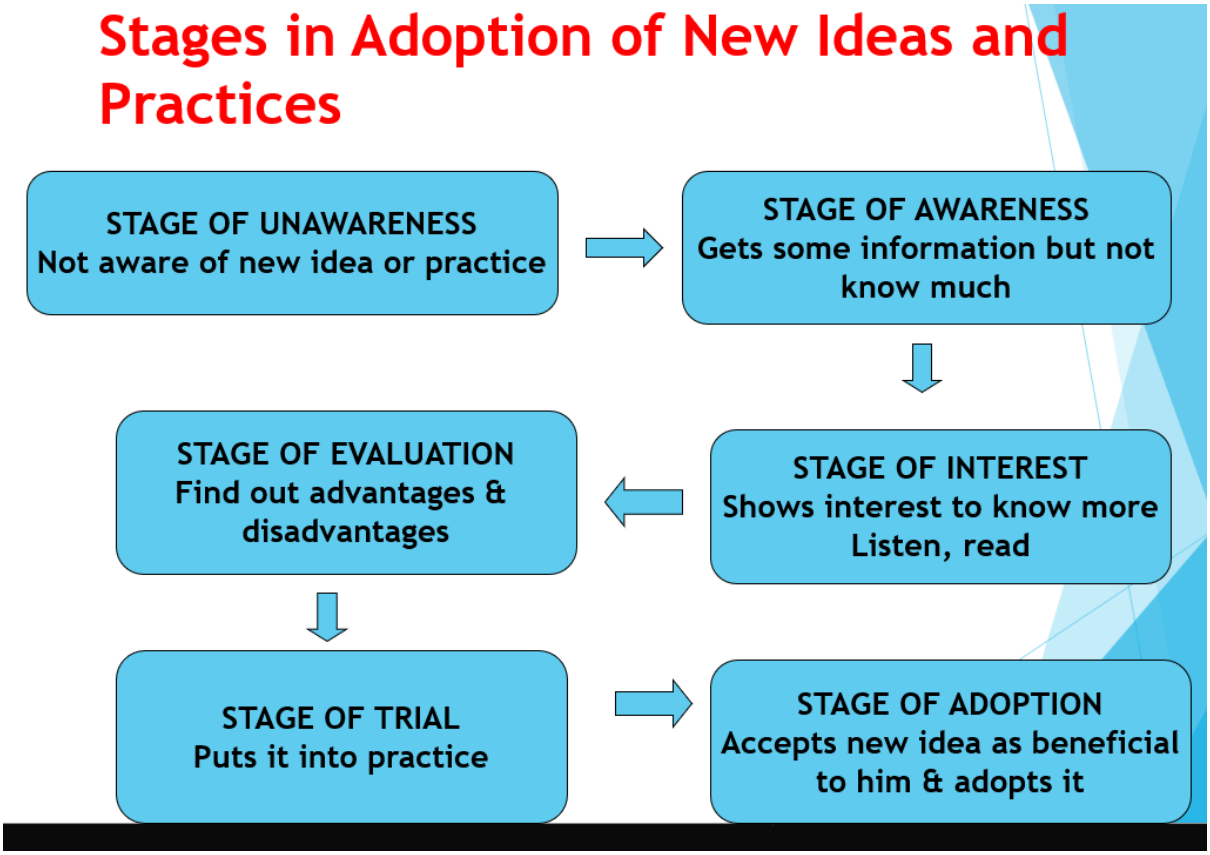
8. **Soil, seed & sower:** The people are soil, the health facts are the seeds & the educator is the sower. All the components of this triad will influence the outcome. The 3 factors should be carefully & satisfactorily interrelated.

9. **Good human relationships:** People must accept you as a friend & a well-wisher & have the confidence to confide in you. The personal qualities of the health educator are more important than his technical qualifications.

10. **Leaders:** People learn best from people who they respect & admire. Try to make use of councilors, ulema, schoolteachers, etc.

Additionally: Credible information based on facts which conform to social system. Set an example for the community to observe healthy practices and lifestyle. Feedback is crucial to success of any programme, wherein the health educator modifies as and when required to suit their needs. Poor education of patients is clearly a sign of poor communication skills on the part of the clinician





STAGES OF HEALTH EDUCATION

1. **Stage of Sensitization**

In this stage people are sensitized by giving messages like smoking kills. Not interested in changing behavior (smokers who know but are not interested in stopping in the next six months, may be unaware of their problem or do not consider it to be a problem.)

2. **Stage of Publicity**

In this stage, media and all possible means of advertising are used for providing information to people. Idea is people should discuss

3. **Stage of Education**

Educate the people through one-way methods like lectures, newspapers, handouts, posters and/or two-way methods including talk shows, conferences, workshops, focal group discussions, mohalla meetings. Give messages like 3 million deaths of smokers globally, 2 million in developed world, 1 million in underdeveloped world.

4. **Stage of Attitude Change**

As a result of education people think in a different way. Convincing youth that smoking is not cool is one way to decrease cigarette use. I know the effects of smoking; it is causative factor of many fatal diseases like oral cancer, periodontal disease, cancer of lungs, cardiac diseases, hypertension, Low birth weight babies & others.

5. **Stage of Motivation/Adaptation**

At this stage health educators persuade people to adopt healthy lifestyle and change. I am quitting smoking. I will do regular brushing. I will exercise when I am tense. I will recite when stressed. I will swim when I am in distress. I will drink boiled water. I will trim my nails

Motivation for performance: Forces that energize, direct, and sustain a person's efforts. Highly motivated people, with adequate ability and understanding of the job, will be highly productive. Health educators must know what behaviors they want to motivate people to exhibit

Performance = knowledge x motivation

6. **Stage of Community Transformation**

It is a ripple effect, one sees other and change lifestyle. My friend can change and adopt healthy lifestyle, so can I. Legislations will ban smoking in public areas

MATERIALS FOR HEALTH EDUCATION

1. **Print media** e.g. Posters, flannel graphs, flip charts, hand bills etc.
2. **Electronic media** e.g. Projectors, radio, television, internet, etc.
3. **Traditional media** e.g. Storytelling, songs, roleplays, announcers etc.

MOTIVATION

Intrinsic motivation is self-generated such as hunger, thirst etc. Satisfaction derived from these are likely to induce long-term changes in attitude and behavior. Extrinsic motivation/incentives are found outside the patient within his/her environment like rewards or punishments, material or abstract.

Maslow's Hierarchy of Needs:

1. **Physiologic:** food, water, oxygen, sleep. Oral H/E: periodic visits to dentist.
2. **Safety:** protection against physical threat/harm. Oral H/E: enlighten about preventive dental measures.
3. **Belonging and Love:** oral H/E kindness by dentist.
4. **Esteem and Ego:** desire to be successful and respected. Oral H/E: aesthetic dentistry
5. **Self-actualization.** Oral H/E: dentist sets a realistic goal and patient achieves the goal.

EDUCATION

Oral health educator should be clear about his/her objectives and goals. Should be able to utilize available resources and be cognizant of barriers of communication. Then able to plan an education program. Dental health

educators should be cognizant in sending written, verbal and non-verbal messages. If dentist-patient relationship is positive, then chances of behavior change are more.

COMMUNICATION

The Dentist must show concern for patient's problems by questioning, listening and supporting without criticizing or rejecting their ideas as baseless. Be able to communicate with level of individual, anticipate probable objections, allow listeners to question back if information is not clear and it is clarified. A dentist should also be a good listener. When asked to speak in a formal setting, a speech is prepared which is organized, focused, accurate, relevant & brief. Feedback is important.

DELIVERY OF HEALTH EDUCATION

The risk factors for many general health conditions are common to those that affect oral health, namely smoking, alcohol misuse and a poor diet. There is currently a drive for greater emphasis on prevention of ill health and reduction of inequalities of health by giving advice, provision of support to change behaviour and application of evidence-informed actions.

It is therefore important that all clinical teams make every contact count and support patients in making healthier choices. By doing this not only will patients' oral health benefit but their general health will be at lower risk as well. Clinical dental teams therefore have an important role in advising their patients about how they can make choices that improve and maintain both their dental and general health. It is important that the whole dental team, as well as other healthcare workers, give consistent messages and that those messages are up to date and correct.

(Practical Exercise 1 on next page)

PRACTICAL EXERCISE 1:

Take brief history of a simulated patient or an actual patient on the proforma below and then give health education according to the condition.

Name	
Age (Years)	
Sex/Gender	
Address	
Occupation	
Chief Complaint: What is your chief complaint?	☐ Pain ☐ Bleeding ☐ Plaque/Calculus ☐ Caries ☐ Staining ☐ Trauma ☐ Sensitivity ☐ Bad Breath (Halitosis) ☐ Irregular Teeth ☐ Missing Teeth _____ any other complaint
Smoking and Smokeless Tobacco Use	
Are you a smoker or have you ever smoked in the past?	☐ Non-smoker ☐ Current Smoker ☐ Past Smoker
How often do you smoke?	☐ Daily Multiple Times ☐ Once Daily ☐ Multiple times a week ☐ Weekly ☐ Occassionally
How many packs of cigarettes do you smoke in a day?	☐ <10 (Light Smoker) ☐ 11-20 (Medium S) ☐ >20 (Heavy S)
Do you use snuff/naswar or have you ever used it in the past?	☐ Non-user ☐ Past User ☐ Current User
How often do you take snuff/naswar?	☐ Daily Multiple Times ☐ Once Daily ☐ Multiple times a week ☐ Weekly ☐ Occassionally

Toothbrushing	
How often do you do toothbrushing?	☐ Twice a day ☐ Once Daily ☐ Multiple times a week ☐ Weekly ☐ Occassionally
What time of the day do you do toothbrushing?	☐ Before breakfast ☐ After breakfast ☐ Before a Meal ☐ After a Meal ☐ Before going to bed
What kind of toothbrush do you use?	☐ Manual ☐ Electric ☐ Miswak
What is the consistency of the bristles of the toothbrush that you use?	☐ Extra Hard ☐ Hard ☐ Medium ☐ Soft ☐ Extra Soft
Flossing	
Do you use dental floss or any other interdental mechanical plaque control method? If yes, then which one?	☐ No ☐ Dental Floss ☐ Dental Pick ☐ Toothpick ☐ Tongue Cleaner ☐ Interdental brush _____ any other type
How often do you do flossing?	☐ Don't floss ☐ Once Daily ☐ Multiple times a week ☐ Weekly ☐ Occassionally
Diabetes Mellitus	
Do you suffer from Diabetes Mellitus?	☐ Yes ☐ No
If yes, do you take medication for it?	☐ Yes ☐ No
If yes, what medication(s) do you take?	☐ Insulin ☐ Don't Know _____ other antidiabetic drugs
If yes, what is disease activity of your disease?	☐ Controlled ☐ Uncontrolled

Other Diseases: Which other diseases do you suffer from or not?	_____ state which disease
Pregnancy	
Are you pregnant?	☐ Yes ☐ No
If yes, for how many months have you been pregnant?	☐ <3 months (1st Trimester) ☐ 3-6 months (2nd Trimester) ☐ 6-9 months (3rd Trimester)
Miscellaneous Questions	
Drugs or Medications: Which other drugs and medicines are you taking?	_____ state which drugs or medications
Orthodontic Appliances: are you wearing braces?	☐ Yes ☐ No
Prosthodontic care: Do you have any missing teeth?	☐ Yes ☐ No ☐ Don't Know
Do you want a denture/crown/bridge to treat your missing teeth?	☐ Yes ☐ No
Clinical Findings	
Disease Present on Examination and History	☐ Dental Caries ☐ Periodontal Disease ☐ Oral Cancer ☐ Missing Teeth ☐ Malocclusion ☐ Trauma

HEALTH EDUCATION ADVICE (choose the appropriate heading (s) and tick the boxes)

Caries Prevention

Age	Advice to be given
0-3 years old	• Breast feeding provides the best nutrition for babies ☐ • From six months of age infants should be introduced to drinking from a free-flow cup, and from age one year feeding from a bottle should be discouraged ☐ • Sugar should not be added to weaning foods or drinks ☐ • Clean oral cavity with clean moist cloth after weaning ☐ • Parents/carers should brush or supervise tooth brushing ☐

	• Brush last thing at night and on one other occasion. ☐ • It is good practice to use only a smear of toothpaste ☐ • The frequency and amount of sugary food and drinks should be reduced. ☐ • Sugar-free medicines should be recommended ☐
3-6 years old	• Brush at least twice daily, with fluoridated toothpaste ☐ • Brush last thing at night and at least on one other occasion ☐ • Brushing should be supervised by a parent/carer ☐ • It is good practice to use only a pea size amount ☐ • Spit out after brushing and do not rinse, to maintain fluoride concentration levels ☐ • The frequency and amount of sugary food and drinks should be reduced ☐ • Sugar-free medicines should be recommended ☐ • Avoid sugar containing foods and drinks at bedtime when saliva flow is reduced and buffering capacity is lost ☐ • Visit dentist so that fluoride varnish two times a year (2.2% NaF) can be applied to teeth ☐
7 years to young adults	• Brush at least twice daily, with fluoridated toothpaste ☐ • Brush last thing at night and at least on one other occasion ☐ • Use fluoridated toothpaste ☐ • Spit out after brushing and do not rinse, to maintain fluoride concentration levels ☐ • The frequency and amount of sugary food and drinks should be reduced ☐ • Avoid sugar containing foods and drinks at bedtime when saliva flow is reduced and buffering capacity is lost ☐ • Visit dentist so that fluoride varnish two times a year (2.2% NaF) can be applied to teeth ☐ • Visit dentist for fissure sealant application on permanent molars ☐
Adults	• Brush at least twice daily, with fluoridated toothpaste ☐ • Brush last thing at night and at least on one other occasion ☐ • Use fluoridated toothpaste ☐ • Spit out after brushing and do not rinse, to maintain fluoride concentration ☐ • The frequency and amount of sugary food and drinks should be reduced ☐ • Use a fluoride mouth rinse daily (0.05% NaF) at a different time to brushing ☐ • Avoid sugar containing foods and drinks at bedtime when saliva flow is reduced and buffering capacity is lost ☐ • Visit dentist so that fluoride varnish two times a year (2.2% NaF) can be applied to teeth ☐

Periodontal Disease Prevention

Age	Advice to be given
All Adults & Children	• Remove plaque effectively using methods shown by the dental team. ☐ • Daily, effective plaque removal is more important to periodontal health than tooth scaling and polishing by the clinical team ☐ • Advise best methods of plaque removal to prevent gingivitis, achieve lowest risk of periodontitis and tooth loss ☐ • Use behaviour change methods with oral hygiene instruction ☐
	• Brush gum line and each tooth twice daily (before bed and at least on one other occasion) ☐ • Instruct on brushing technique like Modified Bass and avoid horizontal scrub method ☐ • Use either Manual or powered toothbrush ☐ • Small toothbrush head, soft texture ☐ • For small spaces between teeth: Use dental floss or tape ☐ • For larger spaces: Use interdental or single-tufted brushes ☐ • Around orthodontic appliances and bridges: Use interdental brushes or use method suggested by the dental professional ☐ • Correct factors which impede effective plaque control including supra and sub-gingival calculus, open margins, restoration overhangs and contours which prevent effective plaque removal ☐ • Assess patient's/parent's/ carer's preferences for plaque control ➢ Decide on manual or powered toothbrush ☐ ➢ Demonstrate methods and types of brushes ☐ ➢ Assess plaque removal abilities and confidence with brush ☐ • Patient sets a target for tooth brushing for next visit ☐

Risk Factor Control

Risk factor	Advice to be given
Tobacco (for both smoking and snuff / naswar)	• Do not smoke. Smoking increases the risk of periodontal disease, reduces benefits of treatment and increases the chance of losing teeth. ☐ • Ask, Advise, Act: Take a history of tobacco use, give brief advice to users to quit and sign post to local stop smoking service ☐ • Major causative factor for oral cancer. ☐ • Quitting tobacco use is the most important thing you can do to protect your health. ☐

	• Cutting down while you receive dental treatment is not enough ☐ • Tobacco use is hurting your oral health, your finances and your family's happiness. ☐ • Encourage non-users to stay away from tobacco, affirm non-use of tobacco and advise them to never use tobacco in future. ☐ • Affirm and congratulate those who have quit the tobacco use and offer support, if required. ☐ • Ask every tobacco user if he or she is willing to quit currently. ☐ • If the patient is willing to quit, assess the level of dependence. ☐ • If the patient is not prepared to quit shift them to the 5R method: Relevance of quitting, Risks of continuous tobacco usage, Rewards of quitting, Roadblocks to quitting, and Repetition at each visit ☐ • ASSIST TOBACCO USERS TO MAKE A QUIT PLAN: Set a firm quit date, ideally within 2 weeks. ☐ • Get support from family, friends, coworkers. ☐ • Review past quit attempts-what helped and what led to relapse. ☐ • Identify reasons for quitting in writing and keep a copy. ☐ • Reduce tobacco use during the 2 weeks before quitting. ☐ • Anticipate challenges, particularly during the first few weeks, including nicotine withdrawal symptoms. ☐ • Throw out all tobacco products in his or her possession. ☐ • Avoid places where tobacco is available. ☐ • Encourage other tobacco users around to quit along with him or her. ☐ • Advise the patient: Total abstinence is essential to quitting-not even a single puff or portion. ☐ • Having other tobacco users in the home hinders successful quitting. ☐ • Withdrawal symptoms typically decrease considerably after 1-3 weeks of quitting. Suggest alternatives to tobacco. ☐ • Recommend or provide pharmacotherapy for depressed patients and those who have tried to quit several times and failed ☐
Diabetes Mellitus	• Patients with diabetes should try to maintain good diabetes control as they are at greater risk of developing serious periodontal disease ☐ • Less likely to benefit from periodontal treatment if diabetes is not well-controlled ☐ • Take your medications properly ☐
Medications	• Some medications can affect gingival health ☐ • For patients who use medication that cause dry mouth or gingival enlargement explain oral health findings and risk related to medication ☐ • Assess and discuss clinical management ☐

ADVICE FOR PREGNANT MOTHERS

ADVICE TO BE GIVEN
• Poor maternal oral health can increase the risk of complications of pregnancy including preterm delivery or low birth weight, gestational diabetes, preeclampsia and stillbirth. ☐ • Moreover, foetal exposure to oral pathogens may increase risk of subsequent neonatal intensive care admission. ☐ • An individualized preventive plan needs to be made for each patient including oral health instructions, oral rinses, and use of xylitol gum to decrease the likelihood of Mutans Streptococcus transmission post-partum. ☐ • Dietary consideration e.g., maintaining healthy diet, avoiding frequent exposures to cariogenic foods and beverages, overall nutrient and energy needs. ☐ • Ideally, a dental prophylaxis should be performed during 1st trimester and again during 3rd trimester. ☐ • Elective restorative and periodontal therapy should be performed during 2nd trimester. ☐ • Foetal organ development occurs during the first trimester; it is best to avoid all potential risks at that time if possible. ☐ • Other elective treatments, such as teeth whitening and other cosmetic procedures, should be postponed until after birth. ☐ • It is best to avoid this dental work while pregnant and avoid exposing the developing baby to any risks, even if they are minimal. ☐ • If dental work is needed, the amount of anesthesia administered should be as little as possible, but still enough to make patient comfortable. ☐ • Patient's comfort leads to less stress on the foetus. ☐ • Amalgam fillings should be avoided. ☐ • Rubber dam and increase speed suction devices should be used. ☐ • Nitrous oxide/ oxygen analgesia should be avoided. ☐ • Precautions must be taken to prevent hypoxia, hypotension and aspiration (Patient can be asked to keep legs uncrossed while they sit in a dental chair to help maintain healthy circulation or keep a pillow to make them comfortable). ☐ • If morning sickness or gastro-oesophageal reflux occurs, patients should be instructed to rinse with a cup of water with a teaspoon of sodium bicarbonate and avoid brushing for an hour. ☐ • A daily neutral sodium fluoride mouth rinse or gel should be used to prevent softening by acids (from foods and morning sickness) and control pulpal sensitivity. ☐ • A palliative approach to alleviate dry mouth may include increase water consumption or chewing sugarless gum to increase salivation. ☐ • Avoid use of aspirin, aspirin-containing products, erythromycin estolate and tetracycline during pregnancy. ☐ • Non-steroidal anti-inflammatory drugs routinely are not recommended during pregnancy, if necessary, administration should be avoided during 1st and 3rd trimester and be limited to 48-72 hours. ☐ • Antibiotics such as penicillin, amoxicillin and clindamycin, which are labelled category B for safety in pregnancy, may be prescribed after procedure. ☐ • Routine x-rays, usually taken during annual examinations (check-ups), can usually be postponed until after birth. ☐

Student demonstrated proper health education delivery technique: ☐ Yes ☐ No

Student needs improvement on: _____

PRACTICAL EXERCISE 2 FOR STUDENT: Design a one-page leaflet on any one of the above health education topics and draw/paste it here.

Student designed appropriate leaflet: ☐ Yes ☐ No

Student needs improvement on: _____

_____

Signature of Teacher

Block E Module 2: Infection and Inflammation and Auxiliary Dental Materials Practical List

1. **Brushing Techniques**
2. **Flossing Techniques**
3. **Disinfection and Sterilization**
4. **Waste Segregation and Disposal**

Block E

Module 2: Infection and Inflammation and Auxiliary Dental Materials

Brushing Techniques

Number of Hours: 2 hours

Learning Outcomes:

1. Perform brushing techniques in skill lab on a given model.

Materials Required:

1. Pen, pencil and paper
2. Computers with internet access
3. Whiteboard with marker
4. Oral Cavity Model with Toothbrush

Date:

Introduction

- Brushing teeth is an important part of dental care routine.
- For a healthy mouth and smile, the American Dental Association (ADA) recommends - Brush your teeth twice a day with a soft-bristled brush.
- The size and shape of your brush should fit your mouth, allowing you to reach all areas easily.
- Replace your toothbrush every three or four months, or sooner if the bristles are frayed.
- Make sure to use an ADA specified fluoride toothpaste.

Objectives

1. To clean teeth surfaces from food, debris and stain
2. To remove plague and disturb reformation
3. To stimulate the gingival tissues
4. Application of dentifrice with specific therapeutic agents to address caries, periodontal disease or sensitivity problem.

- Toothbrushes may be manual or electric with continuous design modifications by competing manufacturers.
- The patient's compliance, motivation along with the individual's dexterity and thoroughness are more critical than technique or design in determining efficacy of plaque removal by a toothbrush.

- For small children, toothbrushing should be performed by an adult until the child is approximately 6 years old or till the child is capable of independent brushing.
- In adults, toothbrushing can remove plaque effectively from smooth surfaces and prevent or resolve gingivitis at these sites. However, anatomic and prosthetic factors may limit access inter-proximally, in pits and fissures and around prostheses.
- In general, the high prevalence of chronic marginal gingivitis in adults suggests poor tooth-brushing compliance or low performance dexterity.
- Improper toothbrushing can damage teeth and surrounding tissues by mechanical abrasion resulting in cervical notches, gingival ulceration and recession.
- Therefore, re-education of toothbrushing techniques may be required for adults.
- Toothbrushing in the elderly can preserve gingival health, improve appearance, decrease mouth odor and minimize taste interference.
- However, diminished cognition and medical conditions may hinder toothbrushing and the elderly may have their dexterity impeded by decreased visual acuity and physical disabilities such as arthritis and stroke.
- The institutionalized elderly may have brushing performed inadequately by careers.
- Double-headed toothbrushes can aid plaque removal in this population and modifications such as adding fresh acrylic to the handle to mold to the patient's handgrip can aid self-care for handicapped patients.
- **Toothbrushing Time and Frequency:** Daily toothbrushing is extremely important to maximize sulcular cleaning as a periodontal disease control measure, because few individuals completely remove plaque and use fluoride dentifrices more often in caries control.
- Recommended to use 8 to 10 strokes in each brushing area of the tooth surface.
- Toothbrushing after every meal would be ideal, but keeping in mind the practical problems, twice daily toothbrushing is recommended, i.e. once in the morning after breakfast and once in the night immediately after dinner.
- As the debris is not easily removed due to reduced salivary flow during sleeping, night-time toothbrushing is more important.
- Benefits of proper oral care must be explained and demonstrated to patients to ensure continued commitment to a personal oral hygiene program.
- It is proposed not to insist on the duration of toothbrushing, e.g. for 3 to 5 minutes, but advise toothbrushing all the teeth surfaces thoroughly as far as possible.
- "One brushing area". The area covered by normal length of the toothbrush is one area covering about 3-4 teeth
- Toothbrushing is one of the most widely used mechanical methods of plaque control
- Manual toothbrushes vary in size, shape, texture and design.
- It consists of a handle and a head with bristles.
- Tufts in a toothbrush head are composed of the bristles, which are bunched together.
- The head is divided into the toe, which is at the extreme end of the head, and the heel, which is closest to the handle.
- A constriction, termed the shank, usually occurs between the handle and the head.
- Many toothbrushes are manufactured in different sizes such as large, medium and small so that they adapt better to the oral anatomy of different individuals.
- Toothbrushes also differ in their defined hardness or texture classified as extra hard, hard, medium, soft or extra/ultra soft.

(Practical Exercise 1 given on next page)

Practical Exercise 1

Draw a labelled diagram of a manual toothbrush below.

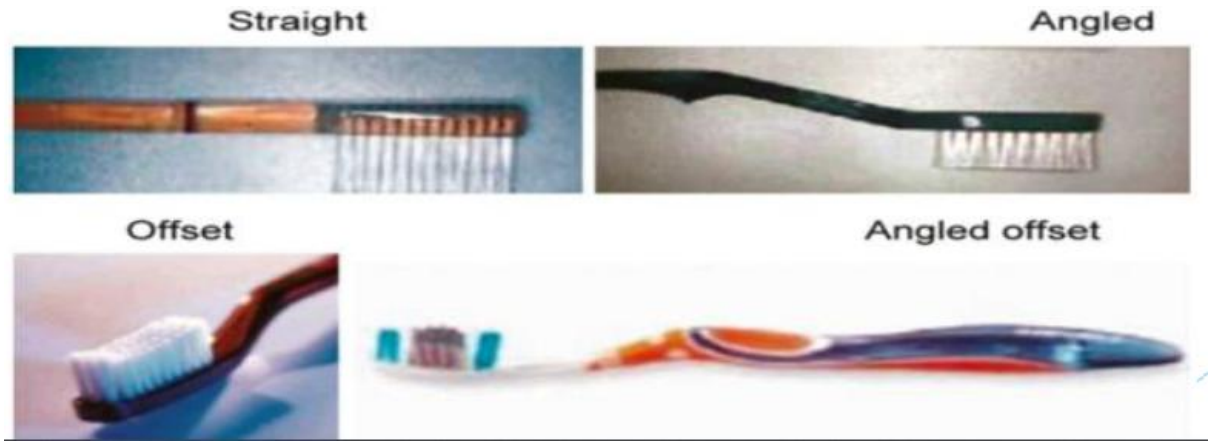
Student drew appropriate labelled diagram: ☐ Yes ☐ No

Student needs improvement on: _____

- **Profiles:** Toothbrushes have four basic lateral profiles when viewed from the side: flat, concave, convex and multileveled (rippled or scalloped).
- Concave shape is useful for improved cleaning of facial surfaces.
- Convex shape is more useful for improved cleaning of lingual surfaces.
- Toothbrushes with multilevel profiles are found to be consistently more effective than flat toothbrushes, especially when interproximal efficacy is monitored.
- **Bristle Shapes:** Recently toothbrush products utilizing the bristles of new shapes and textures in multiple diameters, textures and bristle trims have been developed.
- Compared to toothbrushes with standard round bristles, laboratory studies have documented improved efficacy of toothbrushes with tapered, feathered and diamond-shaped bristles. Rounded, tapered or smooth bristle tips are less abrasive.

- **Handle Designs:** Many of the new toothbrushes have a styled handle design.

- Many modifications, such as triangular extrusions or indentations along the sides for better grasp, a "thumb position" on the back of the handle for more comfort, and various angle bends to permit better access into and around the mouth have been introduced.
- Based on the handle designs four types of toothbrushes are available in the market (i) Straight, (ii) Angled, (iii) Offset and (iv) Angled Offset
- Handle design and length may provide comfort and compliance during toothbrush use, and these factors have recently been documented to improve the quality of toothbrushing.
- This is particularly important for children whose dexterity may not be highly developed.

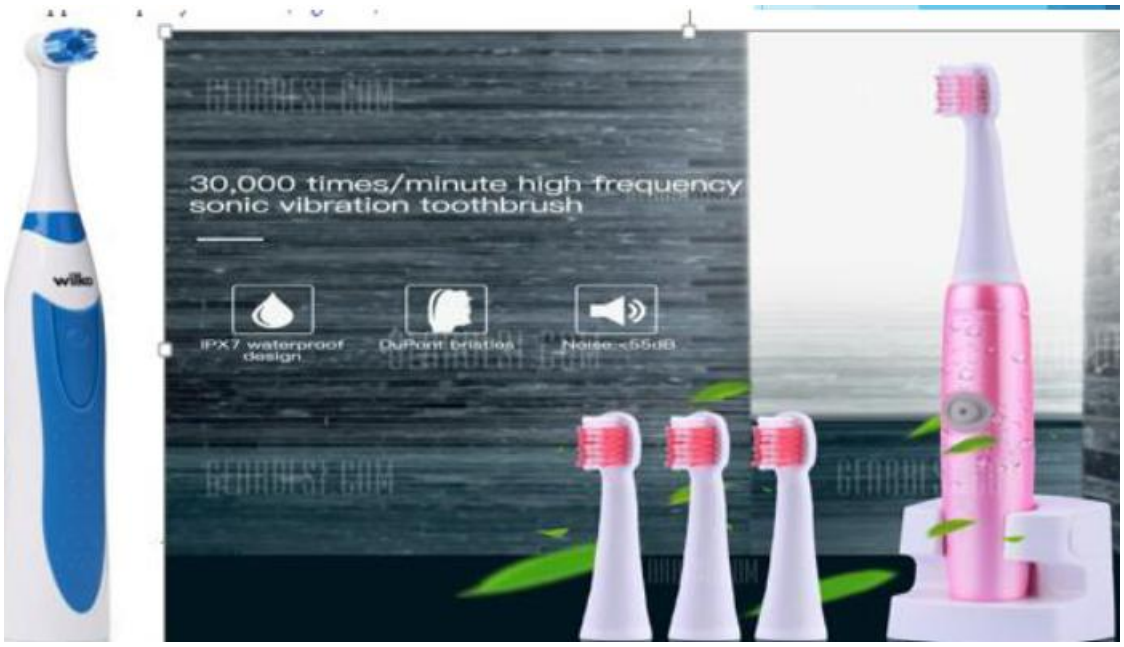


- **Texture:** Bristle resistance to pressure is defined as texture AKA firmness, stiffness and hardness.
- It is related to its: (i) composition, (ii) diameter, (iii) length and (iv) the number of individual bristle per tuft.
- Bristle length is 10-12 mm.
- Diameter of the bristle ranges from 0.007 to 0.015 inches.
- Factors which affect texture are temperature, uptake of water (hydration) and frequency of toothbrush use.
- Nylon bristles are superior to the natural (hog) bristles in several prospects as flexibility of Nylon bristles is as many as 10 times more often than natural bristles before breaking with ease and economy of production
- They are easy to clean and do not split or abrade.
- The configurations and hardness of nylon bristles can be standardized within specified and reproducible tolerances.
- Current opinion favours use of soft textured or medium texture bristle, nylon, multitufted toothbrush with short head.

Powered / Electric Toothbrush

- Sometime back, battery-powered products were a commercial success, which had the advantage of being portable and available at a lower cost.
- Unfortunately, problems with these battery-powered products included short 'working times' and mechanical breakdowns.
- The enthusiasm for the powered toothbrush declined.
- They are recommended mainly for the handicapped.
- Head designs used now are basically of two primary types: (i) rotating, (ii) oscillating type with small, round molar-crown-size brushes head and (iii) oscillating brushes with either vibrational or rotational sonic movements.
- Plaque removal by these brushes appears equally effective
- **Bristle Designs:** the heads of most powered or mechanical toothbrushes are usually removable to allow for replacements and are smaller than manual toothbrushes.

- The head follows three basic patterns when the motor is started:
    - Reciprocating, a back-and-forth movement
    - Arcuate, an up-and-down movement
    - Elliptical, a combination of reciprocating and arcuate motions
- In case of handicapped patients, powered toothbrushes are consistently superior to manual toothbrushes in plaque removal and gingivitis efficacy.
- However, under ideal conditions they are not superior to natural toothbrushing.



TOOTHBRUSHING METHODS

1. Horizontal Reciprocating Scrub
2. Vibratory

i) Bass (Sulcular technique)
ii) Stillman
iii) Charters

3. Vertical Sweeping

i) Modified Stillman (Rolling Stroke, Press Roll)
ii) Modified Charters
iii) Modified Bass
iv) Leonard
v) Smith-Bell (Physiologic Technique)

4. Fones (Rotary)

- A person can brush without damaging the gums or the teeth whatever the way he/she pleases as long as the dental plaque and/or other deposits are removed.
- As a dentist this should be respected since it is very hard to change a person's toothbrushing habits, even harder is to teach someone who has never brushed.
- It is recommended to tell the patient to use vertical movements, which are always from the gums to the edge of the tooth.
- In the upper jaw, from upward to downward and on the lower jaw from downward to upward.
- It is always better to start by leaning the toothbrush against the gum and then move to the face of the tooth, giving the gum a little massage stimulating blood circulation and emptying the gingival sulcus.

(Practical Exercise 2 given on next page)

Practical Exercise 2:

Demonstrate brushing techniques and draw their labelled diagrams in the table given below.

Brushing Technique	Labelled Diagram	Advantages	Disadvantages
Horizontal Scrub		1. Easy to learn and implement. 2. Recommended for small children	1. Cervical abrasion is caused after long use of this technique. 2. No cleaning of interdental spaces. 3. May lead to gingival recession. 4. Not very effective at plaque removal
Bass		1. Effective method for removing plaque. 2. Provides good gingival stimulation 3.The short back and forth motion is easy to master.	1. Can cause injury to the gingival margin if done overzealously 2. Time-consuming as it requires patience and placement of the toothbrush in many different positions to cover the full dentition. 3. In certain patients, dexterity requirement is too high 4. Patients need to be instructed to brush in a controlled and systematic sequence to optimize plaque removal.
Modified Bass		1. Excellent sulcus cleaning 2. Good interproximal & gingival cleaning 3.Good gingival stimulation	1. Dexterity of wrist is required
Stillman		1.Gingival stimulation and massage 2.Effective for gingivitis	1. Dexterity of wrist is required 2. Less effective at subgingival plaque removal 3. Can cause injury to the gingival margin if done overzealously 4. Not as effective for interdental cleaning

Modified Stillman		1.Gingival stimulation and massage 2.Effective for gingivitis	1.Dexterity of wrist is required 2. Time consuming 3. Can cause damage to epithelial attachment
Charters		1. Gingival stimulation and massage 2. Adaptability to various tooth conditions	1.Dexterity requirement is high 2.Poor removal of subgingival bacterial accumulations 3.Limited brush placement
Modified Charters		1. Ideal for patients with orthodontic appliances (e.g., braces), fixed prosthodontics (e.g., bridges), or post-periodontal surgery 2. Enhanced Plaque Removal 3. Promotes Healing and Gum Stimulation	1. Greater Dexterity is required 2. Less Effective for Subgingival Plaque 3. Time consuming
Leonard		1. Simple and Easy to learn for children and individuals with limited cognitive or motor skills. 2. Useful as an introductory method for teaching brushing to preschoolers or those new to oral hygiene routines. 3. Effective for Anterior Teeth 4. May be used therapeutically to teach basic hand motion and grip control in individuals undergoing occupational or neurodevelopmental therapy. 5. Less Technique-Sensitive compared to more advanced techniques like the Bass technique	1. Limited Plaque Removal at the Gingival area 2. Ineffective in interproximal Areas 3. Risk of Gingival Trauma with overzealous brushing can lead to gingival abrasion or recession over time. 4. Encourages Brushing of One Arch at a Time as the upper and lower arches are brushed separately, which increases brushing time and may reduce efficiency or patient compliance. 5. Poor Control on Posterior Teeth as vertical strokes may be awkward or difficult to execute
Smith-Bell		1. Mimics the self-cleansing action of mastication 2. Gingival Stimulation	1. Interdental spaces and sulcular areas of teeth are not properly cleaned

		3. Effective supragingival cleaning	
Fones		1. Easy to learn and perform 2. Requires less time 3. Good for physically or emotionally handicapped individuals & patients who lacks dexterity. 5. Provides good gingival stimulation. 6. Has equal or better potential than bass technique for plaque removal.	1. Possible trauma to gingiva 2. Interdental areas not properly cleaned 3. Detrimental for adults especially those who brush vigorously

Student demonstrated toothbrushing techniques and drew appropriate labelled diagrams: ☐ Yes ☐ No

Student needs improvement on: _____

_____

Signature of Teacher

Block E

Module 2: Infection and Inflammation and Auxiliary Dental Materials

Flossing Techniques

Number of Hours: 2 hours
Learning Outcomes:

1. Perform flossing techniques in skill lab.

Date:

Materials Required:

1. Pen, pencil, and paper

2. Computers with internet access

3. Whiteboard with marker

4. Oral Cavity Model

5. Dental Floss

- **Flossing** is a method for removing bacteria and other debris that cannot be reached by a toothbrush. It generally entails a very thin piece of synthetic cord inserted and moved up and down between the sides of two adjoining teeth.
- **Dental Floss** is a cord of thin filaments used to remove food and dental plaque from between teeth in between areas a toothbrush is unable to reach

INDICATION: Dental floss is best indicated for plaque and debris removal from embrasures, where the papilla fills the interproximal space and the teeth are in contact.

OBJECTIVES OF FLOSSING:

1. Removes plaque and debris that adheres to the teeth, restorations, orthodontic appliances, fixed prostheses in the interproximal embrasures and around implants
2. Aids the clinician in identifying the presence of interproximal calculus deposits, overhanging restorations, or interproximal carious lesions
3. Reduces gingival bleeding
4. May be used as a vehicle for the application of polishing or chemotherapeutic agents (fluorides) to interproximal and subgingival areas

DENTAL FLOSS TYPES

1. Waxed and Unwaxed
2. Flavoured and Unflavoured
3. Colored and Uncolored
4. Fluoridated and Non-fluoridated
5. Thick and Thin
6. Regular Floss / Thread Floss
7. Floss Pick / Specialized Floss Wand / Floss Stick
8. Ergonomic Floss
9. Tape Floss / Dental Tape
10. Super Floss
11. PTFE Floss
12. Biodegradable and Natural Floss
13. Dental Floss Holder
14. Vibrating Dental Flosser
15. Water Flosser

- Not all interproximal contact areas, natural or restored, have the same configuration. So, several types of floss are available to accommodate
- These vary from thin unwaxed varieties to thicker waxed types and include variable thickness floss with no significant differences in the cleaning ability between them
- Unwaxed floss is made from nylon made of about 35 strands twisted together.
- Waxed floss is also made from nylon and covered with a light wax coating.
- Unwaxed floss is frequently recommended because it is thin and slips easily through tight contact areas, & it absorbs food particles better,
- But it can fray and tear when contacting rotated teeth, heavy calculus deposits or defective and overhanging restorations.
- For such conditions, waxed, lightly waxed resistant floss is recommended.
- The waxed variety of dental floss tends to glide through the teeth better.
- Waxed floss is less likely to get stuck between the teeth or get caught on rough edges.
- It also doesn't fray or break as quickly as unwaxed dental floss.
- The downside is that the wax makes the floss a little thicker.
- Therefore, if your teeth are close together, you may prefer to use unwaxed dental floss.

- **Dental floss and tape** are available as coloured and flavoured brands.
- Provides increased appeal and colour provides a visual contrast to plaque and oral debris enabling one to see what is being removed, possibly increasing the motivation to floss.
- A mint flavor leaves a pleasantly fresh, clean taste in the mouth or can try cinnamon for this.
- Flavored floss can be used for children as it is difficult for them to get into the habit of flossing their teeth.
- Flosses impregnated with a variety of agents have been introduced. Examples are floss treated with fluoride, baking soda, herbal extracts, antimicrobial agents or abrasives for whitening.

- **Thread Floss / Regular Floss** is made from nylon
- It works the same way as other dental flosses.
- It is easy to use and easy to glide in between the teeth.
- It is commonly supplied in plastic dispensers which contain 10 to 100 meters of floss
- It is available in different thickness

- **Tape Floss or Dental Tape** is used in widely spaced teeth
- It is thicker and broader than conventional dental floss
- It does not easily fray or break.
- It gives the feeling of getting into both sides of a tooth where people have larger gaps in between.

- Waxed dental tape, unlike round dental floss, is broad and flat, and may be effective in an interproximal space without tight contact points.

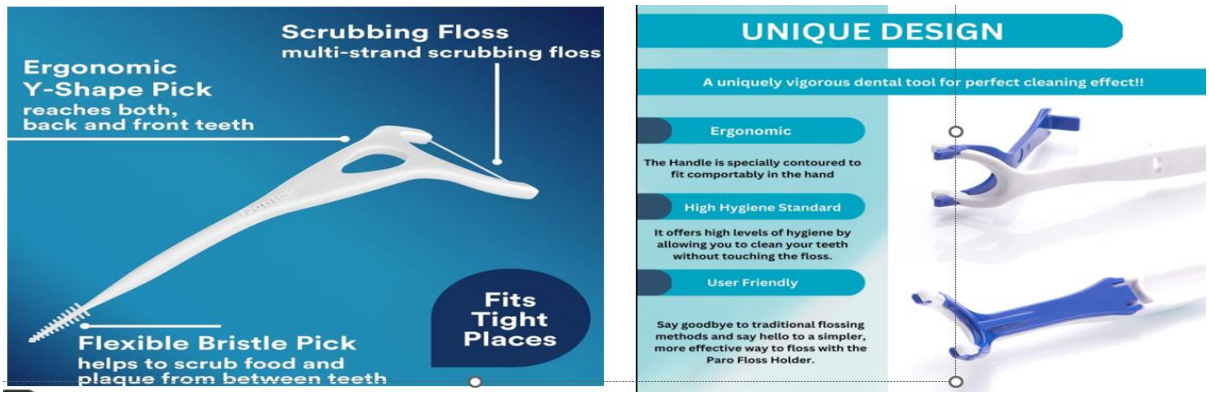
- **Super Floss** is made from yarn-like material.
- It is used to clean around braces, dental bridges or implants.
- Because it has stiffer sections on each end, this type of floss stands up to the rigors of flossing between those complex spaces when wearing braces or dental bridges.

- **PTFE Floss** (polytetrafluorethylene) is composed of the same material as that used in the high-tech Gore-Tex fabric.
- It slides between your teeth with ease.
- It is perfect for those who have a challenging tooth formation or crowded teeth.
- Because perfluorooctanoic acid is a possible carcinogen, dentist consultation is required before using PTFE floss.

- **Biodegradable and Natural Floss:** If one is concerned about the environment, one can buy floss contained in glass bottles that can be reused and packaged in biodegradable packaging.
- One can also buy floss made from silk and waxed with plant-derived vegan candelilla wax as it's also biodegradable.

- **Flossing Stick / Floss Pick / Specialized Plastic Wand** resembles a stick and is the most effective when wound tightly onto it.
- The tighter the floss, the more effective it will be.
- They are handy
- They do not pinch fingers like a regular floss does
- Enhanced reach can make flossing the posterior teeth better
- Disadvantage is that it makes it difficult to floss at all angles which are possible with the regular floss

- **Ergonomic Floss:** has improved handle for better grip
- Its floss head has a unique feature in that it can rotate in any direction making it accessible to any pair of teeth in the mouth



- **Dental Floss Holder** is a device that eliminates the need for placing fingers in the mouth
- They come in a 'Y' shape & the floss is attached to the top points of the Y and works in the same way as you would if holding floss in your hands.
- It is recommended for individuals with: (i) poor manual dexterity, (ii) physical disabilities, (iii) limited mouth opening, (iv) large hands, (v) a strong gag reflex and (vi) low motivation for traditional flossing.
- They are ideal for people who have crowns, dental implants, a bridge or orthodontic braces.
- When one person is assisting another with flossing, the floss holder may also be helpful.
- These may be helpful for people who are just learning how to floss.
- They may also help children with limited dexterity in their arms or hands.
- Or they may be helpful if you are flossing a child's teeth.
- Quick and easy to use, the Y floss holders are easy to get into those hard-to-reach areas of the mouth.
- The longer the handles, the easier they are to use.

- **Vibrating Dental Flosser:** Is used if one does not like the idea of standing in front of a mirror and flossing the teeth manually.
- This electric flosser uses a sturdy single-line type of nylon that vibrates between the teeth.
- This oscillating motion is excellent for those who have difficulty with dental floss.
- Be careful when using an electric vibrating dental flosser, as it can be hard on the gum line.
- They are easy to use and give the gums a nice gentle massage at the same time.
- The downside is that they are more expensive than standard dental floss choices.

- **Water Flosser:** It shoots a thin streak of water between your teeth and the gum line, removing plaque and food particles with ease.
- It has a massaging effect.
- They are an excellent option for those with braces and bridges.
- The downside is that water does not floss as effectively as conventional dental floss types

PRACTICAL EXERCISE 1:

Draw a dental floss and dental pick.

Student drew appropriate diagrams: ☐ Yes ☐ No

Student needs improvement on: _____

USAGE OF FLOSS

The American Dental Association recommends cleaning between your teeth once a day prior to brushing to allow the fluoride from the toothpaste to reach between the teeth.

WHICH FLOSS AND WHEN?

- If one is on the road or at work, a small container of nylon dental floss or dental tape is a fantastic choice.
- If one needs a boost of freshness, mint-flavored floss can be a great choice when traveling & it means one does not have to carry mouthwash.
- When one is at home, one can treat oneself to water flosser or vibrating flosser.
- While there are so many flossing options to choose from, choosing the right one need not be overwhelming.
- No matter what floss one chooses, manual or electric, the most important thing is to floss daily.

BENEFITS OF FLOSSING:

1. Improve oral hygiene
2. Clean those areas where toothbrush cannot reach
3. Removes plaque and food particles from interdental spaces
4. Cleans tooth surface beneath the gum line
5. Prevents halitosis
6. Polishes tooth surface

LIMITATIONS OF FLOSSING:

1. Time Consuming
2. Require skill
3. Tissue damage risk if not used properly
4. Inability to conform to a concave interproximal surface such as the mesial surface of maxillary premolars so then other interproximal devices, which clean those surfaces more effectively, should be used.

FLOSSING METHODS

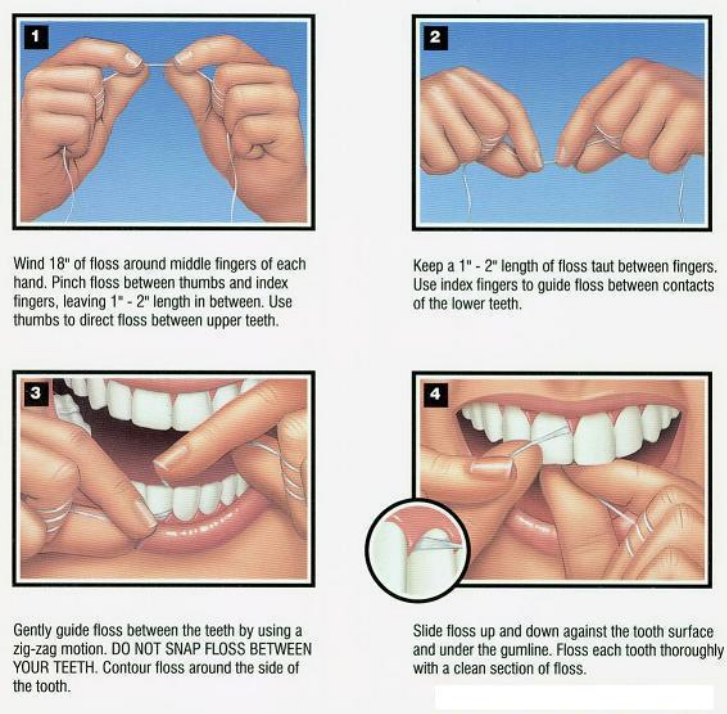
- The two methods are Spool method and the Circle or Loop method.
- Both methods facilitate control of the floss and ease of handling.
- Spool method is particularly suited for teenagers and adults who have acquired the necessary neuromuscular coordination required to use floss.
- Loop method is suitable for children and adults with less nimble hands or physical limitations caused by conditions such as poor muscular coordination or arthritis
- In certain circumstances, the use of a floss holder, floss threaded, variable, thickness floss or precut floss strands with a stiff end may be more effective.

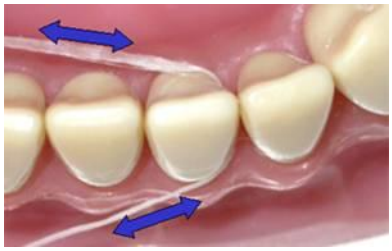
Rules

1. Always keep the pressure of your floss against teeth.
2. Never apply pressure on gums
3. Change the section of floss used from time to time
4. Rinse the mouth afterwards.

SPOOL METHOD:

- The spool method is the most popular for those who do not have problems with stiff joints or fingers.

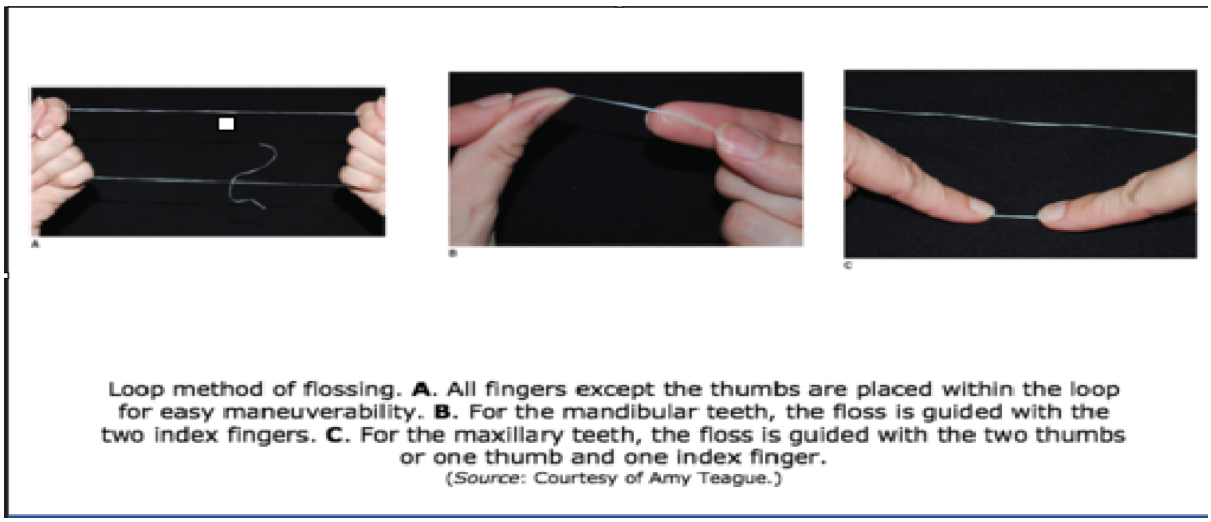




Flossing Movements

LOOP METHOD (CIRCLE METHOD):

- The loop method is often effective for children or adults with dexterity problems like arthritis.



Loop method of flossing. **A.** All fingers except the thumbs are placed within the loop for easy maneuverability. **B.** For the mandibular teeth, the floss is guided with the two index fingers. **C.** For the maxillary teeth, the floss is guided with the two thumbs or one thumb and one index finger.
(*Source:* Courtesy of Amy Teague.)

PRACTICAL EXERCISE 2

Demonstrate flossing methods on the given model and draw labelled diagrams for the spool method and loop method of flossing below.

Student demonstrated flossing techniques and drew appropriate labelled diagrams: ☐ Yes ☐ No

Student needs improvement on: _____

_____

Signature of Teacher

Block E

Module 2: Infection and Inflammation and Auxiliary Dental Materials

Disinfection and Sterilization

Number of Hours: 2 hours

Learning Outcomes:

1. Describe the infection control procedure in a dental care setting.
2. Describe disinfection and sterilization in dental care setting.

Materials Required:

1. Pen, pencil and paper
2. Whiteboard with marker
3. Autoclave
4. Disinfectant
5. Dental Unit

Date:

INTRODUCTION:

Instruments that are being used in a dental clinic are classified upon the risk of transmitting infection. According to the classification instruments are either sterilized or disinfected. To prevent cross infection, the equipment and surroundings of the dental clinic is also disinfected.

Classification of Patient Care Items

Instruments are classified into 3 categories depending upon the risk of transmitting infection

1. Critical
2. Semi-Critical
3. Non-Critical

Critical Instruments

Instruments that are used to penetrate soft tissues or bone are classified as critical instruments. They should be sterilized after each use. These include the following instruments:

- Forceps • Bone chisels
- Scalpels • Burs
- Scalers

Semi-Critical Instruments

Instruments that do not penetrate soft tissues and bone but contact oral tissues only are classified as semi-critical instruments. They also should be sterilized after each use or at least receive high-level disinfection. These include the following instruments:

- Mirrors
- Amalgam condensers
- Impression trays

Non-Critical Instruments

Instruments or devices that come into contact only with intact skin are classified under non-critical instruments. They should receive intermediate or low-level disinfection. These instruments include:

- X-ray Heads
- Face-bows
- Blood pressure apparatus cuffs

Heat Sterilized Items

Items that must be heat sterilized between patients

- All hand and orthodontic instruments
- Burs and bur changers
- Endodontic instruments
- Air-water syringe tips
- Surgical instruments
- Ultrasonic scalers
- Metal impression
- I/O radiographic equipment

Chemically Sterilized Items

Items that may be chemically sterilized include:

- Glass slabs
- Metal spatulas

- Mirrors for intraoral photography
- Cheek retractors

Disinfection

Disinfection is defined as the destruction or inhibition of most pathogenic agents on inanimate objects by chemical or physical means. It does not necessarily kill all microorganism especially bacterial spores, thus is less effective than sterilization. It can be accomplished by two means:

- Heat Disinfection
- Chemical Disinfection

Heat Disinfection

It is accomplished by boiling water at atmospheric pressure for at least 5 minutes. It is used for the disinfection of Prosthodontic instruments such as polishing buffs and brushes.

Chemical Disinfection

It is accomplished by using certain chemicals such as phenols, alcohols, halogens and others. Phenols destroy the membrane of microorganisms; alcohol denatures the proteins. Hypochlorite, glutaraldehyde and halogens such as iodine and chlorine are also used for disinfection purposes.

Sterilization

A process which kills all forms of microbial life including transmissible agents such as viruses, bacteria, fungi & spore forms.

Various approved methods of sterilization are:

1. Moist heat; Steam under pressure
2. Dry heat
3. Chemical vapour
4. Ethylene oxide

1. Moist Heat; Steam Under Pressure

It is the most widely used method for sterilization of critical and non-critical items that are not sensitive to heat and moisture. This process utilizes a combination of pressure, temperature and time that causes denaturation and coagulation of proteins. Two different methods are used:

- **121 °C at 15 psi for 15minutes**
- **134°C at 3 psi for 3 minutes**

SNO	Advantages	SNO	Disadvantages
1.	Good penetration	1.	Non- stainless steel metal items corrode
2.	More economical	2.	May damage plastic and rubber items

3.	Reliable method	3.	Sharp instruments loose lustre and get dull

2. Dry Heat

The method of sterilization utilizes the principle of oxidation to destroy microorganisms. Instruments are heated at:

1. 170° C for one hour
2. 160° C for two hours

Advantages		Disadvantages	
1	Useful for materials that cannot be subjected to steam under pressure	1	Less reliable
2	No corrosion	2	Prolonged process
		3	Not suitable for certain instruments like plastic

3. Chemical Vapour (Chemiclave)

This procedure involves heating a mixture of formaldehyde, alcohols, ketones, acetone and water and placing instruments in them under pressure. The variables are adjusted at:

- 20 minutes at 127°C to 132°C with 20 - 40 pounds pressure

Advantages		Disadvantages	
1.	Less corrosion	1.	Cannot be used for material which can be altered by chemicals
		2.	Adequate ventilation is needed
2.	Short cycle of sterilization	3.	Slight odour
		4.	High cost of special solutions

4. Ethylene Oxide

Instruments are placed inside ethylene oxide which alkylates the DNA molecules and thereby inactivates microorganisms. The only disadvantage of this method is that it is difficult to operate.

(Practical Exercise 1 on next page)

Practical Exercise 1:
Write down the following:

Classification of Patient Care Items
Instruments are classified into three categories depending upon the risk of transmitting infection.
1. _____
2. _____
3. _____

Critical Instruments

_____
_____
_____
_____
_____

Semi-Critical Instruments

_____
_____
_____
_____
_____

Non-Critical Instruments

_____
_____
_____
_____
_____

Enlist the items that must be Heat Sterilized between patients

_____
_____
_____
_____
_____

Enlist the items that may be Chemically Sterilized

_____
_____
_____
_____
_____

Disinfection

_____
_____
_____

Heat Disinfection

Chemical Disinfection

Sterilization

Various approved methods of sterilization are:

1. Moist Heat: Stem under Pressure

Two different methods are used:

1._____ 2. _____

Advantages		Disadvantages	
1.		1.	
2.		2.	
3.		3.	

2. Dry Heat

Advantages		Disadvantages	
1.		1.	
2.		2.	
3.		3.	

3. Chemical Vapour (Chemiclave)

Advantages		Disadvantages	
1.		1.	
2.		2.	
3.		3.	

4. Ethylene Oxide

Advantages		Disadvantages	
1.		1.	
2.		2.	
3.		3.	

Student wrote appropriate answers: ☐ Yes ☐ No

Student needs improvement on: _____

_____

Signature of Teacher

DISINFECTION OF DENTAL UNIT:

The dental unit is cleaned by a disposable towel using a hospital disinfectant or other cleaning agents such as phenols, iodophors and chlorine containing compounds.

Clinical Surfaces

Clinical surfaces have a high potential for direct contamination from spray or splatter or by contact with gloved hands during or after treatment procedures. Such surfaces are:

- Dental Lamp
- Head Rest
- Chair Back
- X-Ray Tube

- Adjustable operating table

These surfaces need to be thoroughly cleaned with disinfectant solution and surface barriers can be used between patients for cross infection control. Surfaces barriers are usually coverings made of aluminum foil or special casing for specific structures of the dental unit.

House Keeping Surfaces

These surfaces do not make any contact with patients or devices in use during dental procedures. There is limited risk of disease transmission because they are not direct vectors of infection. Such surfaces are:

- Patient leg rest
- Instrument tables
- Instrument washing area / sink
- Doors
- Floors

These surfaces need to be thoroughly cleaned by physical removal of microorganisms and soil by wiping or scrubbing. This is critical before wiping thoroughly with disinfectant.

Practical Exercise 2:
Write down the following:

Clinical Surfaces
The different clinical surfaces in a dental clinic are:

1. _____
2. _____
3. _____
4. _____
5. _____

Disinfection of these surfaces is carried out by:

_____
_____
_____
_____

HOUSE KEEPING SURFACES

The different housekeeping surfaces in a dental clinic are:

1. _____
2. _____
3. _____
4. _____
5. _____

Disinfection of these surfaces is carried out by:

_____
_____
_____
_____
_____
_____
_____
_____

Student wrote the correct answers: ☐ Yes ☐ No

Student needs improvement on: _____

_____

Signature of Teacher

Block E

Module 2: Infection and Inflammation and Auxiliary Dental Materials

Waste Segregation and Disposal

Number of Hours: 2 hours

Learning Outcomes:

1. Describe the various types of waste in health care.
2. Categorize biomedical waste according to the color-coding system.
3. Discuss the management of mercury spill.

Materials Required:

1. Pen, pencil and paper
2. Whiteboard with marker
3. Color-coded waste disposal bins.

Date:

Introduction

Bio-dental waste management has emerged as a critical and important function in the entire ambit of providing quality health care. The first action in each patient area should be to segregate these waste components at the time of waste generation and keep them segregated until final disposal. This allows the bulk of the waste (general waste) to be disposed off via the municipal route and the smaller volumes of potentially infectious health care waste to be handled and disposed off in a more secure manner.

WASTE CATEGORIES:

The waste is categorized as follows and should be segregated accordingly:

1. **General Waste**

Separate into organic waste that can be composted and recycled such as stationary waste, cartons, boxes etc.

2. **Biomedical Waste**

Must be separated into the following:

- **Infectious Sharps**

Needle and syringes, reamers, wires, orthodontic bands, lancets, scalpels, broken glass etc.

- **Infectious Non- Sharp Wastes**

  Surgical specimens, extracted teeth etc.

- **Soiled Waste**

  Non-plastic items such as dressings, cotton, linen, bandages, etc. soiled with blood and/or body fluids

- **Solid Waste**

  Disposable non- incinerable plastic items such as used gloves, catheters, intravenous sets etc.

Colour Coding System

Waste should be placed into appropriate colour-coded and labelled containers. The containers should have an outer rigid part made of plastic or metal (with a lid and handles) and an inner lining of disposable polythene bags. Containers should be emptied every day, and internal lining be replaced. Colour-coded bags and bins are used for ease of segregation and ultimate disposal.

Waste Categories	Contents	Colour Coding
General waste	Stationery waste, cartons etc.	Green
Solid, non-sharp waste	Plastic tubing, catheters	Blue
Soiled waste	Cotton dressings, bed linen, bandages etc.	Red
Infected non- sharp waste	Used cotton, gauze, biopsy tissue, extracted tooth	Yellow
Waste sharps	Needles, lancets, reamers, Orthodontic bands etc.	White

Practical Exercise 1

Write down the following:

General Waste

_____

_____

Biomedical Waste

Must be separated into the following:

- **Infectious Sharps**

  _____

  _____

- **Infectious Non-Sharp Waste**

  _____

  _____

- **Soiled Waste**

  _____

  _____

- **Solid Waste**

  _____

  _____

Colouring Coding System

Colour-Coded bags and bins are used for ease of segregation and ultimate disposal

Waste Categories	Contents	Color coding
General waste		
Solid, non-sharp waste		
Soiled waste		
Infected non-sharp waste		
Waste sharps		

Student wrote the correct answers: ☐ Yes ☐ No

Student needs improvement on: _____

_____

Signature of Teacher

Block F Module 3: Pre-Clinical Dentistry I: Healing, Repair & Dental Restorations Practical List

1. **Atraumatic Restorative Treatment**
2. **Dental Indices**
3. **Fluorosis Index**
4. **School Dental Health Programmes and outreach programmes**

Block F

Module 3: Pre-Clinical Dentistry I: Healing, Repair & Dental Restorations

Atraumatic Restorative Treatment

Number of Hours: 2

Learning Outcomes:

1. Demonstrate the application of atraumatic restorative procedures in a community/ simulated environment.

Materials Required:

1. Pen, pencil and paper
2. Whiteboard with marker
3. ART kit.
4. Dental Models
5. Simulated patient

Date:

Introduction

Atraumatic restorative treatment (ART) is a procedure where carious cavities of teeth are excavated using hand instruments only and restored with tooth friendly and adhesive cement such as glass ionomer (type 9). This method of treatment initially developed with the idea of providing basic dental treatment to underprivileged people in less industrialized countries and neglected groups like refugees and disadvantaged communities. They usually do not approach dental health care for decay until teeth require their removal or pain is intolerable. These people are deprived of advanced oral health care as in the developed world. The main reasons for underlying circumstances are dearth of electricity and traditional restorative dental care requiring electrically driven equipment. On the other hand, ART technique enables restoration of carious teeth of people in areas where scarcity of electricity and / or where the community cannot afford costly dental equipment. "Teeth for life" concept is supported by ART technique by proving a specially designed tool to health workers. With this technique, tooth structure is conserved to a great extent by removing carious tooth part with hand instruments alone and restoring the cavity with tooth adhesive material such as glass ionomer cement (GIC). As GIC has fluoride releasing property, it prevents further tooth decay. ART concept has established a position in modem surgery in developed countries. This technique could be performed in a patient with multiple carious lesions and caries progression is stabilized before more definitive treatment is provided. This technique also gained its importance in treating anxious patients who are scared of drilling. This is mainly because of accomplishing restorative procedure by using hand instruments only. As the ART procedure could be carried out at home or hospital, for this reason it gained popularity in treating patients with medical or physical disability and it has

became easy. The principal objective of managing dentinal lesion operatively is to remove mainly completely demineralised tooth tissues. This is best achieved through using hand instruments or slowly rotating drills if accessibility is not available. In doing so, only soft, completely demineralised tissue is removed without any preconceived cavity design. A very large proportion of dentine lesions can be treated using the ART approach, which causes less discomfort than conventionally placed amalgam restorations. The anatomy of the carious lesion dictates the size and shape of the cavity preparation, followed by restoration with an adhesive filling material into the cleaned cavity preparation, over the margin and over the adjacent pit and fissures. This sealant restoration arrests caries activity that is present in dentine and enamel. If it is supported by good oral hygiene and other preventive measures, it increases the survival of the restoration.

Principles

1. Removing carious tooth tissue using hand instruments only.

2. Restoring the cavity with adhesive cement (glass ionomer)

Reasons for Using Hand Instruments

• With this technique, restorative care is made available to all population groups.

• This technique is said to be tooth friendly as this conserves sound tooth tissues and causes less trauma to the teeth by requiring minimal cavity preparation.

• Cost effective technique as this uses hand instruments in place of costly electrically driven dental equipment
• Use of local anesthesia for pain management is minimal there by reducing the psychological trauma to patients.

• Hand instruments are easy clean and sterilize after every use, thus making infection control simplified.

Reasons for Using Glass Ionomer Cement

• Glass ionomer cement has inherent property of chemically bond to both enamel and dentine, thereby need for the cutting of sound tooth structure for cavity preparation is reduced

• Leaching of fluoride from glass ion om er cement restoration also prevent and arrest the caries progression.

• Glass ionomer cement is considered to be biocompatible cement as this restoration does not cause any irritation to pulp and gingiva and has a co-efficient of thermal expansion similar to tooth structure.

• For these reasons, ART provides both preventive and curative treatment in one procedure.

Indications:

• Carried out only in the small and shallow cavities involving dentine that are accessible to hand instruments.
• Introducing oral care to very young children scared of drilling.
• Patients with extreme fear / anxiety.
• For home bound elderly and those living in nursing homes.
• For mentally or physically handicapped patients.
• In high-risk cases as an intermediate treatment to stabilize conditions.

Contraindications

• Presence of swelling (periapical abscess) or fistula (opening from periapical abscess region to the oral cavity) near the decayed tooth.

• Pulp exposure

• Chronic inflammation of the pulp with pain in the tooth.

• Frank carious cavity with inaccessible opening to hand instruments.

ART INSTRUMENTS

Instruments	Materials	Other
Mouth mirror	Cotton wool roll	Examination gloves
Explorer	Cotton wool pellet	Mouth mask
Pair of tweezers	Clean water	Operating light
Dental hatchet	Glass ionomer restorative material liquid, powder and measuring spoon	Operating bed/head rest extension
Spoon excavator, small	Dentine conditioner	Stool
Spoon excavator, medium	Petroleum jelly	Methylated alcohol
Spoon excavator, large	Wedge	Pressure cooker
Applier/carver	Plastic strip	Instrument forceps
Glass slab or paper mixing pad	Articulation paper	Soap and towel
Spatula		Sheet of textile Sharpening stone and oil

(Practical Exercises 1 and 2 on next page)

Practical Exercise 1

Draw all the instruments and materials required for ART below and do not draw the others category:

Student drew appropriate diagrams: ☐ Yes ☐ No

Student needs improvement on: _____

_____

Signature of Teacher

Practical Exercise 2

For each of the instruments and materials required for ART which you have drawn above, write down one of their functions.

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

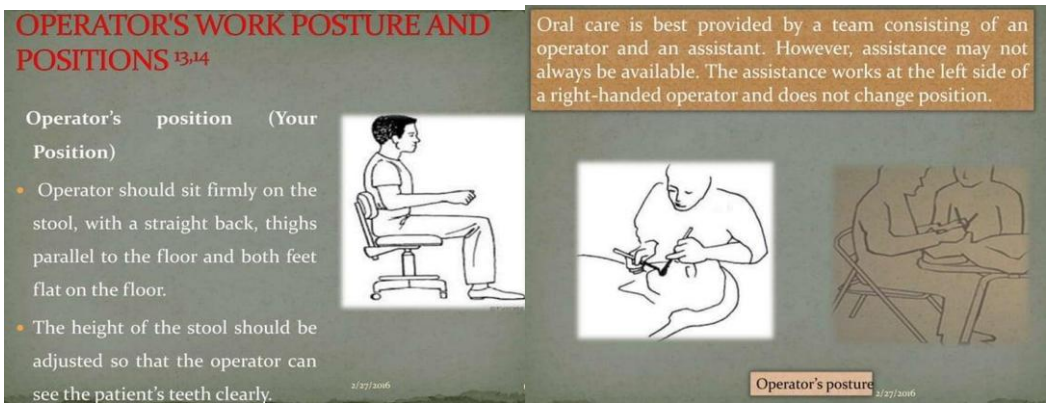
Student wrote the correct answers: ☐ Yes ☐ No

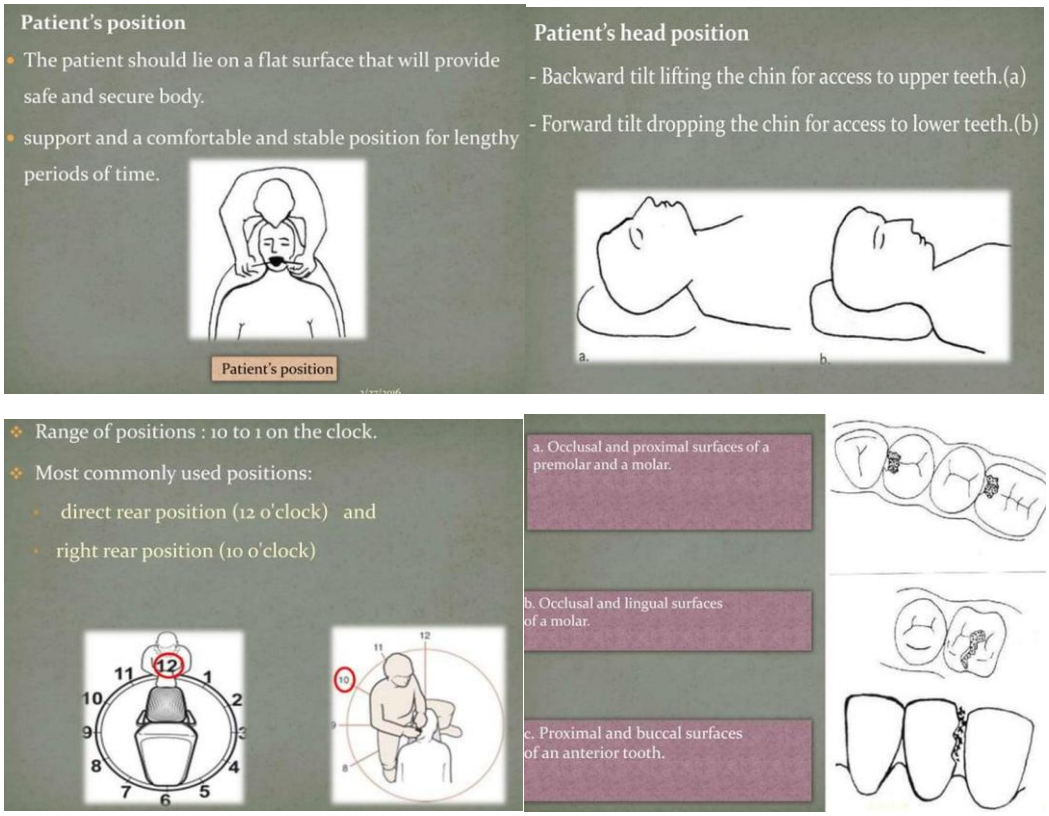
Student needs improvement on: _____

_____

Signature of Teacher

Operator Position and ART filling Procedure





Practical Exercise 3

1. After learning to demonstrate ART on a dental model and/or patient, write down the steps of the ART procedure for restoring one-surface cavities.

1. _____

_____

2. _____

_____

3. _____

_____

4. _____

_____

5. _____

_____

6. _____

_____

7. _____

_____

8. _____

_____

9. _____

_____

10. _____

_____

11. _____

_____

12. _____

_____

2. Write down the steps of the ART procedure for restoring one-surface cavities.

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

3. Write down the steps of the ART procedure for restoring anterior teeth cavities.

1. _____

2. _____

3. _____

4. _____

Student wrote the correct answers: ☐ Yes ☐ No

Student needs improvement on: _____

_____

Signature of Teacher

Block F

Module 3: Pre-Clinical Dentistry I: Healing, Repair & Dental Restorations

Dental Indices

Number of hours: 4

Learning Outcomes:

1. Demonstrate the measurement of different indices on study models
2. Discuss the merits and demerits of different oral disease indices

Materials Required:

1. Pen, pencil and paper
2. Whiteboard with marker
3. Dental Examination Instruments.
4. Dental Indices Models
5. Simulated patient

Date:

Index

A numerical value describing the relative status of a population on a graduated scale with definite upper and lower limits, which is designed to permit and facilitate comparison with other populations classified by the same criteria and methods.

Uses

1. Clinical trial
2. Epidemiologic survey

Indices covered in practicals:

1. Decayed, Missing and Filled Teeth for permanent and deciduous teeth (DMFT, dmft)
2. Decayed, Missing and Filled Surfaces for permanent and deciduous teeth (DMFS, dmfs)
3. Simplified Oral Hygiene Index (OHI-S)
4. Community Periodontal Index of Treatment Needs (CPITN)
5. Dean's Fluorosis Index (DFI)

Decayed, Missing and Filled Teeth for permanent and deciduous teeth (DMFT, dmft)

Introduction

The Decayed - Missing - Filled Index was introduced by Henry Klein, Carrole .E. Palmer & Knutson J.W in 1938. It has been used for more than 70 years as a key measure of caries experience in Dental Epidemiology. The DMFT index measures total lifetime caries experience.

Permanent dentition

The DMFT Index is applied to the permanent dentition and is expressed as the total number of teeth or surfaces that are decayed (D), missing (M) or filled (F) in an individual. When the index is applied to teeth specifically, it is called the DMFT index and scores per individual can range from 0 to 28 or 32, depending on whether the third molars are included in the scoring or not.

When the index is applied only to tooth surfaces (five per posterior tooth and four per anterior tooth), it is called the DMFS index, and scores per individual can range from 0 to 128 or 148, depending on whether the third molars are included in the scoring or not.

Deciduous dentition

When written in lowercase letters, the dmft index is a variation that is applied to the primary dentition. The caries experience for a child is expressed as the total number of teeth or surfaces that are decayed (d), missing (m) or filled (f)- The dmft index expresses the number of affected teeth in the primary dentition, with scores ranging from 0 to 20 for children. Because of the difficulty in distinguishing between teeth extracted due to caries and those that have naturally exfoliated, missing teeth may be ignored according to some protocols. In this case, it is called the df index.

Permanent	Description	Deciduous
D	Used to describe decayed teeth	**d**
M	Used to describe missing teeth due to caries	**m**
F	Used to describe teeth that have been previously filled	**f**
T	Denotes teeth	**t**

Criteria of DMFT

Identification of dental caries:

1. The lesion is clinically visible and obvious.

2. The explorer tip can penetrate deep into soft yielding material.

3. There is discoloration or loss of translucency typical of undermined or dematerialized enamel.

4. The explorer tip in a pit or fissure catches or resists removal after moderate to firm pressure on insertion and when there is softness at the base of the area.

Principles and rules in recording DMFT

1. No tooth must be counted more than once. It's either decayed, missing, filled or sound.

2. Decayed, Missing and Filled teeth should be recorded separately.

3. When counting the number of decayed teeth, it also includes those teeth which have restoration with recurrent decay.

4. Care must be taken to list as missing only those teeth which have been lost due to decay. Also included should be those teeth which are so badly decayed that they are indicated for extractions.

5. The following should not be counted as missing:

    a) Unerupted teeth.

    b) Missing teeth due to accident.

    c) Congenitally missing teeth.

    d) Teeth that have been extracted for orthodontic reasons.

6. A tooth may have several restorations, but it is counted as one tooth.

7. Deciduous teeth are not included in DMFT count.

8. A tooth is considered to be erupted when occlusal surface or incisal edge is totally exposed or can be exposed by gently reflecting the overlying gingival tissue with the mirror and explorer.

9. Generally, all 28 permanent teeth are examined. The teeth not included are:

    a) The 3rd molar

    b) Unerupted teeth

10. Congenitally missing and supernumerary teeth

    a) Teeth removed for reasons other than dental caries such as for orthodontic treatment or impaction

    b) Teeth restored for reasons other than dental caries such as trauma, cosmetic purposes or for use as a bridge abutment.

    c) Primary tooth retained with the permanent successor erupted. The permanent tooth is evaluated since a primary tooth is never included in this index.

WHO modification of DMFT index (1986)

1. All 3rd molars are included.

2. Temporary restorations are considered as 'D'.

3. Only carious cavities are considered as 'D'. The initial lesions (chalky spots, stained fissures etc.) are not considered as 'D'. The DMFT Index can be applied to denote the number of affected teeth (DMFT) or to measure the surface affected by dental caries (DMFS).

Limitations of DMFT index

1. DMFT values are not related to the number of teeth at risk.
2. DMFT index can be invalid in older adults because teeth can become lost for reasons other than caries.
3. DMFT index can be misleading in children whose teeth have been lost due to orthodontic reasons.
4. DMFT index can overestimate caries experience in teeth in which preventive fillings have been placed.
5. DMFT index is of little use in studies of root caries.

Examination method for DMFT (Permanent teeth only)

'D' Decayed	• It indicates the number of permanent teeth that are decayed. • In counting the number of decayed permanent teeth, remember that a tooth can only be counted once. • It cannot be counted as decayed and filled. • If it has been restored and caries can be described, count it as decayed. • Be sure the explorer falls into carious tooth substance and not just in a deep groove before counting occlusal caries.
'M' Missing	• Indicate the number of missing permanent teeth due to decay. • Those teeth which are so badly decayed that they are indicated for extraction are counted as missing. • When possible, history should be taken when it is suspected that teeth have been lost due to caries or for reasons other than caries.
F' Filled	• Indicate the numbers of permanent teeth that have been attacked by caries, due to which they have been restored to keep them in healthy condition in mouth. • A tooth may have several fillings, but it is counted as one tooth.

Practical Exercise 1

Record and calculate the DMFT index on the given model and/or on a simulated patient.

Practical Exercise 2

Record and calculate the dmft index on the given model and/or on a simulated patient.

DMFT Index

18	17	16	15	14	13	12	11	21	22	23	24	25	26	27	28
48	47	46	45	44	43	42	41	31	32	33	34	35	36	37	38

DT : MT : FT : DMFT :

dmft Index

55	54	53	52	51	61	62	63	64	65
85	84	83	82	81	71	72	73	74	75

dt: mt: ft: dmft:

Recording form for caries index

Individual DMFT	Total each component separately then add. i.e. D+M+F= DMFT
Percentage of teeth affected by dental caries	DMFT divided by total number of teeth examined, multiplied by 100. (D+M+F/ 28 or 32) x 100
Group average	Calculate DMFT of each individual of group Add all DMFTs and divide them by total number of subjects.

Student recording and calculated DMFT and dmft correctly: ☐ Yes ☐ No

Student needs improvement on: _____

_____

Signature of Teacher

Decayed, Missing and Filled Surfaces for permanent and deciduous teeth (DMFS, dmfs)

DMFS Index

DMFS index records the number of decayed, missing and filled surfaces of permanent teeth, providing a more sensitive measure of caries experience.

dmfs Index

dmfs index records the number of decayed, missing and filled surfaces of primary teeth. It expresses the number of affected surfaces in primary dentition (five per posterior tooth and four per anterior tooth), with a score range of 0 to 88 surfaces.

Procedure for DMFS / dmfs Recording

Tooth Surfaces Examined:

Posterior teeth: 5 surfaces (M, D, F, L, O)

Anterior teeth: 4 surfaces (M, D, F, L)

Each affected surface is recorded separately.

Practical Exercise 3

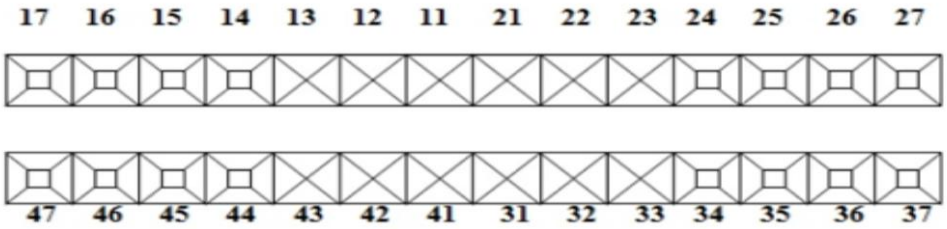
Record and calculate the DMFS index on the given model and/or on a simulated patient.

Practical Exercise 4

Record and calculate the dmfs index on the given model and/or on a simulated patient.

Recording Tables: DMFS / dmfs

Permanent Dentition (DMFS)



Total Decayed Surfaces = _____

Total Missing Surfaces = _____

Total Filled Surfaces = _____

DMFS Score = D + M + F = _____

Primary Dentition (dmfs)

Tooth No.	Mesial	Distal	Labial / Buccal	Lingual / Palatal	Occlusal	Tooth dmfs
55						
54						
53						
52						
51						
61						
62						
63						
64						
65						
85						
84						
83						
82						
81						
71						
72						
73						
74						
75						

Total Decayed Surfaces = _____

Total Missing Surfaces = _____

Total Filled Surfaces = _____

dmfs Score = d + m + f = _____

Student recording and calculated DMFS and dmfs correctly: ☐ Yes ☐ No

Student needs improvement on: _____

_____

Signature of Teacher

Simplified Oral Hygiene Index (OHI-S)

The Simplified Oral Hygiene Index (OHI-S) is a quantitative index used to assess oral cleanliness by estimating the amount of debris and calculus present on selected tooth surfaces.

Components of OHI-S: OHI-S consists of two components:

1. Simplified Debris Index (DI-S)
2. Simplified Calculus Index (CI-S)

Formula: OHI-S = DI-S + CI-S

Teeth and Surfaces Examined: Six specific teeth are examined, one from each sextant:

Sextant	Tooth Number	Surface Examined
Maxillary right posterior	16	Facial
Maxillary anterior	11	Facial
Maxillary left posterior	26	Facial
Mandibular left posterior	36	Lingual
Mandibular anterior	31	Facial
Mandibular right posterior	46	Lingual

Rules for calculation

1. Only fully erupted permanent teeth are scored.
2. Third molars and incompletely erupted teeth are not scored because of the wide variations in heights of clinical crowns.
3. The buccal and lingual debris scores are both taken on the tooth in a segment having the greatest surface area covered by debris.
4. The buccal and lingual calculus scores are both taken on the tooth in a segment having the greatest surface area covered by supragingival and subgingival calculus.
5. If the index tooth is missing, the next fully erupted tooth in that sextant is examined.

Procedure

1. Seat the patient comfortably and explain the procedure.
2. Examine only fully erupted permanent teeth.
3. Dry the teeth using cotton rolls or gauze.
4. Examine the selected tooth surfaces for debris using a dental explorer.
5. Record debris scores according to the criteria.
6. Examine the same surfaces for calculus both visually and using an explorer.
7. Record calculus scores.

Scoring Criteria

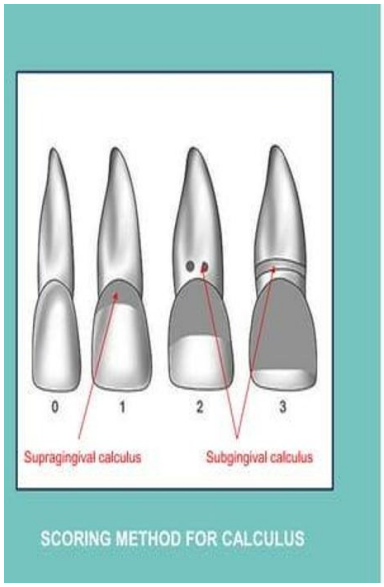
Simplified Debris Index (DI-S)

DEBRIS SCORE

SCORE	CRITERIA
0	No debris or stains present.
1	Soft debris covering not more than 1/3rd the tooth surface or presence of extrinsic stains without other debris regardless of the area covered.
2	Soft debris covering more than 1/3rd, but not more than 2/3rd of the exposed tooth surface.
3	Soft debris covering more than 2/3rd of the exposed tooth surface.

$$\text{Debris index(DI)} = \frac{\text{Total Debris Score}}{\text{No. of segments scored}}$$

Simplified Calculus Index (CI-S)



CALCULUS SCORE

SCORE	CRITERIA
0	No calculus present.
1	Supragingival calculus covering not more than 1/3rd of the exposed tooth surface.
2	Supragingival calculus covering more than 1/3rd but not more than 2/3rd of the exposed tooth surface or presence of individual flecks of subgingival calculus around the cervical portion of the tooth or both.
3	Supragingival calculus covering more than 2/3rd of the exposed tooth surface or a continuous heavy band of the subgingival calculus around the cervical portion of the tooth or both.

$$\text{Calculus Index (CI)} = \frac{\text{Total calculus score}}{\text{No. of segments scored}}$$

Practical Exercise 5

Record and calculate the OHI-S index on the given model and/or on a simulated patient.

Recording Table

Debris and Calculus Scores			
Tooth No.	**Surface**	**Debris Score**	**Calculus Score**
16	Facial		
11	Facial		
26	Facial		

36	Lingual		
31	Facial		
46	Lingual		
Total			

Calculations

DI-S = Total Debris Score ÷ Number of surfaces examined

CI-S = Total Calculus Score ÷ Number of surfaces examined

OHI-S = DI-S + CI-S = =

Interpretation of Scores

Interpretation of DI-S and CI-S

Score Range	Interpretation
0.0 – 0.6	Good
0.7 – 1.8	Fair
1.9 – 3.0	Poor

Interpretation of OHI-S

Score Range	Interpretation
0.0 – 1.2	Good oral hygiene
1.3 – 3.0	Fair oral hygiene
3.1 – 6.0	Poor oral hygiene

Result

Based on the calculated OHI-S score, the oral hygiene status of the patient is:

_____

Student recorded, calculated and interpreted OHI-S correctly: ☐ Yes ☐ No

Student needs improvement on: _____

_____

Signature of Teacher

Community Periodontal Index of Treatment Needs (CPITN)

The Community Periodontal Index of Treatment Needs (CPITN) is an epidemiological index designed to assess periodontal health by recording gingival bleeding, presence of calculus, and periodontal pocket depth, and to determine the type of periodontal treatment required.

Purpose and Uses of CPITN

1. To screen periodontal conditions in individuals and communities.
2. To estimate periodontal treatment needs.
3. To plan and monitor community periodontal health programs.
4. To provide a rapid and reproducible method for periodontal assessment.

Instrument Used: CPITN Probe

WHO–CPITN Probe Characteristics:

- Lightweight probe with a 0.5 mm ball tip.
- Black band between 3.5 mm and 5.5 mm from the tip.
- Additional markings at 8.5 mm and 11.5 mm.

Functions:

1. Measurement of periodontal pocket depth.
2. Detection of subgingival calculus.

Sextants and Teeth Selection

The mouth is divided into six sextants:

Sextant	Teeth Included
Upper right posterior	18–14
Upper anterior	13–23
Upper left posterior	24–28
Lower left posterior	38–34
Lower anterior	33–43
Lower right posterior	44–48

Rules:

1. A sextant is examined only if two or more functional teeth are present.
2. If only one or no teeth are present, the sextant is scored as X.
3. Third molars are excluded unless they function in place of second molars.

Index Teeth for Examination

Adults (≥20 years): 17/16, 11, 26/27, 36/37, 31, 46/47

Adolescents and young people (≤19 years): 16, 11, 26, 36, 31, 46

If index teeth are missing, remaining teeth in the sextant are examined.

Examination Procedure

1. Seat the patient comfortably and explain the procedure.
2. Examine each sextant systematically.
3. Insert the CPITN probe gently along the gingival sulcus, keeping it parallel to the long axis of the tooth.
4. Probe six sites per tooth (mesial, mid, and distal on both buccal and lingual surfaces).
5. Apply a probing force not exceeding 20 grams.
6. Record the highest score observed in each sextant.

CPITN Codes and Criteria

Code	Criteria
0	Healthy periodontium
1	Bleeding observed during or after probing
2	Calculus detected during probing, with or without bleeding
3	Pathological pocket 4–5 mm (gingival margin on black band)
4	Pathological pocket ≥6 mm (black band not visible)
X	Less than two teeth present in sextant

Practical Exercise 6

Record and calculate the CPITN index on the given model and/or on a simulated patient.

Recording Table

CPITN Recording Chart

Sextant	Teeth Examined	Code
UR Posterior		
Upper Anterior		
UL Posterior		
LL Posterior		
Lower Anterior		
LR Posterior		

Determination of Treatment Needs

CPITN Code	Treatment Need	Description
Code 0	TN-0	No treatment required
Code 1	TN-1	Oral hygiene instruction
Code 2	TN-2	Oral hygiene instruction + scaling and removal of plaque retentive factors
Code 3	TN-2	Scaling and root planing + oral hygiene instruction
Code 4	TN-3	Complex periodontal treatment including deep scaling and surgical procedures

Result

Based on CPITN examination, the periodontal treatment need of the patient is:

_____

Student recorded, calculated and interpreted CPITN correctly: ☐ Yes ☐ No

Student needs improvement on: _____

_____

Signature of Teacher

Block F

Module 3: Pre-Clinical Dentistry I: Healing, Repair & Dental Restorations

Fluorosis Index

Number of Hours: 2

Learning Outcomes:

1. Explain fluorosis Index.
2. Calculate dean's fluorosis index on the given model.

Materials Required:

1. Pen, pencil and paper
2. Whiteboard with marker
3. Dental Examination Instruments.
4. Dental Indices Models
5. Simulated patient

Date:

Dental Fluorosis

Dental fluorosis is a hypoplasia or hypomineralization of tooth enamel caused by chronic ingestion of excessive fluoride during the developmental stage of teeth. It is clinically manifested as dull, opaque white areas which may become mottled, discoloured or pitted. Indices are used to express clinical observations in numerical or categorical values for comparison and epidemiological assessment.

Definition of Index

An index is a numerical value describing the relative status of an individual or population on a graduated scale with definite upper and lower limits, designed to permit comparison using standardized criteria.

DEAN'S FLUOROSIS INDEX

Dean's Fluorosis Index was devised by Trendley H. Dean in 1934 to assess the presence and severity of mottled enamel. It is an ordinal scale based on the clinical appearance of the two most affected teeth.

Advantages

1. Simple and easy to apply
2. Useful in epidemiological surveys
3. Standardized and widely accepted

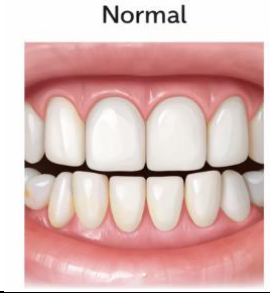
Limitations

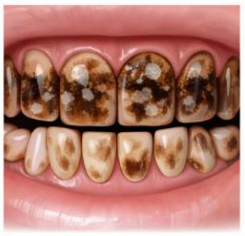
1. Does not provide information on distribution of fluorosis within dentition
2. Isolated defects may not be recorded
3. Categories may overlap

Method of Examination

- Examination is carried out in good natural light.
- The subject is seated facing the source of light.
- Mouth mirror and probe are used for examination.
- The two most affected teeth are selected for scoring.

Classification of Dean's Fluorosis Index

Category	Clinical Criteria
Normal	Enamel shows usual translucency with smooth, glossy, pale creamy white appearance. 
Questionable	Slight aberrations from normal translucency, ranging from a few white flecks to occasional white spots. 
Very Mild	Small opaque, paper white areas scattered irregularly; less than 25% of surface involved; no brown stain. 
Mild	White opaque areas involving less than 50% of the tooth surface; faint brown stains may be present.

	Mild 
Moderate	All enamel surfaces affected; surfaces subjected to attrition are definitely marked; brown stains frequently present. Moderate 
Moderately Severe	Marked enamel hypoplasia; pitting is more frequent and generally seen on all surfaces; brown stains more pronounced. Moderately Severe 
Severe	All enamel surfaces affected; discrete or confluent pitting; widespread brown to black stains; alteration in tooth form. Severe 

MODIFIED DEAN'S FLUOROSIS INDEX

Modified Dean's Fluorosis Index is a numerical modification of Dean's original classification. It assigns numerical scores to each category to facilitate calculation of the Community Fluorosis Index (CFI).

Classification of Modified Dean's Fluorosis Index

Score	Category	Clinical Criteria
0	Normal	Enamel shows usual translucency with smooth, glossy, pale creamy white colour. Normal 
0.5	Questionable	Slight aberrations from normal translucency, ranging from a few white flecks to occasional white spots. Questionable 
1	Very Mild	Small opaque, paper white areas scattered irregularly; less than 25% of surface involved; no brown stain. Very Mild 
2	Mild	White opaque areas involving less than 50% of the tooth surface; faint brown stains may be present. Mild 
3	Moderate	All enamel surfaces affected; surfaces subjected to attrition are definitely marked; brown stains frequently present.

		Moderate 
4	Severe	All enamel surfaces affected; discrete or confluent pitting; widespread brown to black stains; alteration in tooth form. Severe 

Procedure

1. Seat the subject comfortably facing the light source.
2. Examine all teeth using mouth mirror and probe.
3. Identify the two most affected teeth.
4. Assess enamel changes according to Dean's criteria.
5. Assign appropriate Dean's and Modified Dean's scores.
6. Record findings on the recording table.

Practical Exercise 1

Record all the information given below about Dean's Flourosis index using the given model and/or a simulated patient.

Recording Table

Tooth Number	Clinical Appearance	Dean's Category	Modified Dean's Score

Final Recording

Dean's Fluorosis Index Category: _____

Modified Dean's Fluorosis Index Score: _____

Interpretation

Based on both indices' findings, the subject is classified as having: _____

Student recorded, calculated & interpreted Dean's & Modified Dean's Fluorosis Index correctly: ☐ Yes ☐ No

Student needs improvement on: _____

_____

Signature of Teacher

Block F

Module 3: Pre-Clinical Dentistry I: Healing, Repair & Dental Restorations

School Dental Health Programmes and outreach programmes

Number of hours: 20

Learning Outcomes:

1. Define the concept of school health programs and describe their importance in community health (WHO initiative).
2. Explain the aims of school dental health and the role it plays in preventing oral diseases among children.
3. Discuss the importance of early detection and the prevention of dental diseases in the school setting.
4. Critically assess the challenges and limitations of implementing comprehensive dental care in schools
5. Develop effective communication skills tailored to interacting with children and their caregivers about oral health.
6. Propose strategies for integrating dental health education into existing school health curricula to enhance long-term dental care among children

Materials Required:

1. Pen, pencil and paper
2. Dental Examination Instruments
3. School Children patients during school visit

Date:

Practical Exercise 1

During your school visit start the examination of the child by following the School Dental Visit Questionnaire given below.

School Dental Visit Questionnaire (2nd Year BDS)

Instructions for Students:

This questionnaire is to be used during a school dental visit for the assessment of oral health status and related factors among school-going children. Complete Sections A–C by interview and observation. Complete Section D after clinical examination using mouth mirror and probe under natural light, following WHO criteria. According to the findings fill in Section F.

Section A: Identification Details

Name of School: _____

School Address / Area: _____

Date of Visit: ____ / ____ / _____

Examiner Name (Student): _____

Examiner Roll No.: _____

Child's Serial Number: _____

Section B: Socio-Demographic Information

Name of Child: _____

Age (in completed years): _____ years

Gender: ☐ Male ☐ Female

Class / Grade: _____

Type of School: ☐ Government ☐ Private

Area of Residence: ☐ Urban ☐ Rural

Section C: Oral Health Behaviour and History

1. How often do you brush your teeth?

☐ Twice daily ☐ Once Daily ☐ Other please specify: _____

2. What is the timing of your toothbrushing?

☐ Before Meals ☐ After Meals

3. What do you use to clean your teeth?

☐ Toothbrush & toothpaste ☐ Toothpowder ☐ Miswak ☐ Other: _____

4. If you use toothpaste, what type do you use?

☐ Fluoridated ☐ Non-fluoridated ☐ Don't know

5. Do you rinse your mouth after meals?

☐ Always ☐ Sometimes ☐ Never

6. How often do you consume sugary foods?

☐ Once daily ☐ More than once daily ☐ Occasionally ☐ Rarely

7. How often do you drink sugary beverages?

☐ Daily ☐ Weekly ☐ Occasionally ☐ Never

8. Have you ever visited a dentist before?

☐ Yes ☐ No

9. If yes, what was the 4eason for the last dental visit?

☐ Pain ☐ Check-up ☐ Tooth decay ☐ Gum problem ☐ Other: _____

10. Do you have pain or discomfort in your teeth at present?

☐ Yes ☐ No

Section D: Caries Experience Index (dmft / DMFT)

1. Dentition Type: ☐ Primary ☐ Permanent ☐ Mixed

2. Decayed, missing, filled teeth (DMFT) recording for permanent teeth Decayed, filled teeth (dmft) recording for primary teeth:

DMFT Index

18	17	16	15	14	13	12	11	21	22	23	24	25	26	27	28
48	47	46	45	44	43	42	41	31	32	33	34	35	36	37	38

DT : MT : FT : DMFT :

dmft Index

55	54	53	52	51	61	62	63	64	65
85	84	83	82	81	71	72	73	74	75

dt: mt: ft: dmft:

Section E: Oral Hygiene Status

Overall oral hygiene status: ☐ Good ☐ Fair ☐ Poor

Presence of visible plaque: ☐ Yes ☐ No

Gingival condition: ☐ Healthy ☐ Bleeding ☐ Inflamed

Part F: Treatment Priority & Recommendations (Based on your findings)

1. Urgency of Care:

☐ No obvious problem (Recall)

☐ Routine dental care needed (e.g., small caries, prophylaxis)

☐ Early dental care needed (e.g., large caries, mild pain)

☐ Urgent care needed (e.g., swelling, abscess, severe pain)

2. Specific Advice Given:

☐ Oral hygiene instructions (Brushing frequency and method, flossing frequency and method)

☐ Health education (Stop smoking and drugs)

☐ Diet counseling (Reduce sugar frequency)

☐ Fluoride application advised

☐ Referred to dentist for: _____

Student filled in the proforma correctly: ☐ Yes ☐ No

Student needs improvement on: _____

_____

Signature of Teacher

School Dental Visit Questionnaire (2nd Year BDS)

Instructions for Students:

This questionnaire is to be used during a school dental visit for the assessment of oral health status and related factors among school-going children. Complete Sections A–C by interview and observation. Complete Section D after clinical examination using mouth mirror and probe under natural light, following WHO criteria. According to the findings, fill in Section F.

Section A: Identification Details

Name of School: _____

School Address / Area: _____

Date of Visit: ____ / ____ / _____

Examiner Name (Student): _____

Examiner Roll No.: _____

Child's Serial Number: _____

Section B: Socio-Demographic Information

Name of Child: _____

Age (in completed years): _____ years

Gender: ☐ Male ☐ Female

Class / Grade: _____

Type of School: ☐ Government ☐ Private

Area of Residence: ☐ Urban ☐ Rural

Section C: Oral Health Behaviour and History

2. How often do you brush your teeth?

☐ Twice daily ☐ Once Daily ☐ Other please specify: _____

3. What is the timing of your toothbrushing?

☐ Before Meals ☐ After Meals

4. What do you use to clean your teeth?

☐ Toothbrush & toothpaste ☐ Toothpowder ☐ Miswak ☐ Other: _____

5. If you use toothpaste, what type do you use?

☐ Fluoridated ☐ Non-fluoridated ☐ Don't know

6. Do you rinse your mouth after meals?

☐ Always ☐ Sometimes ☐ Never

7. How often do you consume sugary foods?

☐ Once daily ☐ More than once daily ☐ Occasionally ☐ Rarely

8. How often do you drink sugary beverages?

☐ Daily ☐ Weekly ☐ Occasionally ☐ Never

9. Have you ever visited a dentist before?

☐ Yes ☐ No

10. If yes, what was the 4eason for the last dental visit?

☐ Pain ☐ Check-up ☐ Tooth decay ☐ Gum problem ☐ Other: _____

11. Do you have pain or discomfort in your teeth at present?

☐ Yes ☐ No

Section D: Caries Experience Index (dft / DMFT)

1. Dentition Type: ☐ Primary ☐ Permanent ☐ Mixed

2. Decayed, missing, filled teeth (DMFT) recording for permanent teeth Decayed, filled teeth (dft) recording for primary teeth:

DMFT Index

18	17	16	15	14	13	12	11	21	22	23	24	25	26	27	28
48	47	46	45	44	43	42	41	31	32	33	34	35	36	37	38

DT : MT : FT : DMFT :

dft Index

55	54	53	52	51	61	62	63	64	65
85	84	83	82	81	71	72	73	74	75

dt : ft : dft :

Section E: Oral Hygiene Status

Overall oral hygiene status: ☐ Good ☐ Fair ☐ Poor

Presence of visible plaque: ☐ Yes ☐ No

Gingival condition: ☐ Healthy ☐ Bleeding ☐ Inflamed

Part F: Treatment Priority & Recommendations (Based on your findings)

1. Urgency of Care:

☐ No obvious problem (Recall)

☐ Routine dental care needed (e.g., small caries, prophylaxis)

☐ Early dental care needed (e.g., large caries, mild pain)

☐ Urgent care needed (e.g., swelling, abscess, severe pain)

2. Specific Advice Given:

☐ Oral hygiene instructions (Brushing frequency and method, flossing frequency and method)

☐ Health education (Stop smoking and drugs)

☐ Diet counseling (Reduce sugar frequency)

☐ Fluoride application advised

☐ Referred to dentist for: _____

Student filled in the proforma correctly: ☐ Yes ☐ No

Student needs improvement on: _____

_____

Signature of Teacher

School Dental Visit Questionnaire (2nd Year BDS)

Instructions for Students:

This questionnaire is to be used during a school dental visit for the assessment of oral health status and related factors among school-going children. Complete Sections A–C by interview and observation. Complete Section D after clinical examination using mouth mirror and probe under natural light, following WHO criteria. According to the findings, fill in Section F.

Section A: Identification Details

Name of School: _____

School Address / Area: _____

Date of Visit: ____ / ____ / _____

Examiner Name (Student): _____

Examiner Roll No.: _____

Child's Serial Number: _____

Section B: Socio-Demographic Information

Name of Child: _____

Age (in completed years): _____ years

Gender: ☐ Male ☐ Female

Class / Grade: _____

Type of School: ☐ Government ☐ Private

Area of Residence: ☐ Urban ☐ Rural

Section C: Oral Health Behaviour and History

12. How often do you brush your teeth?

☐ Twice daily ☐ Once Daily ☐ Other please specify: _____

13. What is the timing of your toothbrushing?

☐ Before Meals ☐ After Meals

14. What do you use to clean your teeth?

☐ Toothbrush & toothpaste ☐ Toothpowder ☐ Miswak ☐ Other: _____

15. If you use toothpaste, what type do you use?

☐ Fluoridated ☐ Non-fluoridated ☐ Don't know

16. Do you rinse your mouth after meals?

☐ Always ☐ Sometimes ☐ Never

17. How often do you consume sugary foods?

☐ Once daily ☐ More than once daily ☐ Occasionally ☐ Rarely

18. How often do you drink sugary beverages?

☐ Daily ☐ Weekly ☐ Occasionally ☐ Never

19. Have you ever visited a dentist before?

☐ Yes ☐ No

20. If yes, what was the 4eason for the last dental visit?

☐ Pain ☐ Check-up ☐ Tooth decay ☐ Gum problem ☐ Other: _____

21. Do you have pain or discomfort in your teeth at present?

☐ Yes ☐ No

Section D: Caries Experience Index (dft / DMFT)

2. Dentition Type: ☐ Primary ☐ Permanent ☐ Mixed

2. Decayed, missing, filled teeth (DMFT) recording for permanent teeth Decayed, filled teeth (dft) recording for primary teeth:

DMFT Index

18	17	16	15	14	13	12	11	21	22	23	24	25	26	27	28
48	47	46	45	44	43	42	41	31	32	33	34	35	36	37	38

DT : MT : FT : DMFT :

dft Index

55	54	53	52	51	61	62	63	64	65
85	84	83	82	81	71	72	73	74	75

dt : ft : dft :

Section E: Oral Hygiene Status

Overall oral hygiene status: ☐ Good ☐ Fair ☐ Poor

Presence of visible plaque: ☐ Yes ☐ No

Gingival condition: ☐ Healthy ☐ Bleeding ☐ Inflamed

Part F: Treatment Priority & Recommendations (Based on your findings)

1. Urgency of Care:

☐ No obvious problem (Recall)

☐ Routine dental care needed (e.g., small caries, prophylaxis)

☐ Early dental care needed (e.g., large caries, mild pain)

☐ Urgent care needed (e.g., swelling, abscess, severe pain)

2. Specific Advice Given:

☐ Oral hygiene instructions (Brushing frequency and method, flossing frequency and method)

☐ Health education (Stop smoking and drugs)

☐ Diet counseling (Reduce sugar frequency)

☐ Fluoride application advised

☐ Referred to dentist for: _____

Student filled in the proforma correctly: ☐ Yes ☐ No

Student needs improvement on: _____

_____

Signature of Teacher

School Dental Visit Questionnaire (2nd Year BDS)

Instructions for Students:

This questionnaire is to be used during a school dental visit for the assessment of oral health status and related factors among school-going children. Complete Sections A–C by interview and observation. Complete Section D after clinical examination using mouth mirror and probe under natural light, following WHO criteria. According to the findings, fill in Section F.

Section A: Identification Details

Name of School: _____

School Address / Area: _____

Date of Visit: ____ / ____ / _____

Examiner Name (Student): _____

Examiner Roll No.: _____

Child's Serial Number: _____

Section B: Socio-Demographic Information

Name of Child: _____

Age (in completed years): _____ years

Gender: ☐ Male ☐ Female

Class / Grade: _____

Type of School: ☐ Government ☐ Private

Area of Residence: ☐ Urban ☐ Rural

Section C: Oral Health Behaviour and History

22. How often do you brush your teeth?

☐ Twice daily ☐ Once Daily ☐ Other please specify: _____

23. What is the timing of your toothbrushing?

☐ Before Meals ☐ After Meals

24. What do you use to clean your teeth?

☐ Toothbrush & toothpaste ☐ Toothpowder ☐ Miswak ☐ Other: _____

25. If you use toothpaste, what type do you use?

☐ Fluoridated ☐ Non-fluoridated ☐ Don't know

26. Do you rinse your mouth after meals?

☐ Always ☐ Sometimes ☐ Never

27. How often do you consume sugary foods?

☐ Once daily ☐ More than once daily ☐ Occasionally ☐ Rarely

28. How often do you drink sugary beverages?

☐ Daily ☐ Weekly ☐ Occasionally ☐ Never

29. Have you ever visited a dentist before?

☐ Yes ☐ No

30. If yes, what was the 4eason for the last dental visit?

☐ Pain ☐ Check-up ☐ Tooth decay ☐ Gum problem ☐ Other: _____

31. Do you have pain or discomfort in your teeth at present?

☐ Yes ☐ No

Section D: Caries Experience Index (dft / DMFT)

3. Dentition Type: ☐ Primary ☐ Permanent ☐ Mixed

2. Decayed, missing, filled teeth (DMFT) recording for permanent teeth Decayed, filled teeth (dft) recording for primary teeth:

DMFT Index

18	17	16	15	14	13	12	11	21	22	23	24	25	26	27	28
48	47	46	45	44	43	42	41	31	32	33	34	35	36	37	38

DT : MT : FT : DMFT :

dft Index

55	54	53	52	51	61	62	63	64	65
85	84	83	82	81	71	72	73	74	75

dt : ft : dft :

Section E: Oral Hygiene Status

Overall oral hygiene status: ☐ Good ☐ Fair ☐ Poor

Presence of visible plaque: ☐ Yes ☐ No

Gingival condition: ☐ Healthy ☐ Bleeding ☐ Inflamed

Part F: Treatment Priority & Recommendations (Based on your findings)

1. Urgency of Care:

☐ No obvious problem (Recall)

☐ Routine dental care needed (e.g., small caries, prophylaxis)

☐ Early dental care needed (e.g., large caries, mild pain)

☐ Urgent care needed (e.g., swelling, abscess, severe pain)

2. Specific Advice Given:

☐ Oral hygiene instructions (Brushing frequency and method, flossing frequency and method)

☐ Health education (Stop smoking and drugs)

☐ Diet counseling (Reduce sugar frequency)

☐ Fluoride application advised

☐ Referred to dentist for: _____

Student filled in the proforma correctly: ☐ Yes ☐ No

Student needs improvement on: _____

_____

Signature of Teacher

School Dental Visit Questionnaire (2nd Year BDS)

Instructions for Students:

This questionnaire is to be used during a school dental visit for the assessment of oral health status and related factors among school-going children. Complete Sections A–C by interview and observation. Complete Section D after clinical examination using mouth mirror and probe under natural light, following WHO criteria. According to the findings, fill in Section F.

Section A: Identification Details

Name of School: _____

School Address / Area: _____

Date of Visit: ____ / ____ / _____

Examiner Name (Student): _____

Examiner Roll No.: _____

Child's Serial Number: _____

Section B: Socio-Demographic Information

Name of Child: _____

Age (in completed years): _____ years

Gender: ☐ Male ☐ Female

Class / Grade: _____

Type of School: ☐ Government ☐ Private

Area of Residence: ☐ Urban ☐ Rural

Section C: Oral Health Behaviour and History

32. How often do you brush your teeth?

☐ Twice daily ☐ Once Daily ☐ Other please specify: _____

33. What is the timing of your toothbrushing?

☐ Before Meals ☐ After Meals

34. What do you use to clean your teeth?

☐ Toothbrush & toothpaste ☐ Toothpowder ☐ Miswak ☐ Other: _____

35. If you use toothpaste, what type do you use?

☐ Fluoridated ☐ Non-fluoridated ☐ Don't know

36. Do you rinse your mouth after meals?

☐ Always ☐ Sometimes ☐ Never

37. How often do you consume sugary foods?

☐ Once daily ☐ More than once daily ☐ Occasionally ☐ Rarely

38. How often do you drink sugary beverages?

☐ Daily ☐ Weekly ☐ Occasionally ☐ Never

39. Have you ever visited a dentist before?

☐ Yes ☐ No

40. If yes, what was the 4eason for the last dental visit?

☐ Pain ☐ Check-up ☐ Tooth decay ☐ Gum problem ☐ Other: _____

41. Do you have pain or discomfort in your teeth at present?

☐ Yes ☐ No

Section D: Caries Experience Index (dft / DMFT)

4. Dentition Type: ☐ Primary ☐ Permanent ☐ Mixed

2. Decayed, missing, filled teeth (DMFT) recording for permanent teeth Decayed, filled teeth (dft) recording for primary teeth:

DMFT Index

18	17	16	15	14	13	12	11	21	22	23	24	25	26	27	28
48	47	46	45	44	43	42	41	31	32	33	34	35	36	37	38

DT : MT : FT : DMFT :

dft Index

55	54	53	52	51	61	62	63	64	65
85	84	83	82	81	71	72	73	74	75

dt : ft : dft :

Section E: Oral Hygiene Status

Overall oral hygiene status: ☐ Good ☐ Fair ☐ Poor

Presence of visible plaque: ☐ Yes ☐ No

Gingival condition: ☐ Healthy ☐ Bleeding ☐ Inflamed

Part F: Treatment Priority & Recommendations (Based on your findings)

1. Urgency of Care:

☐ No obvious problem (Recall)

☐ Routine dental care needed (e.g., small caries, prophylaxis)

☐ Early dental care needed (e.g., large caries, mild pain)

☐ Urgent care needed (e.g., swelling, abscess, severe pain)

2. Specific Advice Given:

☐ Oral hygiene instructions (Brushing frequency and method, flossing frequency and method)

☐ Health education (Stop smoking and drugs)

☐ Diet counseling (Reduce sugar frequency)

☐ Fluoride application advised

☐ Referred to dentist for: _____

Student filled in the proforma correctly: ☐ Yes ☐ No

Student needs improvement on: _____

_____

Signature of Teacher

School Dental Visit Questionnaire (2nd Year BDS)

Instructions for Students:

This questionnaire is to be used during a school dental visit for the assessment of oral health status and related factors among school-going children. Complete Sections A–C by interview and observation. Complete Section D after clinical examination using mouth mirror and probe under natural light, following WHO criteria. According to the findings, fill in Section F.

Section A: Identification Details

Name of School: _____

School Address / Area: _____

Date of Visit: ____ / ____ / _____

Examiner Name (Student): _____

Examiner Roll No.: _____

Child's Serial Number: _____

Section B: Socio-Demographic Information

Name of Child: _____

Age (in completed years): _____ years

Gender: ☐ Male ☐ Female

Class / Grade: _____

Type of School: ☐ Government ☐ Private

Area of Residence: ☐ Urban ☐ Rural

Section C: Oral Health Behaviour and History

42. How often do you brush your teeth?

☐ Twice daily ☐ Once Daily ☐ Other please specify: _____

43. What is the timing of your toothbrushing?

☐ Before Meals ☐ After Meals

44. What do you use to clean your teeth?

☐ Toothbrush & toothpaste ☐ Toothpowder ☐ Miswak ☐ Other: _____

45. If you use toothpaste, what type do you use?

☐ Fluoridated ☐ Non-fluoridated ☐ Don't know

46. Do you rinse your mouth after meals?

☐ Always ☐ Sometimes ☐ Never

47. How often do you consume sugary foods?

☐ Once daily ☐ More than once daily ☐ Occasionally ☐ Rarely

48. How often do you drink sugary beverages?

☐ Daily ☐ Weekly ☐ Occasionally ☐ Never

49. Have you ever visited a dentist before?

☐ Yes ☐ No

50. If yes, what was the 4eason for the last dental visit?

☐ Pain ☐ Check-up ☐ Tooth decay ☐ Gum problem ☐ Other: _____

51. Do you have pain or discomfort in your teeth at present?

☐ Yes ☐ No

Section D: Caries Experience Index (dft / DMFT)

5. Dentition Type: ☐ Primary ☐ Permanent ☐ Mixed

2. Decayed, missing, filled teeth (DMFT) recording for permanent teeth Decayed, filled teeth (dft) recording for primary teeth:

DMFT Index

18	17	16	15	14	13	12	11	21	22	23	24	25	26	27	28
48	47	46	45	44	43	42	41	31	32	33	34	35	36	37	38

DT : MT : FT : DMFT :

dft Index

55	54	53	52	51	61	62	63	64	65
85	84	83	82	81	71	72	73	74	75

dt : ft : dft :

Section E: Oral Hygiene Status

Overall oral hygiene status: ☐ Good ☐ Fair ☐ Poor

Presence of visible plaque: ☐ Yes ☐ No

Gingival condition: ☐ Healthy ☐ Bleeding ☐ Inflamed

Part F: Treatment Priority & Recommendations (Based on your findings)

1. Urgency of Care:

☐ No obvious problem (Recall)

☐ Routine dental care needed (e.g., small caries, prophylaxis)

☐ Early dental care needed (e.g., large caries, mild pain)

☐ Urgent care needed (e.g., swelling, abscess, severe pain)

2. Specific Advice Given:

☐ Oral hygiene instructions (Brushing frequency and method, flossing frequency and method)

☐ Health education (Stop smoking and drugs)

☐ Diet counseling (Reduce sugar frequency)

☐ Fluoride application advised

☐ Referred to dentist for: _____

Student filled in the proforma correctly: ☐ Yes ☐ No

Student needs improvement on: _____

_____

Signature of Teacher

School Dental Visit Questionnaire (2nd Year BDS)

Instructions for Students:

This questionnaire is to be used during a school dental visit for the assessment of oral health status and related factors among school-going children. Complete Sections A–C by interview and observation. Complete Section D after clinical examination using mouth mirror and probe under natural light, following WHO criteria. According to the findings, fill in Section F.

Section A: Identification Details

Name of School: _____

School Address / Area: _____

Date of Visit: ____ / ____ / _____

Examiner Name (Student): _____

Examiner Roll No.: _____

Child's Serial Number: _____

Section B: Socio-Demographic Information

Name of Child: _____

Age (in completed years): _____ years

Gender: ☐ Male ☐ Female

Class / Grade: _____

Type of School: ☐ Government ☐ Private

Area of Residence: ☐ Urban ☐ Rural

Section C: Oral Health Behaviour and History

52. How often do you brush your teeth?

☐ Twice daily ☐ Once Daily ☐ Other please specify: _____

53. What is the timing of your toothbrushing?

☐ Before Meals ☐ After Meals

54. What do you use to clean your teeth?

☐ Toothbrush & toothpaste ☐ Toothpowder ☐ Miswak ☐ Other: _____

55. If you use toothpaste, what type do you use?

☐ Fluoridated ☐ Non-fluoridated ☐ Don't know

56. Do you rinse your mouth after meals?

☐ Always ☐ Sometimes ☐ Never

57. How often do you consume sugary foods?

☐ Once daily ☐ More than once daily ☐ Occasionally ☐ Rarely

58. How often do you drink sugary beverages?

☐ Daily ☐ Weekly ☐ Occasionally ☐ Never

59. Have you ever visited a dentist before?

☐ Yes ☐ No

60. If yes, what was the 4eason for the last dental visit?

☐ Pain ☐ Check-up ☐ Tooth decay ☐ Gum problem ☐ Other: _____

61. Do you have pain or discomfort in your teeth at present?

☐ Yes ☐ No

Section D: Caries Experience Index (dft / DMFT)

6. Dentition Type: ☐ Primary ☐ Permanent ☐ Mixed

2. Decayed, missing, filled teeth (DMFT) recording for permanent teeth Decayed, filled teeth (dft) recording for primary teeth:

DMFT Index

18	17	16	15	14	13	12	11	21	22	23	24	25	26	27	28
48	47	46	45	44	43	42	41	31	32	33	34	35	36	37	38

DT : MT : FT : DMFT :

dft Index

55	54	53	52	51	61	62	63	64	65
85	84	83	82	81	71	72	73	74	75

dt : ft : dft :

Section E: Oral Hygiene Status

Overall oral hygiene status: ☐ Good ☐ Fair ☐ Poor

Presence of visible plaque: ☐ Yes ☐ No

Gingival condition: ☐ Healthy ☐ Bleeding ☐ Inflamed

Part F: Treatment Priority & Recommendations (Based on your findings)

1. Urgency of Care:

☐ No obvious problem (Recall)

☐ Routine dental care needed (e.g., small caries, prophylaxis)

☐ Early dental care needed (e.g., large caries, mild pain)

☐ Urgent care needed (e.g., swelling, abscess, severe pain)

2. Specific Advice Given:

☐ Oral hygiene instructions (Brushing frequency and method, flossing frequency and method)

☐ Health education (Stop smoking and drugs)

☐ Diet counseling (Reduce sugar frequency)

☐ Fluoride application advised

☐ Referred to dentist for: _____

Student filled in the proforma correctly: ☐ Yes ☐ No

Student needs improvement on: _____

_____

Signature of Teacher

School Dental Visit Questionnaire (2nd Year BDS)

Instructions for Students:

This questionnaire is to be used during a school dental visit for the assessment of oral health status and related factors among school-going children. Complete Sections A–C by interview and observation. Complete Section D after clinical examination using mouth mirror and probe under natural light, following WHO criteria. According to the findings, fill in Section F.

Section A: Identification Details

Name of School: _____

School Address / Area: _____

Date of Visit: ____ / ____ / _____

Examiner Name (Student): _____

Examiner Roll No.: _____

Child's Serial Number: _____

Section B: Socio-Demographic Information

Name of Child: _____

Age (in completed years): _____ years

Gender: ☐ Male ☐ Female

Class / Grade: _____

Type of School: ☐ Government ☐ Private

Area of Residence: ☐ Urban ☐ Rural

Section C: Oral Health Behaviour and History

62. How often do you brush your teeth?

☐ Twice daily ☐ Once Daily ☐ Other please specify: _____

63. What is the timing of your toothbrushing?

☐ Before Meals ☐ After Meals

64. What do you use to clean your teeth?

☐ Toothbrush & toothpaste ☐ Toothpowder ☐ Miswak ☐ Other: _____

65. If you use toothpaste, what type do you use?

☐ Fluoridated ☐ Non-fluoridated ☐ Don't know

66. Do you rinse your mouth after meals?

☐ Always ☐ Sometimes ☐ Never

67. How often do you consume sugary foods?

☐ Once daily ☐ More than once daily ☐ Occasionally ☐ Rarely

68. How often do you drink sugary beverages?

☐ Daily ☐ Weekly ☐ Occasionally ☐ Never

69. Have you ever visited a dentist before?

☐ Yes ☐ No

70. If yes, what was the 4eason for the last dental visit?

☐ Pain ☐ Check-up ☐ Tooth decay ☐ Gum problem ☐ Other: _____

71. Do you have pain or discomfort in your teeth at present?

☐ Yes ☐ No

Section D: Caries Experience Index (dft / DMFT)

7. Dentition Type: ☐ Primary ☐ Permanent ☐ Mixed

2. Decayed, missing, filled teeth (DMFT) recording for permanent teeth Decayed, filled teeth (dft) recording for primary teeth:

DMFT Index

18	17	16	15	14	13	12	11	21	22	23	24	25	26	27	28
48	47	46	45	44	43	42	41	31	32	33	34	35	36	37	38

DT : MT : FT : DMFT :

dft Index

55	54	53	52	51	61	62	63	64	65
85	84	83	82	81	71	72	73	74	75

dt : ft : dft :

Section E: Oral Hygiene Status

Overall oral hygiene status: ☐ Good ☐ Fair ☐ Poor

Presence of visible plaque: ☐ Yes ☐ No

Gingival condition: ☐ Healthy ☐ Bleeding ☐ Inflamed

Part F: Treatment Priority & Recommendations (Based on your findings)

1. Urgency of Care:

☐ No obvious problem (Recall)

☐ Routine dental care needed (e.g., small caries, prophylaxis)

☐ Early dental care needed (e.g., large caries, mild pain)

☐ Urgent care needed (e.g., swelling, abscess, severe pain)

2. Specific Advice Given:

☐ Oral hygiene instructions (Brushing frequency and method, flossing frequency and method)

☐ Health education (Stop smoking and drugs)

☐ Diet counseling (Reduce sugar frequency)

☐ Fluoride application advised

☐ Referred to dentist for: _____

Student filled in the proforma correctly: ☐ Yes ☐ No

Student needs improvement on: _____

_____

Signature of Teacher

School Dental Visit Questionnaire (2nd Year BDS)

Instructions for Students:

This questionnaire is to be used during a school dental visit for the assessment of oral health status and related factors among school-going children. Complete Sections A–C by interview and observation. Complete Section D after clinical examination using mouth mirror and probe under natural light, following WHO criteria. According to the findings, fill in Section F.

Section A: Identification Details

Name of School: _____

School Address / Area: _____

Date of Visit: ____ / ____ / _____

Examiner Name (Student): _____

Examiner Roll No.: _____

Child's Serial Number: _____

Section B: Socio-Demographic Information

Name of Child: _____

Age (in completed years): _____ years

Gender: ☐ Male ☐ Female

Class / Grade: _____

Type of School: ☐ Government ☐ Private

Area of Residence: ☐ Urban ☐ Rural

Section C: Oral Health Behaviour and History

72. How often do you brush your teeth?

☐ Twice daily ☐ Once Daily ☐ Other please specify: _____

73. What is the timing of your toothbrushing?

☐ Before Meals ☐ After Meals

74. What do you use to clean your teeth?

☐ Toothbrush & toothpaste ☐ Toothpowder ☐ Miswak ☐ Other: _____

75. If you use toothpaste, what type do you use?

☐ Fluoridated ☐ Non-fluoridated ☐ Don't know

76. Do you rinse your mouth after meals?

☐ Always ☐ Sometimes ☐ Never

77. How often do you consume sugary foods?

☐ Once daily ☐ More than once daily ☐ Occasionally ☐ Rarely

78. How often do you drink sugary beverages?

☐ Daily ☐ Weekly ☐ Occasionally ☐ Never

79. Have you ever visited a dentist before?

☐ Yes ☐ No

80. If yes, what was the 4eason for the last dental visit?

☐ Pain ☐ Check-up ☐ Tooth decay ☐ Gum problem ☐ Other: _____

81. Do you have pain or discomfort in your teeth at present?

☐ Yes ☐ No

Section D: Caries Experience Index (dft / DMFT)

8. Dentition Type: ☐ Primary ☐ Permanent ☐ Mixed

2. Decayed, missing, filled teeth (DMFT) recording for permanent teeth Decayed, filled teeth (dft) recording for primary teeth:

DMFT Index

18	17	16	15	14	13	12	11	21	22	23	24	25	26	27	28
48	47	46	45	44	43	42	41	31	32	33	34	35	36	37	38

DT : MT : FT : DMFT :

dft Index

55	54	53	52	51	61	62	63	64	65
85	84	83	82	81	71	72	73	74	75

dt : ft : dft :

Section E: Oral Hygiene Status

Overall oral hygiene status: ☐ Good ☐ Fair ☐ Poor

Presence of visible plaque: ☐ Yes ☐ No

Gingival condition: ☐ Healthy ☐ Bleeding ☐ Inflamed

Part F: Treatment Priority & Recommendations (Based on your findings)

1. Urgency of Care:

☐ No obvious problem (Recall)

☐ Routine dental care needed (e.g., small caries, prophylaxis)

☐ Early dental care needed (e.g., large caries, mild pain)

☐ Urgent care needed (e.g., swelling, abscess, severe pain)

2. Specific Advice Given:

☐ Oral hygiene instructions (Brushing frequency and method, flossing frequency and method)

☐ Health education (Stop smoking and drugs)

☐ Diet counseling (Reduce sugar frequency)

☐ Fluoride application advised

☐ Referred to dentist for: _____

Student filled in the proforma correctly: ☐ Yes ☐ No

Student needs improvement on: _____

_____

Signature of Teacher

School Dental Visit Questionnaire (2nd Year BDS)

Instructions for Students:

This questionnaire is to be used during a school dental visit for the assessment of oral health status and related factors among school-going children. Complete Sections A–C by interview and observation. Complete Section D after clinical examination using mouth mirror and probe under natural light, following WHO criteria. According to the findings, fill in Section F.

Section A: Identification Details

Name of School: _____

School Address / Area: _____

Date of Visit: ____ / ____ / _____

Examiner Name (Student): _____

Examiner Roll No.: _____

Child's Serial Number: _____

Section B: Socio-Demographic Information

Name of Child: _____

Age (in completed years): _____ years

Gender: ☐ Male ☐ Female

Class / Grade: _____

Type of School: ☐ Government ☐ Private

Area of Residence: ☐ Urban ☐ Rural

Section C: Oral Health Behaviour and History

82. How often do you brush your teeth?

☐ Twice daily ☐ Once Daily ☐ Other please specify: _____

83. What is the timing of your toothbrushing?

☐ Before Meals ☐ After Meals

84. What do you use to clean your teeth?

☐ Toothbrush & toothpaste ☐ Toothpowder ☐ Miswak ☐ Other: _____

85. If you use toothpaste, what type do you use?

☐ Fluoridated ☐ Non-fluoridated ☐ Don't know

86. Do you rinse your mouth after meals?

☐ Always ☐ Sometimes ☐ Never

87. How often do you consume sugary foods?

☐ Once daily ☐ More than once daily ☐ Occasionally ☐ Rarely

88. How often do you drink sugary beverages?

☐ Daily ☐ Weekly ☐ Occasionally ☐ Never

89. Have you ever visited a dentist before?

☐ Yes ☐ No

90. If yes, what was the 4eason for the last dental visit?

☐ Pain ☐ Check-up ☐ Tooth decay ☐ Gum problem ☐ Other: _____

91. Do you have pain or discomfort in your teeth at present?

☐ Yes ☐ No

Section D: Caries Experience Index (dft / DMFT)

9. Dentition Type: ☐ Primary ☐ Permanent ☐ Mixed

2. Decayed, missing, filled teeth (DMFT) recording for permanent teeth Decayed, filled teeth (dft) recording for primary teeth:

DMFT Index

18	17	16	15	14	13	12	11	21	22	23	24	25	26	27	28
48	47	46	45	44	43	42	41	31	32	33	34	35	36	37	38

DT : MT : FT : DMFT :

dft Index

55	54	53	52	51	61	62	63	64	65
85	84	83	82	81	71	72	73	74	75

dt : ft : dft :

Section E: Oral Hygiene Status

Overall oral hygiene status: ☐ Good ☐ Fair ☐ Poor

Presence of visible plaque: ☐ Yes ☐ No

Gingival condition: ☐ Healthy ☐ Bleeding ☐ Inflamed

Part F: Treatment Priority & Recommendations (Based on your findings)

1. Urgency of Care:

☐ No obvious problem (Recall)

☐ Routine dental care needed (e.g., small caries, prophylaxis)

☐ Early dental care needed (e.g., large caries, mild pain)

☐ Urgent care needed (e.g., swelling, abscess, severe pain)

2. Specific Advice Given:

☐ Oral hygiene instructions (Brushing frequency and method, flossing frequency and method)

☐ Health education (Stop smoking and drugs)

☐ Diet counseling (Reduce sugar frequency)

☐ Fluoride application advised

☐ Referred to dentist for: _____

Student filled in the proforma correctly: ☐ Yes ☐ No

Student needs improvement on: _____

_____

Signature of Teacher

Block G Module 4: Pre-Clinical Dentistry II: Neoplasia & Dental Rehabilitation Practical List

1. Dietary counseling in a dental care setting

Block G

Module 4: Pre-Clinical Dentistry II: Neoplasia & Dental Rehabilitation

Dietary counseling in a dental care setting

Number of Hours: 2

Learning Outcomes:

1. Assess patient's dietary habits and identify potential oral health risks.
2. Provide personalized dietary advice to patient's specific needs and oral health status.
3. Apply oral health education principles to provide comprehensive dietary counseling.
4. Calculate and interpret Dental Health Score from patient's food diary.

Date:

INTRODUCTION

Oral health is an integral part of general health & is achieved by eating a balanced diet. So, patients are informed about the importance of good dentition. So, guidance in the art of food planning & food preparation & food services is provided. It assists a person to adjust food consumption to his or her health needs.

Nutrition: Science of food and its relationships to health. It is concerned primarily with the part played by the nutrients in body growth, development and maintenance.

Food: Anything that is eaten, drunk or absorbed for maintenance of life, growth and repair of the tissues.

Diet: Total oral intake of a substance that provides nourishment and energy.

Balanced Diet: It is one which contains varieties of foods in such quantities and proportions that the need for energy, amino acids, vitamins, fats, carbohydrates and other nutrients is adequately met for maintaining health, vitality and general well-being and makes provision for a short duration of leanness.

DIET COUNSELLING

Diet counselling involves giving advice on food selection based on the individual's reasons for liking or not liking certain foods. Counselling requires obtaining information as to why, where, when, and what specific foods (e.g. sweets) are eaten, how frequently, and what feelings are experienced. The objectivity, personalization of the diet, and the time spent on counselling are rewarded both financially and by the satisfaction of performing a usual health care and preventive dentistry service.

Minimal Requirements for a Successful Dietary Counselling Service include:

1. The patient and not the counsellor should bear the responsibility for accomplishing the dietary change.
2. Enrolling active patient involvement in planning, implementing, and evaluating the diet before and after counselling
3. Insisting on a series of follow-up visits to tailor the diet to the patient's needs and likes, and to avoid, if possible, dislikes without jeopardizing the dental-oral health status.

Diet counselling could be directive or non-directive. In the directive counselling, the role of the patient is passive,

and the decisions are made by the counsellor for the patient. In the non-directive counselling, the counsellor's role is merely to aid the patient in clarifying and understanding his or her own final decision as to the type of action that should be taken. The non-directive counselling approach is recommended. Diet counselling is tailor-made based on needs of individual patients on a one-on-one basis. Dietary advice is a set of general instructions given to people at large. Dentist counsels via face-to-face interview via eye contact, tone of voice, facial expression & gestures conveying sincerity, enthusiasm & empathy. Modified diet should not deviate too much from regular diet & adapted to patient's needs & daily routine lifestyle. Counselling is done in a different room not in dental chair. Qualities for counselors are patient, sound knowledge of nutrition & health & good communication skills. Maximum patient acceptance and cooperation required for it with him or her making their own final decision about diet. Community based nutritional programs like the school lunch program and midday meal programs can be launched to improve nutritional status of community

Systematic, logical approach for counselling is:

S-O-A-P (Subjective, Objective, Assessment, Plan):

S-Subjective: What does the patient report? Depicts the need for counselling, reason for consuming type of diet, what is being consumed.

O-Objective: What does the clinician observe? Depicts Clinical examination, role of diet in oral health and prevention

A-Assessment: Clinicians' evaluation based on subjective and objective findings. Depicts food/diet adequacy, cariogenic potential of diet, and diagnosis.

P-Plan: How to go about treatment for patient based on evaluation/diagnosis done? Depicts solution, summary and closure, follow-up and revaluation.

Guidelines for Counseling:

1. Gather information
2. Evaluate and interpret information
3. Develop and implement a plan of action
4. Seek active participation of patient's family
5. Follow up to assess the progress made

Patient Selection

Diet counselling will not succeed with every dental patient. **Patients who need counselling are:**

1. Potential candidates must want information about their potential dental caries problem and must be willing to improve current undesirable food selections and eating habits.
2. They should give high priority to preventive dentistry and should be willing to expend long-term efforts to maintain their natural dentition in good health for a lifetime.
3. They should have a positive attitude.
4. They should have a demonstrable need for dietary improvement, based on their current food intake regimen which can be achieved by Dental Health Diet Score.

FOOD DIARY

A food diary is a record of everything you eat and drink, often including what, how much, when, where, and why (feelings/hunger) to help you understand habits, manage weight, track nutrients, and meet health goals, using notebooks, apps, or printables for simple logging

Instructions of a Seven – Day Food Intake Diary:

1. Please record in detail everything you eat or drink in the order in which it is eaten.
2. The frequency of eating is an important consideration, therefore, including not only meals but between meal snacks, candies, gum, etc.

The following information is essential:

1. The amount in household measurements such as 8 oz, 1 serving, ½ cup, 1 teaspoon.
2. The food and how it is prepared such as fried chicken, baked apple, raw carrots, etc.
3. The addition of sugar, syrup, or milk to cereal, beverages, or other foods such as 1 bowl of cornflakes with 2 teaspoons of sugar and ½ c of milk.

Example

Time	Meal	Food Consumed
7:30 am	Breakfast	Tea with milk (200 ml) + **2 teaspoons sugar**; white bread (2 slices) with butter (1 tsp) and jam (2 tsp)
10:00 am	Snack	Chocolate bar (40 g)
1:30 pm	Lunch	White rice (1 cup cooked); chicken curry (3 oz); mixed vegetables (½ cup); soft drink (330 ml can**)**
4:00 pm	Snack	Sweet biscuits (3 pieces, ~30 g)
8:00 pm	Dinner	Roti (2 medium); lentils (½ cup); yogurt (½ cup)
10:00 pm	Bedtime snack	Ice cream (1 scoop, 100 ml)

INTERVIEWING AND COUNSELING VISIT

This visit is scheduled for at least 5 days after the food diary is given to the patient to complete. It is strongly advised that this visit be devoted exclusively to interviewing and counselling and that it does not include other dental procedures, not even oral prophylaxis or X-rays. This is so for three reasons:

1. A useful diet counselling service takes from 45 to 60 minutes, depending on the experience of the counsellor and the patient's comprehension.
2. Reserving this office visit solely for diet counselling gives the counselling session the identification and importance it deserves, with the result that the patient is more likely to heed the prescribed diet
3. Furthermore, a fee for the time spent and the counselling rendered is less likely to be questioned.

Diet History and Evaluation for Dental Caries:

The patient's 7-day food diary is analyzed for:

1. Adequacy of intake of foods from the food groups
2. The amount and type of food sweetened with sugar and the frequency of eating them.

The patient is asked to do the following:

1. **Step 1:** Circle in red all the foods recorded in the 7–day food diary that are sweetened with sugar. This circling foods in red will point out and separate the protective, noncariogenic, high – nutrient density foods from the empty calorie, cariogenic types.
2. **Step 2:** The total number of exposures of the teeth to sweets, the form of the sweets (solid or liquid), and when they were eaten (at meals or between meals) are determined.
3. **Step 3:** Allow the patient to delete from the diet Plaque – Forming, Sugar – Sweetened foods
4. **Step 4:** Allow the patient to select non-plaque promoting snack substitutes. If snacking is a habit of long standing, acceptable alternatives include raw fruits, raw vegetables, Cheddar cheese, or nuts. However, if the patient is consistently reminded that increasing the total food intake at each meal will satisfy appetite and hunger, it is possible that the number of between – meal snacks will eventually be reduced.
5. **Step 5:** Allow the patient to select menus. Starting with the existing menu as a nucleus, encourage the patient to examine each meal and make deletions, substitutions, or additions with which he or she can comfortably live. The rule is to improve the quality, and not the quantity, of the food so that acceptance will be more likely. For example, if the patient is accustomed to eating doughnuts and coffee sweetened with sugar, suggest as a substitute coffee sweetened with an artificial sweetener (or no sweetener at all) and muffins or toast.

Reinforcement by Follow – up Reevaluation Visit

Schedule a follow-up visit for 2 weeks later. The patient is asked to complete a second 7-day food diary in the same manner first just before returning. Evaluate the new food diary and compare the results with the original plan. Self-help preventive measures should be discussed at each dental visit. Repetition, clarification, and encouragement are the keys to success in long-term maintenance of the new, acceptable, less cariogenic and more nutritious diet

Effective Communication

Communication is a basic tool in the practice of preventive dentistry can create motivation for change. Some dentists and dental hygienists have been reluctant to provide the service on a fee – for – time basis. Communication is a combination of interviewing, teaching, counselling, and motivating is used.

This attitude is faulty, unrealistic, and should be changed.

Rules for achieving effective communication with a patient:

1. Keeping eye contact
2. Communication can be both verbal and non-verbal
3. Personalization of the message

Interviewing

Purpose of an Interview: To obtain information and to give help.

The basic goal in interviewing is:

1. To understand the problem.
2. The factors contributing to it
3. The personality of the patient.

Physical settings: Using a private counseling room will indicate that you respect the patient's feelings.

A good dietary interviewing session requires skill, time, and some background knowledge of the science and practice of nutrition, including familiarity with ways in which food habits are formed and the factors that affect these habits. Dentists and dental hygienists are the people who are most likely to have this dual educational background. Nutritionists can readily qualify with some extra course work in dental caries and periodontal diseases and in preventive dentistry. Ideally, as the professional authority, the dentist should be the diet interviewer, but it is probable that he or she will not be able to give adequate time to this phase of preventive services.

How to interview a patient:

1. First, the interviewer should be relaxed and should help the patient to relax and feel comfortable.
2. Start with a brief introductory statement about the purpose of interview.
3. Allow the patient to talk freely.
4. Cross examination may make the patient defensive.
5. The interviewer should guide the interview without any obstructions.
6. Do not make decisions for the person

Teaching and Learning

Patient education is more than simply giving information. It requires the presentation of information with sufficient impact to simulate action by the learner. People learn least well by hearing; they learn better what they can also see; but they learn best by doing, because they are totally involved.

Motivation

Motivation stimulates or is an incentive for action. To modify a patient's diet, the clinician can only seek and encourage the patient's own motivation. The counsellor's positive attitude and conviction as to the necessity and effectiveness of nutrition counselling can stimulate the patient to initiate an improved dietary pattern. According to Garn, the basic factors that motivate people are self-preservation, recognition, love and money. It

is rewarding for the diet counselor when a patient says, “Why didn’t someone take the time to give me this advice about my food habits before? It doesn’t seem that difficult to make some changes.”

Motivating patients to modify food habits:

A person passes through four preliminary decision stages in changing a dietary pattern, the fifth stage involves forming a new habit.

Example: Giving up hard candies to prevent dental decay.

1. **Awareness:** It is recognition that a problem exists, but without an inclination to solve it. (Hard candies produce acid, which can cause my teeth to decay).
2. **Interest:** It is that there is a greater degree of awareness but still no inclination to act. (Maybe I should give up hard candies, I don’t want any more sensitive or painful teeth.)
3. **Involvement:** It is an interest and a definite intention to act. (I definitely will give up hard candy.)
4. **Action:** It is a trial performance. (I have given up hard candies and chew sugarless gum instead to prevent the dry feeling in my mouth.)
5. **Habit:** It is a commitment to perform this action regularly over a sustained period of time. (I haven’t had a hard candy in sixth months).

Diet Management

Four rules should be adopted when making dietary modifications:

1. Maintain overall nutritional adequacy by conforming to the USDA Daily Food Guide for at least the recommended number of servings from each of the food groups.
2. The prescribed diet should vary from the normal diet pattern as little as possible.
3. The diet should meet the body’s requirements for the essential nutrients as generously as the diseased condition can tolerate.
4. The prescribed diet should take into consideration and accommodate the patient’s likes and dislikes, food habits, and other environmental factors as long as they do not interfere with the objectives.

Dietary modifications are made with respect to:

1. Frequency of eating.
2. Quantitative increase, decrease, or elimination of one or more nutrients.
3. Alteration of the physical quantity of the food.

Dietary Counseling for Dental Caries

Keep a food diary: An accurate, complete record of food intake is best achieved by having the patient keep a running daily record of meals and between meal snacks. Recording from memory details concerning the kinds, amounts, and preparation of the foods eaten is not reliable and should be discouraged. A 7-Day Food Intake diary is recommended: The diary is kept for 7 consecutive days, including a weekend day or holiday, to provide a more representative sample of food intake. The patient is asked not to make any changes in the usual dietary pattern during this week of diary keeping because that diet may be perfectly acceptable and may be unrelated to the dental caries problem. For this reason, do not discuss at this time the mechanism of caries production or the role that food can play. The demonstration and discussion of keeping a food diary take only 5 to 10 minutes and can be done as part of any dental visit. These general principles may be applied to the preservation or control of dental caries as follows:

1. Limit the number of eating periods to three regular meals per day, stressing the need to avoid snacks between meals.
2. Increase the intake of protective foods such as vegetables and fruits, milk and cheese, meat, fish, and legumes, which are rich in minerals, vitamins, and protein.
3. Decrease the total amount of carbohydrates so that they provide no more than 50% and no less than 30% of the calories.
4. Ideally, it is best to wean the patient from the taste of sweets. Next best is to restrict the consumption of sugar-containing foods to meals. The complete elimination of sticky, concentrated sweets such as candy, cakes, pastries, and dried fruits, especially between meals, is a requirement.

5. Recommend the liberal use of firm detergent (tooth-cleansing) foods such as raw fruits and raw vegetables so that there will be some oral clearance of food debris and stimulation of salivary flow. These and other nutritious snacks should be recommended as suitable alternatives for the sugar-rich, sticky, retained foods.
6. Recommend drinking and cooking with fluoridated water or the ingestion of fluoride supplements if the patient lives in a non-fluoridated area from birth to 13 years of age; also recommend the use of a fluoride dentifrice and mouthrinse.

Dietary Counseling for other oral diseases

Periodontal Disease: Nutritional care involves increasing vitamin C, folate, and zinc.

Tooth Loss patients with dentures: Modify diet consistency: mechanical soft, ground, pureed. Use least restrictive diet possible; individualize; mix consistencies if appropriate.

Mouth Pain and Oral Infections: Avoid acidic and spicy foods. Offer soft, cold, nutrient dense foods such as canned fruit, ice cream, yogurt, cottage cheese. Try oral supplements. Use PEG or NG feeding if oral supplementation is unsuccessful. For xerostomia, try artificial saliva, citrus beverages, sugar free candies or gums.

Wired or Broken Jaw: Provide pureed, strained, or blended foods as appropriate. Encourage nutrient-dense foods such as blended casseroles. Recommend small, frequent meals with oral supplements such as milkshakes, Instant Breakfast, medical nutritionals. Use liquid vitamin supplement if necessary. Recommend patients weigh self to monitor weight status.

Orthodontic patients: Take vigorous care of oral hygiene with special orthodontic toothbrushes. When appliances are bonded to your teeth, avoid or eliminate certain foods from diet to prevent them from breaking or loosening orthodontic appliances. Modify or be careful with the way one chews during orthodontic treatment to avoid breakages or damages to permanent orthodontic appliances. Avoid hard and crunchy foods & sticky foods. Avoid chewing with front teeth. Avoid biting fingernails and other items.

DENTAL HEALTH DIET SCORE

It is a simple screening device and a simple scoring procedure that can disclose a potential dietary problem that is likely to adversely affect a patient's dental health. It gives points earned because of an adequate intake of food from each of the food groups plus points for ingesting foods, especially recommended because they are the best sources of the ten nutrients essential for achieving and maintaining dental health. From this sum, points are subtracted for frequent ingestion of foods that are overtly sweet - whose sweetness is derived from added refined sugar or concentrated natural sugars. The difference is the Dental Health Diet Score.

Instructions for calculating Dental Health Diet Score

STEP 1: AVERAGE DAILY INTAKE	
Lunch (12.00 Noon)	4 oz tomato juice 1 chicken (3 oz) sandwich on rye bread 1 slice of chocolate cake with fudge icing 1 cup of coffee with 1 tsp of sugar
P.M Snack (2.00 PM) (3.00 PM)	1 cup milk 1 piece of sugarless gum

Step 2: Food group evaluation chart: Add the points. The sum is the Food Group Score 96 is the highest score)				
Food Group	**Servings**	**Portion sized considered one serving**	**No of servings**	**Points**
MILK (milk and cheese)	3	8 oz (1 c) milk 1.5 oz Cheddar cheese	X 8 = 3 X 8 = 24	Highest possible score = 24

		1.5 slice American cheese 1.5 c cottage cheese 8 oz (1 c) yogurt		
MEAT (meat, fish, poultry, dry beans, nuts)	2	2-3 oz lean cooked meat, fish, or poultry 2 eggs 4 tbsp peanut butter 1 c cooked dry beans or lentils	X 12 = 2 X 12 = 24	Highest possible score = 24
FRUITS AND VEGETABLES Vitamin A: (dark green and deep yellow fruits and vegetables)	1	0.5 c cooked fruit or vegetable 1 medium raw fruit or vegetable 0.5 medium grapefruit or melon 4 oz (0.5 c) juice	X 6 = 1 X 6 = 6	Highest possible score = 6
Vitamin C: (juice and citrus fruits)	1		X 6 = 1 X 6 = 6	Highest possible score = 6
Other	2		X 6 = 1 X 6 = 6	Highest possible score = 12
Bread and Cereals (enriched or whole grain)	4	1 slice of bread 0.75 dry cereal 0.5:c cooked cereal, rice, noodles, or macaroni	X 6 = 1 X 6 = 6	Highest possible score = 24

Step: 3 Nutrient Score							
Protein and Niacin 7	**Vitamin A 7**	**Iron 7**	**Folic Acid 7**	**Riboflavin (Vitamin B2) 7**	**Ascorbic Acid (Vitamin C) 7**	**Calcium and Phosphorus 7**	**Zinc 7**
Cheese Dried beans Dried peas Eggs Fish Meat Milk Nuts Poultry	Apricots Broccoli Butter Cantaloupe Carrots Collards Eggs Greens Liver Margarine Milk Peaches Squash Spinach Sweet potatoes	Beef Broccoli Eggs Green leafy vegetables Liver Oysters Sardines Shrimp	Asparagus Broccoli Cereals Kidney Liver Spinach Yeasts	Broccoli Chicken breasts Eggs Ham Liver Milk Mushrooms Pork Okra Spinach	Broccoli Brussels sprouts Cantaloupe Grapefruit Green peppers Greens Oranges Raspberries Strawberries Tomatoes	Broccoli Cheese Eggs Green leafy vegetables Milk Oranges String beans	Beef Liver Lobsters Oysters Shrimp (Other red meats and shellfish)

Calculate Nutrient Score		
Protein 7✓	Ascorbic Acid 7✓	Calcium 7✓
Cheese Milk✓ Meat✓	Broccoli Grapefruit Greens	Broccoli Eggs Milk✓
Regardless of the number of foods checked in the column, only seven points are given per nutrient (56 is a perfect score). Add the circled numbers to obtain the Nutrient Score.		

Step 4: Sweets Evaluation Chart		
Form	**Frequency**	**Points**
Liquid Soft drinks, fruit drinks, cocoa, sugar and honey in beverages, non-dairy creamers, ice cream, sherbet, gelatin dessert, flavored yogurt, pudding, custard, popsicles	X 5 =	
Solid and sticky Cake, cupcakes, donuts, sweet rolls, pastry, canned fruit in syrup, bananas, cookies, chocolate candy, chewing gum, dried fruit, marshmallows, jelly jam.	X 10 =	
Slowly dissolving Hard candies, breath mints, antacid tablets, cough drops.	X 15 =	
Sweet Score		
5 or less	Excellent	
10	Good	
15 or more	Watch out zone	

Dental Health Diet Scorecard

Step 5: Totaling the Scores

Dental health diet score = FOOD SCORE + NUTRIENT SCORE - SWEET SCORE

FOOD SCORE = adequate intake of foods from each of the food groups

NUTRIENT SCORE = consuming food from especially recommended groups of ten nutrients

SWEET SCORE = ingestion of foods that are overtly sweet sugars

ASSESSMENT OF DENTAL HEALTH DIET SCORE		
SCORE	**RESULT**	**INTERPRETATION**
72-96	Excellent	Counseling not required
64-72	Adequate	Educate the patient
56-64	Barely adequate	Counseling required
56 or less	Not adequate	Counseling with diet modification

Practical Exercise 1

Food Diary

Scenario:

You are a dental intern at a preventive dentistry clinic. A new patient, Ms. Ananya, 24 years old, has come for a routine dental check-up. She reports occasional tooth sensitivity and visible early cavities. As part of the caries risk assessment, you asked her to maintain a 7-day food diary. Below is a summary of her recorded intake for two representative days (Day 1 and Day 2).

Task:

Analyze Ms. Ananya's food diary and answer the following questions based on principles of diet counseling for caries prevention.

Food Diary

Day 1		
Time	**Meal**	**Food / Drink Consumed**
8:00 am	Breakfast	Cornflakes (1 bowl) with sugar (2 tsp) and milk (½ cup); tea (1 cup) with sugar (1 tsp)
11:00 am	Snack	Chocolate chip cookie (1 piece)
1:00 pm	Lunch	Chapati (2), dal (1 cup), mixed vegetables (½ cup), gulab jamun (1 small)
4:30 pm	Snack	Cola (1 can), chips (1 packet)
8:00 pm	Dinner	Rice (1 cup), fried fish (1 piece), curd (1 cup), cake (1 slice)
10:30 pm	Bedtime	Hot chocolate (1 cup) with marshmallows

Day 2		
Time	**Meal**	**Food / Drink Consumed**
8:30 am	Breakfast	Toast (2 slices) with jam; coffee (1 cup) with sugar (1 tsp)
10:30 am	Snack	Banana (1 medium)
1:30 pm	Lunch	Chapati (2), paneer curry, salad, jalebi (1 piece)
5:00 pm	Snack	Sugary yogurt (1 cup), peanuts (1 handful)
8:30 pm	Dinner	Noodles (1 cup), chicken stir-fry, sweetened lemonade (1 glass)
10:00 pm	Late Snack	Hard candy (2 pieces)

Questions for Students:

1. Identify cariogenic eating patterns:
i) How many eating episodes (meals + snacks) does Ms. Ananya have per day?
ii) List all the sugar-sweetened foods/drinks consumed over the two days.
2. Analyze food group intake:
i) Using the food group evaluation chart given above, categorize her intake into: Milk, Meat, Fruits & Vegetables, Breads & Cereals.
ii) Is her intake of protective foods (fruits, vegetables, dairy, protein) adequate? Justify.
3. Frequency and timing of sugar exposure:
i) How many times per day are her teeth exposed to fermentable carbohydrates?
ii) Which exposures are between meals, and which are with meals? Why does this matter?
4. Recommendations for dietary modification:
i) Suggest three specific changes to reduce caries risk without compromising nutrition.

ii) Provide two non-cariogenic snack alternatives she could adopt.

5. Patient communication:

i) How would you explain to Ms. Ananya the link between her snacking habits and tooth decay, using patient-friendly language?

ii) What one positive aspect of her current diet would you praise to encourage cooperation?

Practical Exercise 1 Student Answer:

Practical Exercise 1 Student Answer:

Student answered the questions correctly: ☐ Yes ☐ No

Student needs improvement on: _____

_____

Signature of Teacher

(Practical Exercise 2 on next page)

Practical Exercise 2

Dental Health Diet Score

Patient Profile:

Name: Samina Khan

Age: 22 years

Occupation: College student

Chief Complaint: Frequent dental cavities despite regular brushing

24-Hour Food Diary (provided by Samina)

Time	Food/Drink Consumed	Portion Size
8:00 AM	Oatmeal with milk and honey	1 bowl
10:30 AM	Apple	1 medium
1:00 PM	Vegetable sandwich (whole wheat bread)	2 slices
1:00 PM	Orange juice (packaged)	1 glass (200 ml)
4:00 PM	Chocolate chip cookie	2 pieces
4:00 PM	Coffee with sugar	1 cup (2 tsp sugar)
8:00 PM	Rice, dal, mixed vegetables, grilled chicken	1 plate
10:00 PM	Ice cream	1 scoop

Tasks for Students:

Part 1: Calculate the Food Group Score

Using the Food Group Evaluation Chart given above:

1. Categorize each food item into the appropriate food group.
2. Determine the number of servings per food group.
3. Calculate points for each food group and sum them to obtain the Food Group Score.

Part 2: Calculate the Nutrient Score

Using the Nutrient Evaluation Chart given above:

1. Identify foods that are rich in the 10 essential nutrients listed (Protein & Niacin, Vitamin A, Iron, Folic Acid, Riboflavin, Ascorbic Acid, Calcium & Phosphorus, Zinc).
2. Assign points (maximum 7 per nutrient, total 56 possible).
3. Sum the points to get the Nutrient Score.

Part 3: Calculate the Sweet Score

Using the Sweets Evaluation Chart given above:

1. Identify all sugary foods/drinks consumed.
2. Classify them by form (liquid, solid/sticky, slowly dissolving)
3. Calculate frequency and assign points as per the chart.
4. Determine the Sweet Score using the Sweet Score table

Part 4: Calculate the Dental Health Diet Score

Part 5: Interpret the Score

With reference to the Assessment Table given above:

1. Determine Samina’s dietary adequacy level (Excellent, Adequate, Barely Adequate, Not Adequate).
2. Recommend whether counseling is needed and what type.

Part 6: Suggest Dietary Modifications

1. Based on the score and food diary:
2. Suggest two specific dietary changes to reduce caries risk.
3. Recommend two non-cariogenic snack alternatives.
4. Outline a brief counseling plan using the S-O-A-P format (Subjective, Objective, Assessment, Plan).

Practical Exercise 2 Student Answer:

Practical Exercise 2 Student Answer:

Practical Exercise 2 Student Answer:

Student answered the questions correctly: ☐ Yes ☐ No

Student needs improvement on: _____

_____

Signature of Teacher

END OF PRACTICAL LOGBOOK

KHYBER MEDICAL UNIVERSITY

PREPARED BY:

Dr NAJIA SAJJAD KHAN

In collaboration with other respected faculty of Community and Preventive Dentistry of KMU affiliated Dental Colleges of KP

LOGBOOK

2nd Year BDS

Department of Science of Dental Materials

DEPARTMENT OF SCIENCE OF DENTAL MATERIALS

Name:.....

Name of the Institute:.....

Class No:..... Session:.....

Student's Contact No:.....

Email:.....

Student's Signature:.....

Paste your Picture

CERTIFICATE

It is certified that Mr./Miss. .....

Son / Daughter of .....

Class No: ..... has completed the practical work and Logbook during the

session .....

Head of Department

Practical Contents

First Module

- Wire bending exercises
- Manipulation of impression compound and impression taking
- Demonstration of zinc oxide/eugenol impression paste
- Manipulation of alginate impression material and impression taking
- Demonstration of addition silicone impression material

Second Module

- Manipulation of gypsum products for model/cast fabrication
- Making of C-Clasp for fabrication of partial denture
- Making of wax pattern on saddle area of cast for partial denture
- Perform articulation & teeth setup for partial denture
- Performing flasking, dewaxing and application of cold mold seal
- Manipulation of heat cure acrylic for partial denture
- Finishing and polishing partial denture

Third Module

- Manipulation of zinc phosphate cement
- Manipulation of polycarboxylate cement
- Manipulation of glass ionomer cement
- Manipulation of zinc oxide/eugenol cement
- Manipulation of calcium hydroxide cement (setting/non-setting)
- Manipulation of dental amalgam
- Manipulation of dental composites

Fourth Module

- Recognize various materials and equipment used during fabrication of porcelain fused to metal prosthesis.
- Observe the steps during fabrication of porcelain fused to metal prosthesis.

General Information

- Attendance is mandatory.
- Every student has to give a presentation on a given topic in class.
- Regarding lab procedures: Students should complete weekly tasks.
- Tutorials: Group discussions on given topics will be held on regular basis.
- Students should follow the code of conduct of the college.
- Students should come on time. Late comers will not be allowed to enter class or lab.
- Lab coats are mandatory during lab procedures.
- Lab coats should be neat and clean.
- Students should bring their own instruments.
- Eating and drinking is prohibited in the lab and lecture hall.
- Mobile phones should be switched off or at least on silent mode.
- Do not leave your belongings unattended.

Lab Protocols:
Students must have the following items before entering the lab for procedures:

- Lab coat
- Practical Logbook
- Instruments kit
- Working sheet (Any paper of 2x2 feet)

Course Objective

The objective of the course is to develop thorough understanding of properties of materials used in dentistry, their clinical applications and biochemical interaction with oral fluids and tissues.

Course Description

This course will be presented in two (2) parts:

Part I: - Theory (Lectures/Small group discussions/Large group formats/Tutorials)

Part II: - Practical: Following the lectures, general handling of dental materials covered in the lecture will be performed.

Recommended Books

- Applied Dental Materials by McCabe 14th Edition
- Phillips' Science of Dental Materials 13th Edition
- Craig's Restorative Dental Materials 13th Edition

Armamentarium

1. Examination instruments
2. Rubber bowl (Hard & Soft)
3. Mixing spatula (For Cements, Plaster & Alginate)
4. Glass slab
5. Pliers (Cutting, Round & Flat)
6. Wax knife
7. Plaster knife
8. Wax carver
9. Oil Painting Brush
10. Dental flask with press
11. Semi adjustable articulator/hinge articulator
12. Ceramic cup with lid
13. Impression trays: Dentate and Edentulous (Plastic/Metallic) ---- small, medium & large
14. Spirit lamp
15. Scale/ Ruler
16. Glass beaker

Grading Criteria

+A	**Outstanding**
A	**Excellent**
B	**Very Good**
C	**Fair**
D	**Poor**

List of Practicals Performed

S. No.	Title	Date	Signature
1.			
2.			
3.			
4.			
5.			
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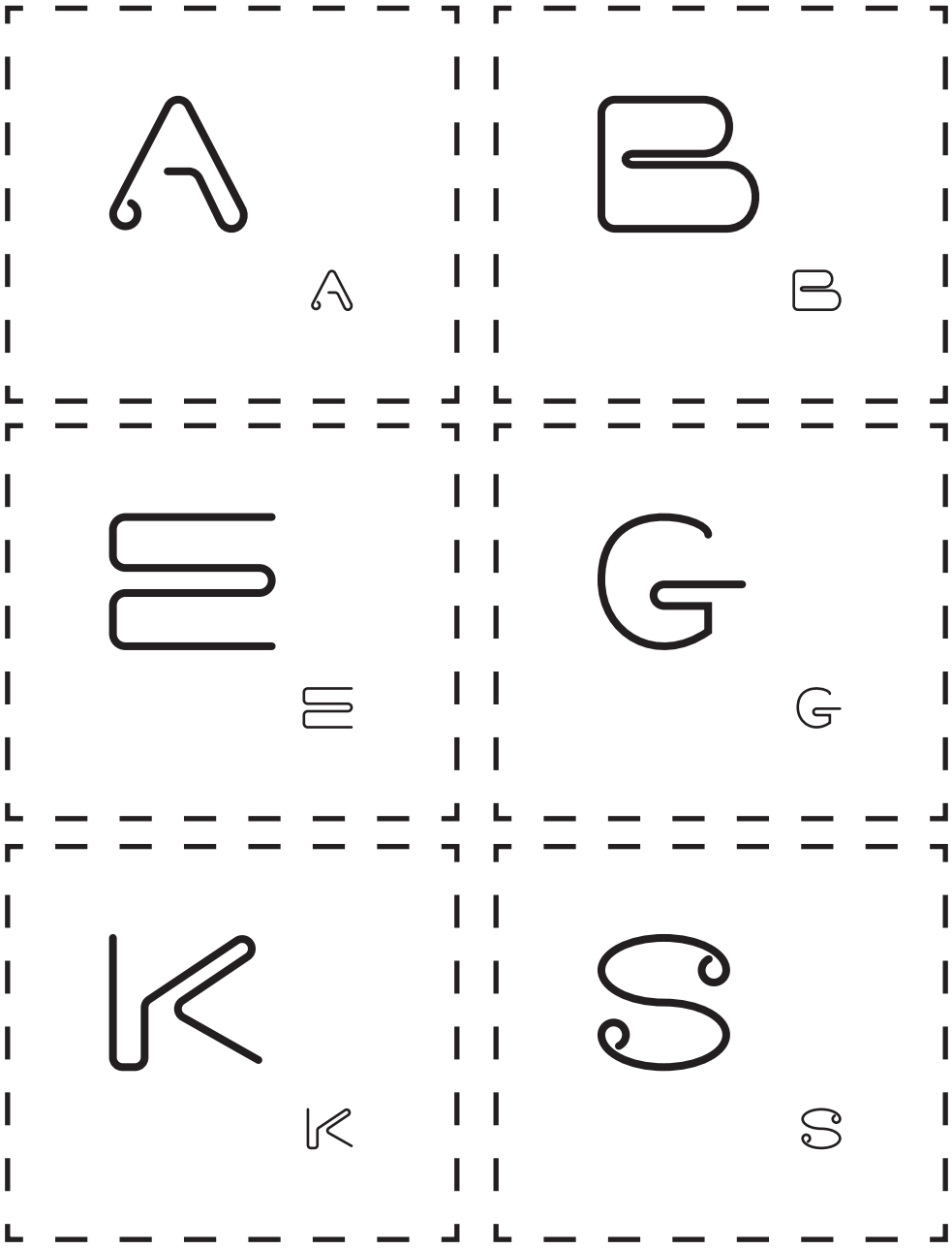
Wire Bending Exercise



Date	Alphabet	Grade	Sign
	A		
	B		
	E		
	G		
	S		
	K		

MANIPULATION OF IMPRESSION MATERIALS

Impression taking using Impression Compound

- Demonstration of Impression Compound
- Practical: Impression taking using edentulous models

Objective

At the end of practical, students should be able to:

1. Perform impression taking using impression compound.
2. Differentiate between the following characteristics:
   a. Dentate/Edentulous Impression trays
   b. Dentate/Edentulous Models

Availability:_____

Presentation:_____

Classification/Types:_____

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Applications/ Uses:_____

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Requirements/ Tools:_____

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Procedure:

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Facilitator's Signature

Demonstration on Manipulation of Zinc Oxide/Eugenol Impression Paste

➢ Demonstration of zinc oxide/eugenol impression paste

Objective

At the end of practical, students should be able to:

1. Perform Mixing/handling of zinc oxide eugenol impression paste.
2. Analyze the following characteristics:
    a. Homogenous mix
    b. Working time
    c. Setting time
    d. Properties

Availability:_____

Presentation:_____

Classification/Types:_____

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Applications/ Uses:_____

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Requirements/ Tools:_____

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Procedure:

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Facilitator's Signature

Impression taking using Alginate Impression Material

- Demonstration of Alginate Impression material
- Practical: Impression taking of fellow colleague's

Objective

At the end of practical, students should be able to:

1. Perform alginate mixing/handling.
2. Analyze the following characteristics of alginate impression material:
    a. Desirable consistency
    b. Working time
    c. Setting time
    d. Properties
3. Identify defects in recorded impression.

Availability:_____

Presentation:_____

Classification/Types:_____

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Applications/ Uses:_____

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Requirements/ Tools:_____

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Procedure:

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Facilitator's Signature

Demonstration on Manipulation of Silicone Impression Material

- Demonstration of silicone impression materials

Objective

At the end of practical, students should be able to:

1. Perform mixing/handling of silicon impression material.
2. Analyze the following characteristics of silicon impression material:
   a. Homogenous Mix
   b. Working time
   c. Setting time
   d. Properties

Availability:_____

Presentation:_____

Classification/Types:_____

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Applications/ Uses:_____

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Requirements/ Tools:_____

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Procedure:

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Facilitator's Signature

MANIPULATION OF DENTAL PLASTER

Fabrication of Model/Cast using Dental Plaster

- Demonstration of model/cast construction using mold/impression
- Practical: Fabrication of model/cast

Objective

At the end of practical, students should be able to:

1. Perform Model fabrication using mold/impression.
2. Analyze the following characteristics of soft/hard plaster:
    a. Pourable mix
    b. Working time
    c. Setting time
    d. Properties

Requirements/:_____

Tools:_____

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Procedure:

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Facilitator's Signature

MANIPULATION OF DENTAL CEMENTS

Zinc Phosphate Cement

- Demonstration of Mixing/Handling
- Practical

Objective

At the end of practical, students should be able to:

1. Perform $ZnPO_4$ cement Mixing/Handling with accuracy
2. Analyze the following characteristics of $ZnPO_4$ cement:
   a. Working consistency
   b. Working time
   c. Setting time
   d. Properties

Manipulation of Zinc Phosphate Cement

Availability:_____

Presentation:_____

Classification/Types:_____

_____

Applications/ Uses:_____

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Requirements/ Tools:_____

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Procedure:

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Facilitator's Signature

Polycarboxylate Cement

- Demonstration of Mixing/Handling
- Practical

Objective

At the end of practical, students should be able to:

1. Perform Cements Mixing/Handling with accuracy
2. Analyze the following characteristics Polycarboxylate cement:
   a. Working consistency
   b. Working time
   c. Setting time
   d. Properties

Manipulation of Polycarboxylate Cement

Availability:_____

Presentation:_____

Classification/Types:_____

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Applications/ Uses:_____

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Requirements/ Tools:_____

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Procedure:

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Facilitator's Signature

Glass Ionomer Cement

- Demonstration of the following characteristics of GIC
  - Proportioning & Mixing
  - Working/setting time & Properties
- Practical

Objective

At the end of practical, students should be able to:

1. Perform Glass ionomer cement Mixing/Handling
2. Analyze the following characteristics of GIC cement:
   a. Working consistency
   b. Working time
   c. Setting time
   d. Properties

Manipulation of Glass Ionomer Cement

Availability:_____

Presentation:_____

Classification/Types:_____

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Applications/ Uses:_____

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Requirements/ Tools:_____

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Procedure:

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Facilitator's Signature

Zinc Oxide/Eugenol Cement

- Demonstration of the following characteristics of ZnO/Eugenol Cement
  - Proportioning & Mixing
  - Working/setting time & Properties
- Practical

Objective

At the end of practical, students should be able to:

1. Perform Zinc Oxide/Eugenol cement Mixing/Handling
2. Analyze the following characteristics of ZnO/Eugenol cement:
   a. Working consistency
   b. Working time
   c. Setting time
   d. Properties

Manipulation of Zinc Oxide/Eugenol Cement

Availability:_____

Presentation:_____

Classification/Types:_____

_____

Applications/ Uses:_____

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Requirements/ Tools:_____

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Procedure:

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Facilitator's Signature

Calcium Hydroxide Cement

- Demonstration of the following characteristics of $Ca(OH)_2$ Cement
  - Proportioning & Mixing
  - Working/setting time & Properties
- Practical

Objective

At the end of practical, students should be able to:

1. Perform $Ca(OH)_2$ cement Mixing/Handling
2. Analyze the following characteristics of $Ca(OH)_2$ cement:
   a. Working consistency
   b. Working time
   c. Setting time
   d. Properties

Manipulation of Calcium Hydroxide Cement

Availability:_____

Presentation:_____

Classification/Types:_____

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Applications/ Uses:_____

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Requirements/ Tools:_____

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Procedure:

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Facilitator's Signature

Dental Amalgam

- Demonstration of the following steps in the manipulation of Dental Amalgam
  - Proportioning
  - Mixing/Trituration
    - Manual
    - Amalgam Mixer
- Practical

Objective

At the end of practical, students should be able to:

1. Perform steps involved in dental amalgam filling

Manipulation of Dental Amalgam

Availability:_____

Presentation:_____

Classification/Types:_____

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Applications/ Uses:_____

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Requirements/ Tools:_____

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Procedure:

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Facilitator's Signature

Dental Composite

- Demonstration of the following steps in the manipulation of Dental Composite
  - Presentation
  - Acid Etching/Bonding and Priming/Curing
  - Incremental Technique/Depth of cure
- Practical

Objective

At the end of practical, students should be able to:

1. Perform steps involved in dental composite filling

Manipulation of Dental Composite

Availability:_____

Presentation:_____

Classification/Types:_____

_____

Applications/ Uses:_____

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Requirements/ Tools:_____

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Procedure:

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Facilitator's Signature

Partial Denture

- Demonstration of fabrication steps for the acrylic Partial Dentures
- Practical: Partial Dentures construction

Objective

At the end of practical, students should be able to:

1. Perform individual steps involved in the Fabrication of Partial denture with accuracy
2. Analyze the following parts of Partial denture:
    - Saddle area
    - Connectors
    - Fitting and Non- Fitting surface
3. Identify the following characteristics of acrylic resin: (Heat and Self cure)
    - Setting time
    - Properties
    - Method of activation
4. Identify the components of acrylic partial denture

Partial Denture Fabrication

Date	Work done	Grade	Facilitator's sign	Grading Criteria
	Clasp making			A. Clasp rounded, not sharp, covered tooth cervically, visible (Not covered by acrylic) = Excellent B. Good C. Average
	Wax pattern			A. Wax pattern smooth, marked areas fully covered, not covering Clasps = Excellent B. Good C. Average
	Articulation & Teeth setup			A. Teeth aligned, not over-erupted and under-erupted, wax enveloped around cervical portion of tooth = Excellent B. Good C. Average
	Flasking			A. Flask cover full Plaster of Paris, Firm Pressure applied on student's flask = Excellent B. Good C. Average
	Dewaxing			A. Mould is smooth, Wax all removed = Excellent B. Good C. Average
	Separating media			A. Thin layer of cold mould seal on soft plaster mould and not teeth = Excellent B. Good C. Average

	Packing			A. Dough stage of heat cure Acrylic resin applied on mould, firm pressure with bench press and acrylic squeezed out, packing in student's flask = Excellent B. Good C. Average
	Curing			A. Student's flask with Acrylic dough 1st placed in normal H2O and then heated up to curing temperature = Excellent B. Good C. Average
	Deflasking			A. Flask placed at RTP and not in cold H_2O = Excellent B. Good C. Average
	Finishing & Polishing			A. Smooth, polished denture base and fitting surfaces = Excellent B. Good C. Average

List of Assignements/Presentations

S. No.	Title	Grade	Date	Signature
1.				
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3.				
4.				
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6.				
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10.				

GENERAL PATHOLOGY AND MICROBIOLOGY

PRACTICAL LOGBOOK

DEPARTMENT OF GENERAL PATHOLOGY AND MICROBIOLOGY

This is to certify that Mr./Ms. _____,

College Roll No. _____, Batch No. _____, Year _____, and KMU Roll No. _____, has successfully completed the required practical work in accordance with the prescribed course of study under the supervision of _____ for the academic year _____, as recorded in the practical schedule of this journal.

Professor In-Charge signature with official stamp

_____

Date:_____

LIST OF PRACTICALS PERFOMED

S.NO	Practical	Date
BLOCK D FOUNDATION		
1.	Coagulative Necrosis	
2.	Pathologic Calcification	
3.	Hyperplasia	
4.	Gram Staining	
5.	Culture Media	
BLOCK E INFLAMMATION, INFECTION & AUXILIARY DENTAL MATERIALS MODULE		
6.	Acute Inflammation	
7.	Bacterial Motility	
8.	Biochemical Tests	
9.	Plasmodium	
10.	Leishmania	
11.	Sterilization and Disinfection	
12.	Ziehl Neelsen Staining (Zn Staining)	
13.	Chronic Inflammation	
14.	Granuloma	
BLOCK F PRE-CLINICAL DENTISTRY I (HEALING, REPAIR & DENTAL RESTORATIONS -I)		
15.	Various Laboratory Instruments and Machine	
16.	Sample collection and Transportation	
17.	Granulation Tissue	
BLOCK G PRE-CLINICAL DENTISTRY II (NEOPLASIA & DENTAL REHABILITATION)		
18.	Ascaris lumbricoides	
19.	Ancylostoma duodenale	
20.	Enterobius vermicularis	
21.	Taenia saginata and Taenia solium	
22.	Hydatid cyst	
23.	Pleomorphic Adenoma	
24.	Squamous Cell Carcinoma	
25.	Basal Cell Carcinoma	
26.	Lipid Profile	

Completed & Checked: _____ Dated: ____/_____/_____

BLOCK – D

Foundation II

Practical # 1

COAGULATIVE NECROSIS

Necrosis: Necrosis is a pathological and irreversible form of cell death resulting from severe cellular injury. It is characterized by denaturation of cellular proteins, loss of cell membrane integrity, leakage of intracellular contents, enzymatic digestion of the dead cells, and an associated inflammatory reaction in the surrounding tissue.

Coagulative necrosis: Coagulative necrosis is a type of irreversible cell death/ necrosis in which injurious stimulus predominantly causes the denaturation of structural and enzymatic proteins, thereby blocking proteolysis of dead cells, resulting in preservation of the basic tissue architecture for a variable period of time despite loss of nuclear staining and cellular viability. It is most commonly caused by ischemia and infarction in solid organs.

Etiology / Causes:

1. Ischemia due to obstruction of blood vessels

   Examples: thrombosis, embolism, atherosclerosis

2. Infarction of solid organs

   Examples: heart, kidney, spleen

3. Chemical and toxic injury

   Examples: strong acids, toxins

4. Physical injury

   Examples: burns, extreme heat or cold

5. Rapidly growing tumors with inadequate blood supply

Note: Ischemic injury to the brain results in liquefactive necrosis due to high lipid content and enzymatic activity.

Pathogenesis:

Severe ischemic or toxic injury leads to denaturation of cellular proteins and inactivation of lysosomal enzymes. Due to inhibition of proteolysis, the dead cells are not immediately digested, and the basic tissue framework remains preserved. Subsequently, inflammatory cells infiltrate the necrotic area, releasing lysosomal enzymes that digest and remove the necrotic tissue.

Morphology: Grossly, the necrotic area appears pale, firm, and well demarcated from surrounding viable tissue. In infarcts, the lesion is often wedge shaped with the apex pointing toward the site of vascular obstruction and the base toward the surface of the organ. Microscopically, the tissue shows preservation of the basic tissue architecture despite loss of cellular viability. The cells exhibit increased eosinophilia of the cytoplasm due to protein denaturation. Nuclear changes are evident in the form of pyknosis, karyorrhexis, and karyolysis, leading to partial or complete loss of nuclear staining. The outlines of the dead cells remain intact, giving rise to characteristic ghost cells. In later stages, inflammatory cell infiltration is seen in the surrounding tissue, which contributes to the removal of necrotic cellular debris.

Microscopic Points of Identification:

1) Preservation of basic tissue architecture
2) Increased eosinophilia of cytoplasm
3) Loss of nuclei showing pyknosis, karyorrhexis, or karyolysis
4) Intact cell outlines producing ghost cells
5) Inflammatory cell infiltration in later stages

Organs Commonly Affected

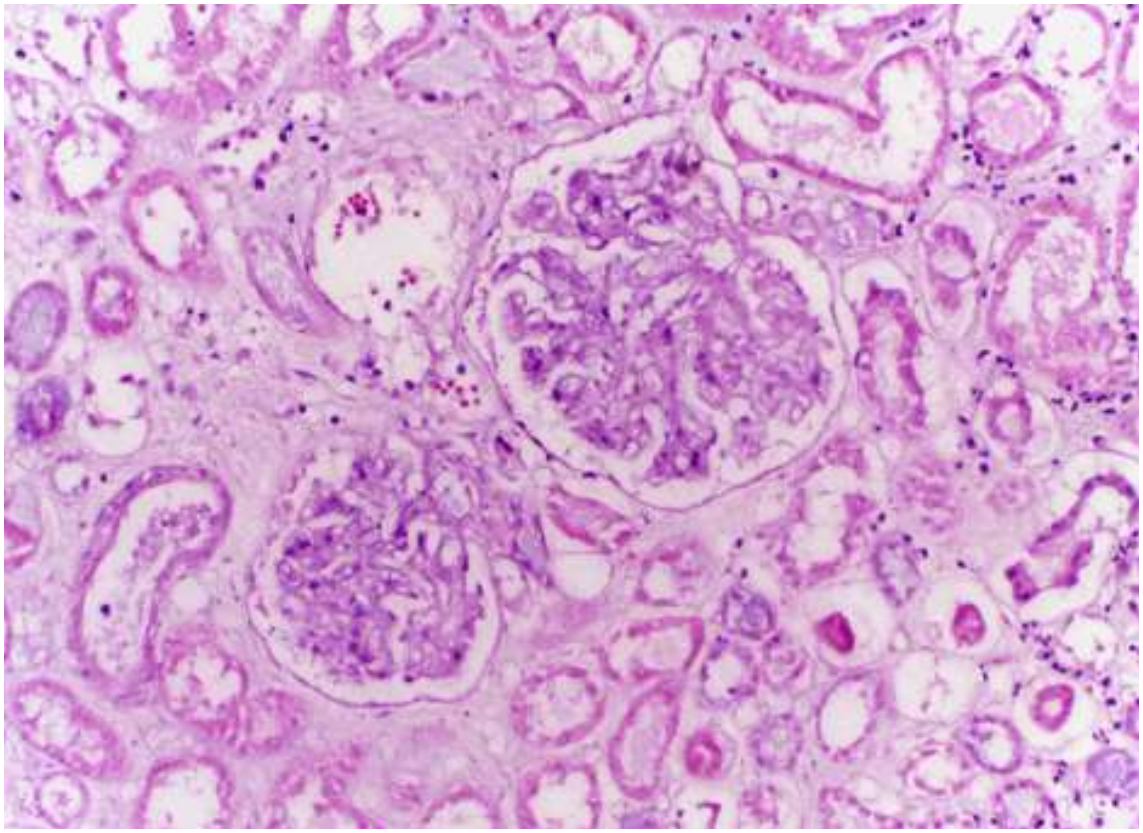
1) Heart
2) Kidney
3) Spleen
4) Adrenal gland
5) Skeletal muscle

Common Clinical Conditions:

1) Myocardial infarction
2) Renal infarction
3) Splenic infarction
4) Ischemic necrosis of solid organs
5) Tumors showing central necrosis

Significance:

1) Indicates irreversible cell injury
2) Leads to loss of function of the affected organ
3) May result in fibrosis and scar formation
4) Important for diagnosis of infarction



The renal parenchyma with coagulative necrosis. The basic tissue architecture is preserved, and the dying cells leave behind characteristic ghost outlines. The cells appear intensely eosinophilic with complete loss of nuclear staining.

References

1. Robbins and Cotran, Basic Pathology
2. Harsh Mohan, Textbook of Pathology
3. Kumar, Abbas, Aster – Robbins Basic Pathology

Student Task:

Instructor's signature:_____ **Dated: _____/_____/_____**

Practical No. 2

PATHOLOGICAL CALCIFICATION

Definition

Pathological calcification refers to the abnormal accumulation of calcium salts along with smaller amounts of iron, magnesium, and other minerals in tissues, occurring in association with disease processes.

Types of Pathological Calcification

There are two main types of pathological calcification:

1. Dystrophic calcification
2. Metastatic calcification

1. Dystrophic Calcification

Definition: Dystrophic calcification is the local deposition of calcium salts in dead or dying tissues. It occurs in the absence of any disturbance in calcium metabolism, and serum calcium levels remain normal.

Causes

1) Tissue necrosis of any cause
2) Chronic inflammation
3) Degenerative changes in tissues
4) Old scars and damaged heart valves

Pathogenesis

Dystrophic calcification occurs due to deposition of calcium salts in areas of dead or injured tissue. The calcium binds to phospholipids present in the membranes of necrotic cells. These deposits act as seeding sites for further crystal growth. Progressive deposition of calcium leads to enlargement of these deposits and formation of laminated calcified structures.

Morphology

Gross Features: Calcium salts appear as fine, white granules or clumps. On palpation, the affected area often feels gritty.

Microscopic Features: On routine hematoxylin and eosin staining, calcium salts appear as basophilic, amorphous, granular, and sometimes clumped deposits. They may be present intracellularly, extracellularly, or in both locations. Calcium may be deposited in layers around dead cells forming seeding crystals. Progressive layering can result in lamellated structures known as psammoma bodies, which resemble grains of sand. In some cases, heterotopic bone formation may be seen at the site of calcification.

Common Organs / Sites

1) Areas of necrosis
2) Old scars
3) Atherosclerotic plaques
4) Damaged heart valves
5) Lungs in asbestosis

2. Metastatic Calcification

Definition: Metastatic calcification is the systemic deposition of calcium salts in normal tissues and occurs due to hypercalcemia secondary to disturbances in calcium metabolism.

Causes

1) Hyperparathyroidism
2) Destruction of bone
3) Vitamin D disorders
4) Renal failure

Pathogenesis:

In metastatic calcification, elevated serum calcium levels lead to deposition of calcium salts in otherwise normal tissues. The deposition is favored in tissues that lose acid and therefore become relatively alkaline.

Morphology

The microscopic appearance of calcium salts in metastatic calcification resembles that of dystrophic calcification. Deposits may be non-crystalline, amorphous, or granular and, in some cases, may form hydroxyapatite crystals.

Common Organs Affected

1) Blood vessel walls
2) Kidneys
3) Lungs
4) Gastric mucosa

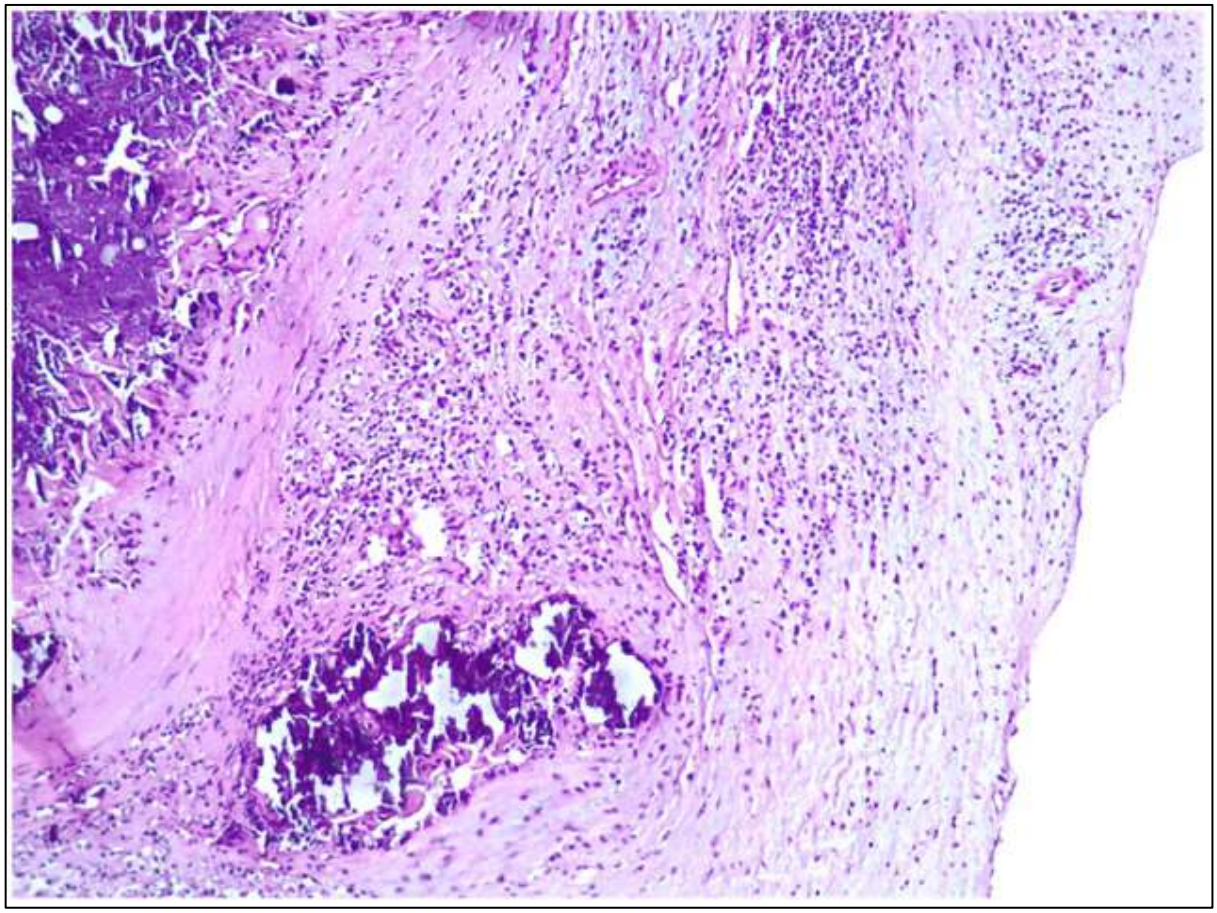
Points of identification: These microscopic features on H&E stain are characteristic of pathological calcification.

1) Presence of basophilic (deep blue-purple) amorphous granular deposits within the tissue.
2) Calcium deposits may be seen intracellularly, extracellularly, or in both locations.
3) Deposits appear as fine granules, coarse clumps, or irregular masses.
4) Lamellated concentric calcified structures (psammoma bodies) may be present.

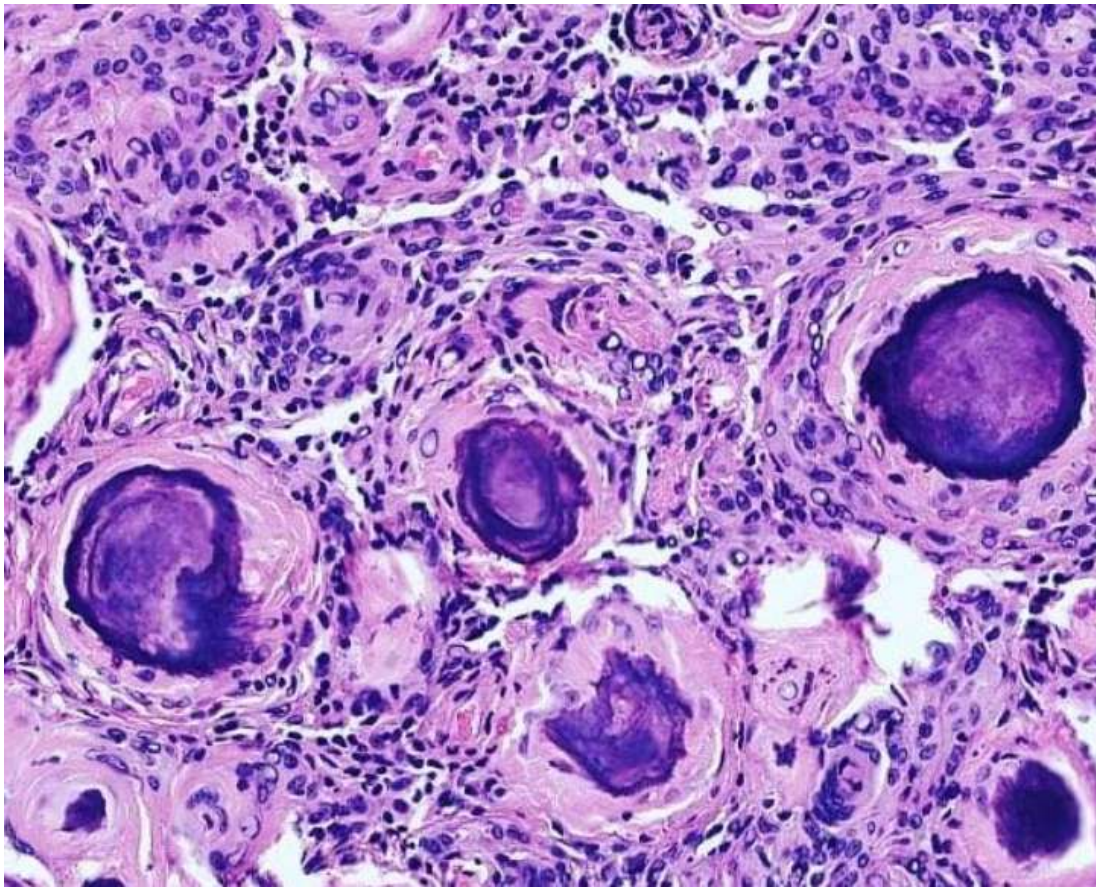
5) Surrounding tissue may show evidence of necrosis, degeneration, or chronic inflammation.
6) In some cases, heterotopic bone formation may be seen at the site of calcification.

Clinical Significance / Complications

1) Interfere with normal tissue function
2) Calcification of heart valves may lead to valvular dysfunction
3) Vascular calcification can cause reduced elasticity of blood vessels
4) Renal calcification may impair kidney function
5) Presence of calcification indicates underlying tissue injury or metabolic disorder



Areas of dystrophic calcifications and abundant inflammatory infiltrate (HE staining)



Psammoma bodies in Psammomatous meningioma

References

1. Robbins and Cotran, Basic Pathology
2. Harsh Mohan, Textbook of Pathology
3. Kumar, Abbas, Aster – Robbins Basic Pathology

Student Task:

Instructor's signature:_____ **Dated: _____/_____/_____**

Practical No. 3

Nodular Hyperplasia of Prostate/ Benign Prostatic Hyperplasia (BPH)

Introduction – Hyperplasia:

Hyperplasia is an increase in the number of cells in an organ or tissue in response to a stimulus. It occurs only in tissues with cells capable of dividing and may occur along with hypertrophy. Hyperplasia can be physiologic or pathologic.

1. Physiologic hyperplasia occurs in response to hormones or growth factors, either to increase functional capacity (e.g., proliferation of breast epithelium at puberty or pregnancy) or for compensatory regeneration (e.g., liver after partial hepatectomy, bone marrow after blood loss).

2. Pathologic hyperplasia results from excessive or inappropriate hormonal or growth factor stimulation, as in endometrial hyperplasia or benign prostatic hyperplasia. Although abnormal, pathologic hyperplasia is controlled and can regress if the stimulus is removed.

Definition – Benign Prostatic Hyperplasia (BPH)

BPH is a common disorder in men over 50, characterized by nodular hyperplasia of the prostatic tissue, especially in the transition and periurethral zones. The nodular overgrowth compresses the urethra and leads to lower urinary tract symptoms. Approximately 30% of men in that age group have moderate to severe symptoms of BPH, and histologic evidence of BPH is found in up to 90% of men by age 80. It is not a premalignant lesion

Etiology

Hormonal factors: Interaction of androgens and estrogens, with dihydrotestosterone (DHT) being the main mediator of prostatic growth. DHT is formed from circulating testosterone by the action of 5α-reductase type 2 within the prostate. Risk increases with advancing age and may be influenced by metabolic factors.

Pathogenesis

Hyperplasia occurs predominantly in the transitional zone (periurethral region) of the prostate. Androgenic stimulation (primarily DHT) promotes proliferation of both glandular epithelium and stromal fibromuscular tissue. The enlarging nodules compress the urethra, increasing urethral resistance and causing symptoms. BPH nodules often form a surgical capsule separating hyperplastic tissue from the peripheral zone.

Morphology:

Gross Features: The prostate is enlarged, often weighing 3- to 5- fold greater than normal (60-100 g). The cut surface shows multiple well-demarcated nodules of varying sizes, mainly in the transition/periurethral zone. Nodules are tan-gray to tan-yellow, firm or soft depending on the proportion of stromal versus glandular components. Predominantly glandular nodules may appear more spongy or cystic, whereas stromal nodules are more solid and firm. Differentiation from carcinoma by grossing alone is difficult; carcinoma typically arises in the peripheral zone.

Microscopically there are two types of Hyperplasia seen in BPH: Glandular Hyperplasia which shows proliferation of acini forming papillary infoldings and cystic dilatation. The acini/ glands are lined by tall columnar epithelium with a basal cell layer. The lumina often contain proteinaceous secretions called corpora amylacea.

Stromal Hyperplasia in which there is marked increase in fibromuscular stroma. Nodules may be predominantly stromal or mixed (glandular and stromal). Most cases exhibit a combination of both glandular and stromal hyperplasia.

Common Site

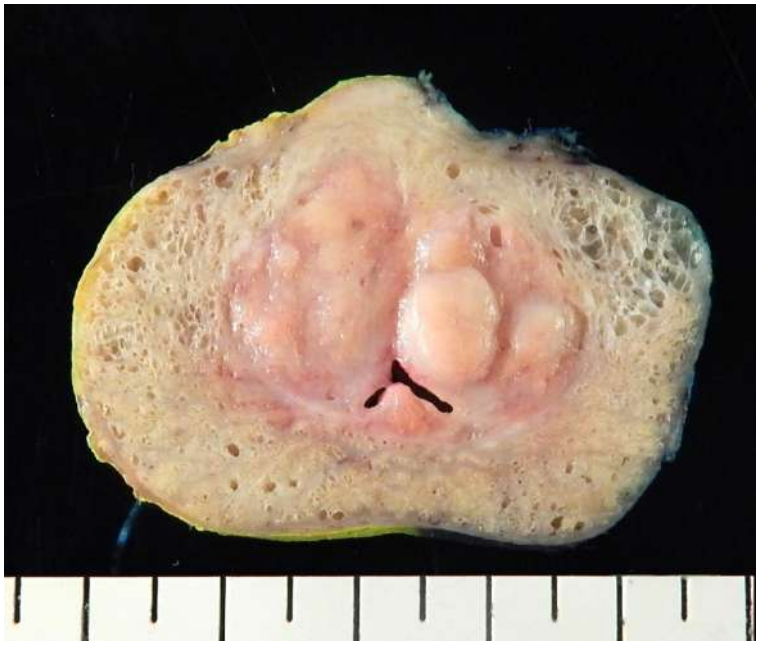
Prostate gland, especially the transitional and periurethral zones around the urethra while most carcinomas (70-80%) arise in peripheral zone.

Clinical Significance / Complications

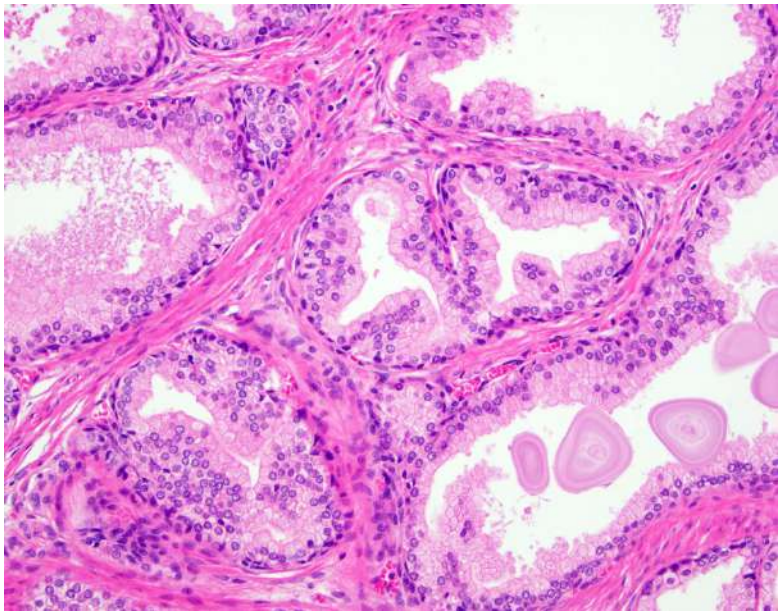
1) Progressive lower urinary tract symptoms, including urinary frequency, urgency, nocturia, weak stream, hesitancy, and incomplete emptying.
2) Acute urinary retention.
3) Bladder stone formation due to chronic urinary stasis.
4) Urinary tract infections.
5) Hydronephrosis and renal impairment from chronic obstruction.

Points of Identification on H&E Slide:

1) Nodular arrangement of hyperplastic glands and stroma.
2) Glandular acini lined by tall columnar epithelial cells with a distinct basal cell layer.
3) Acini lumina containing corpora amylacea.
4) Increased fibromuscular stroma, often around glands.
5) Preservation of basal cells helps differentiate BPH from prostatic carcinoma.



Hyperplastic nodules around the urethra in a cross section of the prostate gland



Glandular hyperplasia in Benign prostatic glands with luminal infoldings, lined by an inner layer of cuboidal to columnar secretory cells by an outer layer of basal cells

References

1. Robbins and Cotran, Basic Pathology
2. Harsh Mohan, Textbook of Pathology
3. Kumar, Abbas, Aster – Robbins Basic Pathology

Student Task:

Instructor's signature:_____ **Dated: _____/_____/_____**

Practical # 4

GRAM STAINING

Introduction:

Developed in 1884 by Hans Christian Gram, Gram staining is used to:

a. Identify bacterial morphology (shape and arrangement)
b. Differentiate bacteria into Gram-positive (purple) and Gram-negative (pink/red)

Principle:

Gram-positive bacteria have a thick peptidoglycan cell wall, which retains the crystal violet–iodine complex and appears purple

Gram-negative bacteria have a thin peptidoglycan layer, lose the primary stain during decolorization, and take up the counterstain, appearing pink/red

Requirements

Equipment

a) Glass slides
b) Wire loop
c) Spirit lamp
d) Staining rack

Sample / Specimen: Bacterial culture or clinical specimen

Reagents:

Step	Stain / Reagent	Role
Primary stain	Crystal violet	Stains all bacteria purple
Mordant	Gram's iodine	Forms insoluble complex with crystal violet
Decolorizer	Acetone-alcohol / iodine-acetone	Removes dye from Gram-negative cells
Counterstain	Safranin / diluted carbol fuchsin (1:10)	Stains Gram-negative cells pink

Procedure

Slide preparation

a) Take a clean, grease-free slide and pass over flame

b) Make a thin smear with specimen using a sterile loop
c) Allow to air dry

Fixation

Heat-fix by passing the slide over flame 3–4 times or use methanol fixation

Staining

1. Primary stain: Flood smear with crystal violet for 1 minute, then rinse with water
2. Mordant: Flood with Gram's iodine for 1 minute, then rinse
3. Decolorization: Apply acetone-alcohol for 5-10 seconds, then rinse immediately. It removes the dye mordant complex from the cell. Gram positive stays dark purple due to thick peptidoglycan layer in the wall of gram +ve bacteria and gram negative bacteria becomes colorless. Acetone breaks gentian violet iodine complex.
4. Counterstain: Flood with diluted safranin for 1 minute, then rinse and air dry

Examination

Observe under oil immersion lens (100x)

Bacteria	Color
Gram-positive	Dark purple / blue
Gram-negative	Pink / red

Common Pitfalls

1. Slide not heat-fixed → smear may wash off
2. Over heat-fixing → distorted cell morphology
3. Over-decolorization → Gram-positive appears Gram-negative
4. Under-decolorization → Gram-negative appears Gram-positive
5. Smear too thick → uneven decolorization; Gram-negative may appear Gram-positive
6. Insufficient counterstain time → Gram-negative cells appear faint

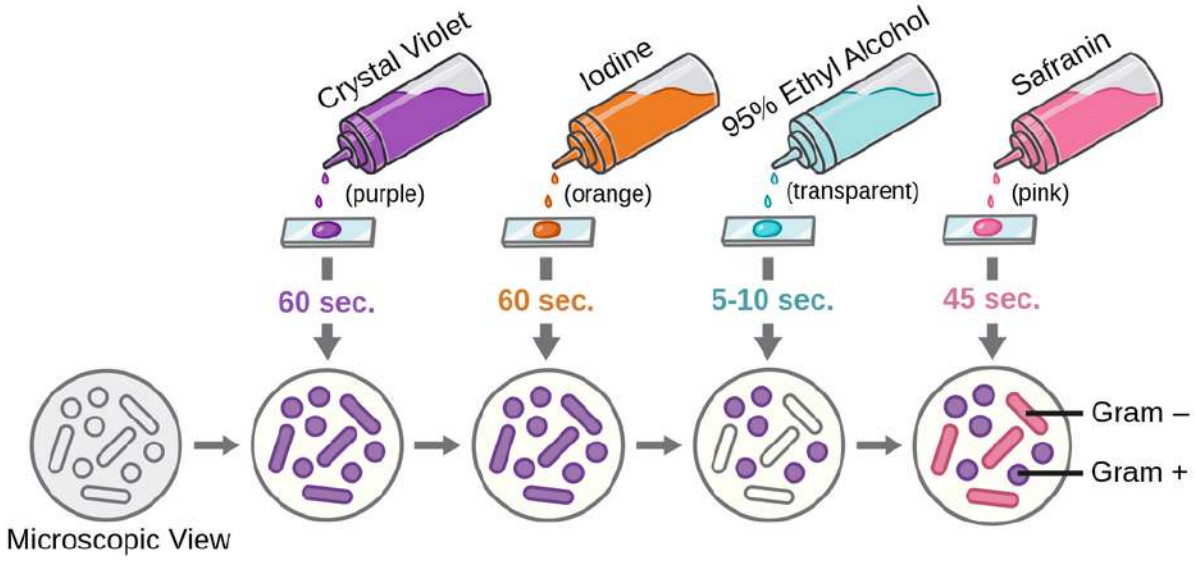
Common examples

Gram-positive bacteria (stain purple)

1. Staphylococcus
2. Streptococcus
3. Bacillus species
4. Clostridium species

Gram-negative bacteria (stain pink/red)

1. Escherichia coli
2. Salmonella species
3. Shigella species
4. Pseudomonas aeruginosa
5. Neisseria gonorrhoeae



References

1. Levinson W. Review of Medical Microbiology and Immunology.
2. Prescott LM, Harley JP, Klein DA. Microbiology.
3. AFIP Manual of Laboratory Medicine

Student Task:

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Practical # 5

CULTURE MEDIA

Introduction

Culture media are artificial nutrient preparations used to grow microorganisms under laboratory conditions. They mimic natural environments to support microbial growth, isolation, and identification.

Culture refers to visible growth of microorganisms on or in a culture medium after inoculation.

Uses in practical lab:

a. Isolate bacteria from clinical specimens
b. Identify pathogenic versus non-pathogenic organisms
c. Perform antibiotic sensitivity testing

Classification of Culture Media

A. Based on Physical State

1. Liquid (Broth) Media

   No solidifying agent; cloudy growth indicates bacteria

   Use: Biochemical tests, turbidity observation

   Examples: Peptone water, Nutrient broth

2. Solid Media

   Contains agar (1.5–2%) to support colony formation

   Use: Colony morphology, isolation of pure cultures

   Example: Nutrient agar in Petri plates

3. Semi-solid Media

   Low agar (0.5%) for motility tests and microaerophilic growth

B. Based on Function:

1. Basal / Basic Media

   Simple non-selective media that support growth of non-fastidious organisms

   Use: Routine culture, subculture, general growth

   Examples: Nutrient agar/broth, Peptone water

2. *Enriched Media*

   Basal media plus extra nutrients (blood, serum) for fastidious bacteria

   Use: Grow organisms with special requirements

   Examples: Blood agar (sheep blood) for hemolysis, Chocolate agar for Haemophilus and Neisseria

3. *Selective Media*

   Contains agents that inhibit unwanted microbes and allow specific ones to grow

   Use: Isolate pathogens from mixed specimens

   Examples: MacConkey agar (selects gram-negative), Bismuth Sulphite agar (Salmonella), Alkaline Peptone Water (Vibrio cholerae)

4. *Differential Media*

   Contains indicators to show differences between organisms (color, hemolysis)

   Use: Distinguish species based on biochemical traits

   Examples: MacConkey agar (lactose fermenters pink, non-fermenters colorless), Blood agar (alpha, beta, gamma hemolysis), EMB agar (metallic green for E. coli)

5. *Enrichment Media*

   Liquid media that increase the number of a specific organism before plating

   Use: Boost low-count pathogens to detectable levels

   Examples: Selenite F broth and Tetrathionate broth (Salmonella)

6. *Transport Media*

   Maintain viability of specimens without significant growth

   Use: Preserve clinical samples until culture

   Examples: Stuart's medium, Amie's medium, Kelly-Blair medium

Sterilization of Media

Media are sterilized by steaming or by autoclaving.

Common culture media

1. Blood Agar/ Blood Agar Plate (BAP)

Purpose: To support growth of a wide range of organisms, particularly those exhibiting hemolysis, such as streptococci, staphylococci, and pneumococci.

Preparation:

Blood is obtained from sheep, rabbit, goat, or horse.

Human blood is rarely used due to:

i. Potential antibodies against target microorganisms
ii. Risk of infection
iii. Presence of antibiotics

Ingredients:

i. Nutrient agar
ii. Minerals
iii. Defibrinated blood
iv. Vitamins

Uses:

a. Isolation and identification of hemolytic organisms
b. Observation of colony morphology and hemolysis patterns

Hemolysis Types:

a. Alpha (α) hemolysis: Partial greenish discoloration around colonies (e.g., Streptococcus pneumoniae, Streptococcus viridans). Caused by hydrogen peroxide oxidizing hemoglobin to green methemoglobin.
b. Beta (β) hemolysis: Complete clearing around colonies (e.g., Streptococcus pyogenes, Staphylococcus aureus, Pseudomonas).
c. Gamma (γ) hemolysis: No hemolysis; agar remains unchanged (e.g., Enterococcus faecalis).

2. Chocolate Agar

Purpose: Enriched medium for fastidious organisms such as Haemophilus influenzae and Neisseria species.

Preparation:

Basic nutrient agar is supplemented with lysed blood (heated at 70°C in a water bath). Avoid overheating to prevent granular texture.

Ingredients and Factors:

- Factor V (NAD): Enhances bacterial growth
- Factor X (Hemin): Required for catalase and heme-containing cytochromes

Uses: Diagnosis of H. influenzae and Neisseria species.

3. Enrichment Media

Definition: Liquid media that favor the multiplication of a specific organism by providing selective nutrients or inhibiting competitors.

Examples: Tetrathionate broth, Selenite F broth (used to enrich Salmonella species)

4. Selective Media

Definition: Contain substances that inhibit unwanted organisms while promoting the growth of desired microorganisms.

Examples:

a) Mannitol Salt Agar (MSA)

Purpose: Isolate Staphylococcus aureus from other staphylococci.

Ingredients:

i. Nutrient agar: energy source
ii. Mannitol: fermentable sugar
iii. Phenol red: pH indicator

Principle: S. aureus ferments mannitol, producing acid, which lowers pH and changes medium color from red to yellow.

b) Lowenstein-Jensen (LJ) Medium

Purpose: Isolation of Mycobacterium tuberculosis.

Type: Semisolid slant medium (butt and slope for increased surface area)

Ingredients:

i. Fresh hen's egg: protein source
ii. Salt glycerol: inhibits M. bovis
iii. Malachite green: suppresses unwanted bacteria

Incubation: 37°C for 6–8 weeks; lid loosened every 4th day for oxygen
Observation: Yellow colonies indicate M. tuberculosis growth

Note: M. leprae cannot be cultured artificially; diagnosis uses animal models and Ziehl-Neelsen staining

c) Potassium Tellurite Medium

Purpose: Isolate Corynebacterium diphtheriae (causes pharyngitis, endocarditis in children <5 years)

Ingredients: Chocolate medium + 0.04% potassium tellurite

Principle: Tellurite reduces to metallic tellurium; colonies appear black, often arranged in "Chinese letter" patterns on Gram stain

Other species: C. gravis, C. intermedius, C. mitis

5. Differential Media

Definition: Contain indicators to distinguish closely related microorganisms based on biochemical reactions.

Examples:

1. Blood agar: hemolysis patterns
2. MacConkey agar: lactose fermenters (pink colonies) vs non-fermenters (colorless)
3. EMB agar: metallic green colonies for E. coli

Uses: Differentiation of closely related species or strains based on observable characteristics.

Media	Type	Use
Nutrient Agar	Basic	Isolated colonies for identification
Blood Agar	Enriched & Differential	β-hemolysis seen as clear zones
MacConkey Agar	Selective + Differential	Pink vs colorless colonies
Selenite Broth	Enrichment	Enrich Salmonella before plating
Amie's Medium	Transport	Keeps specimen alive for later culture

Blood Agar

Blood Agar

Nutrient Agar

Macconkey Agar

LJ (Löwenstein-Jensen) medium

References

1. Levinson W. Review of Medical Microbiology and Immunology.
2. Prescott LM, Harley JP, Klein DA. Microbiology.
3. AFIP Manual of Laboratory Medicine

Student Task:

Instructor's signature:_____ **Dated: _____/_____/_____**

BLOCK – E

INFLAMMATION, INFECTION & AUXILIARY DENTAL MATERIALS MODULE

Practical # 6

ACUTE INFLAMMATION – ACUTE APPENDICITIS

Aim: To study acute inflammation with reference to acute appendicitis and to identify histopathological features in tissue section.

Introduction:

Inflammation: A protective/ potentially harmful response of vascularized tissue involving host cells, blood vessels, proteins and other mediators that is intended to eliminate the initial cause of cell injury, as well as the necrotic cells and tissues resulting from the original insult and to initiate process of repair. May lead to harmful consequences esp. chronic inflammation, - melodramatically referred to it as "the silent killer."

Types of Inflammation:

- Acute inflammation
- Chronic inflammation

Acute inflammation:

It is an immediate and rapid response of vascularized tissue to harmful stimuli. It usually begins within minutes of injury and lasts for a short duration, ranging from a few hours to a few days. The reaction is characterized by increased vascular permeability leading to exudation of fluid and plasma proteins, resulting in edema, along with migration of leukocytes, predominantly neutrophils (polymorphonuclear leukocytes), to the site of injury. The process is generally self-limited, causes minimal tissue damage, and forms an essential part of the innate immune response.

Causes of Acute Inflammation:

1. Mechanical trauma such as cutting and crushing
2. Chemical injury due to acids, alkalis and corrosive substances
3. Physical injury due to heat, cold, radiation and ultraviolet light
4. Infections caused by bacteria, viruses and parasites
5. Immune-mediated injury

Cardinal Signs of Acute Inflammation:

1. Rubor - Redness
2. Calor -Heat
3. Dolor- Pain
4. Tumor- Swelling

5. Functio Laesa - Loss of function

Acute Appendicitis

The vermiform appendix is a narrow, worm-like diverticulum arising from the caecum. It usually measures 2–20 cm in length and contains abundant lymphoid tissue in its wall, making it prone to inflammation.

Layers of Appendix: From outer to inner layer

1. Serosa
2. Muscularis externa- inner circular & outer longitudinal muscles
3. Submucosa - notable for lymphoid follicles
4. Mucosa

Pathogenesis:

Acute appendicitis commonly results from luminal obstruction by lymphoid hyperplasia, fecolith, parasites or foreign bodies. Obstruction leads to increased intraluminal pressure, vascular compromise, bacterial overgrowth and acute inflammation.

Morphology:

Gross Appearance: In early acute appendicitis, the appendix is swollen due to edema and congestion. The serosal surface appears dull, granular and erythematous. Subserosal blood vessels are congested. The normal glistening appearance of the mucosa is lost. In advanced cases, the appendix may show areas of hemorrhage, ulceration or greenish-black discoloration indicating gangrene.

Microscopic Appearance: Variable acute inflammation with predominance of neutrophils; involves some or all layers of the appendiceal wall

Early acute appendicitis:

- Mucosal erosions and scattered crypt abscesses
- Congestion of subserosal blood vessels
- Edema of the wall
- Perivascular infiltration by neutrophils
- Neutrophils present in mucosa, submucosa and muscularis

Acute suppurative appendicitis

- Dense infiltration of neutrophils throughout the wall
- Formation of focal abscesses

- Muscle fiber separation due to edema (muscle splitting)

Gangrenous appendicitis:

- Extensive hemorrhage
- Ulceration of mucosa
- Areas of coagulative necrosis
- Loss of normal tissue architecture

Diagnostic criterion: Presence of neutrophilic infiltration of the muscularis propria is essential for diagnosis of acute appendicitis.

Observe Under Microscope:

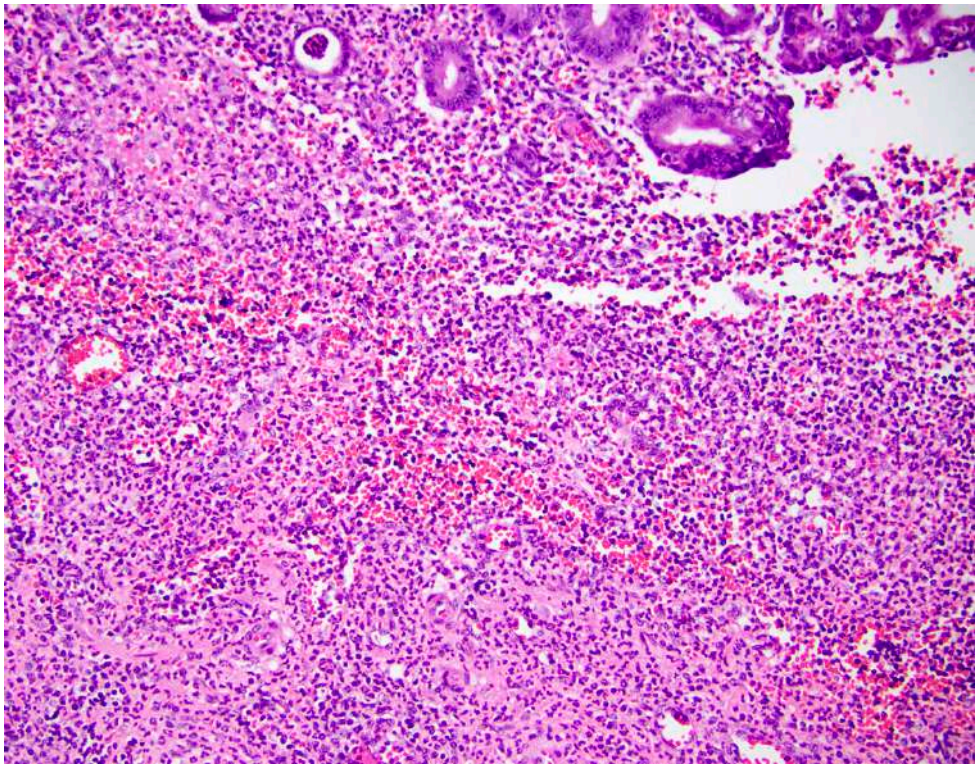
On low power examination, the appendiceal wall appears thickened with congestion and edema. On high power examination, numerous neutrophils are seen infiltrating mucosa, submucosa and muscularis layers. Muscle fibers appear separated due to edema. Mucosal ulceration may be present. In severe cases, areas of necrosis and hemorrhage are seen.

Points of Identification:

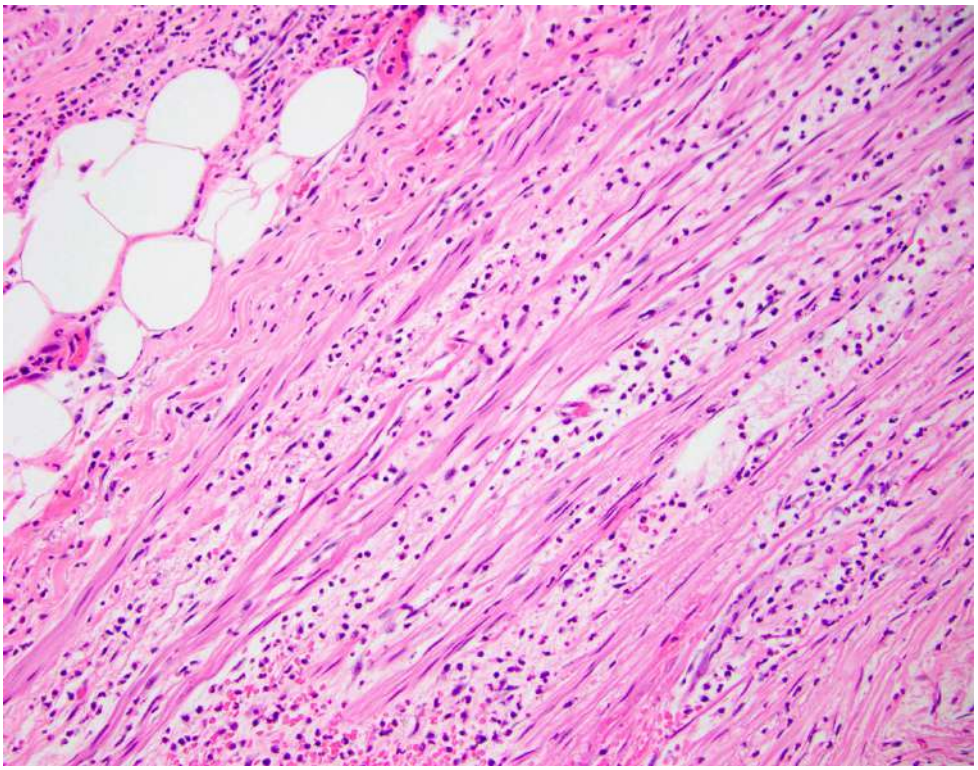
1. Neutrophilic infiltration of muscle layer; most important
2. Muscle splitting due to edema
3. Disruption or ulceration of mucosa
4. Congested blood vessels
5. Occasionally an obstructive element in lumen

References:

1. Robbins and Cotran, Basic Pathology
2. Harsh Mohan, Textbook of Pathology
3. Kumar, Abbas, Aster – Robbins Basic Pathology



Marked neutrophilic infiltration of appendiceal wall



Marked neutrophilic infiltration of appendiceal muscle layer

Student Task:

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Practical # 7

BACTERIAL MOTILITY

Aim:

To determine the motility of bacteria and differentiate between motile and non-motile organisms

Introduction:

Bacterial motility is an important phenotypic characteristic that contributes to colonization, invasion, biofilm formation, and pathogenicity. Motility is usually mediated by flagella, though other mechanisms such as axial filaments and gliding motility may also occur. Demonstration of motility is a valuable preliminary test in microbiological identification and aids in differentiating morphologically similar organisms.

Principle:

When live bacteria are suspended in a liquid medium and observed under a microscope, motile organisms exhibit true directional movement and change their position within the field. Non-motile organisms do not show active movement and may only demonstrate Brownian motion, which is a random, oscillatory movement caused by collision with water molecules and does not result in a change of position.

Common motile organisms:

1. Salmonella species
2. Escherichia coli
3. Vibrio cholerae
4. Proteus species
5. Listeria monocytogenes
6. Campylobacter species
7. Treponema pallidum
8. Leptospira
9. Borrelia species

Methods of demonstrating motility:

a. Hanging drop method
b. Semi-solid motility media such as SIM (Sulfide Indole Motility) medium and motility agar with TTC (Triphenyl Tetrazolium Chloride) indicator

This practical describes the hanging drop method.

Hanging Drop Method:

Requirements

1. Clean glass slide/ hollow-ground (concavity) slide
2. Cover slip
3. Normal saline or broth culture
4. Inoculating wire loop
5. Plasticine or petroleum jelly
6. Compound microscope
7. Fresh bacterial culture

Procedure:

1. Clean a glass slide thoroughly and place a circular ring of plasticine or petroleum jelly on it or use hollow-ground (concavity) slide
2. Using a sterile inoculating loop, prepare a light suspension of the bacterial culture in normal saline.
3. Place a small drop of this suspension in the center of a clean cover slip.
4. Invert the glass slide over the cover slip so that the plasticine ring surrounds the drop.
5. Gently press the slide to seal the edges.
6. Carefully invert the entire assembly so that the drop hangs freely from the cover slip.
7. Place the preparation on the microscope stage.
8. Focus initially using the 10× objective to locate the hanging drop.
9. Examine under the 40× objective, partially closing the condenser iris diaphragm to improve contrast.
10. Observe the movement of organisms, especially near the margins of the drop.

Results and interpretation:

a. Motile organisms show active, directional movement across the field with a definite change in position.
b. Non-motile organisms show no true movement and may exhibit only Brownian motion, characterized by a to-and-fro oscillation around a fixed point.

Precautions

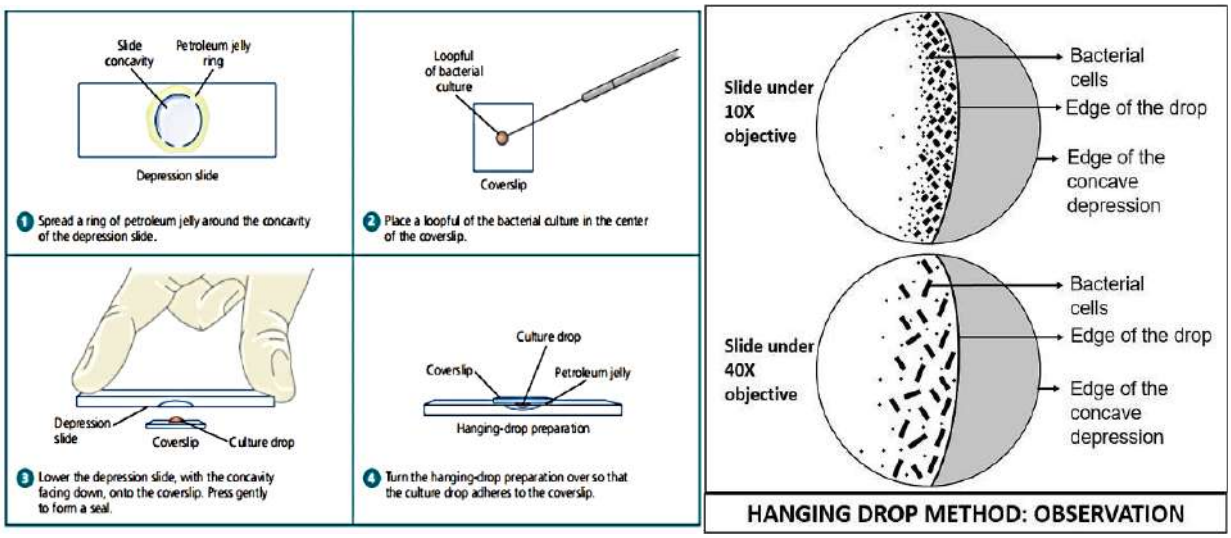
1. Use fresh bacterial cultures.
2. Ensure the drop does not touch the slide.
3. Avoid air bubbles in the preparation.
4. Adjust illumination properly for better contrast.

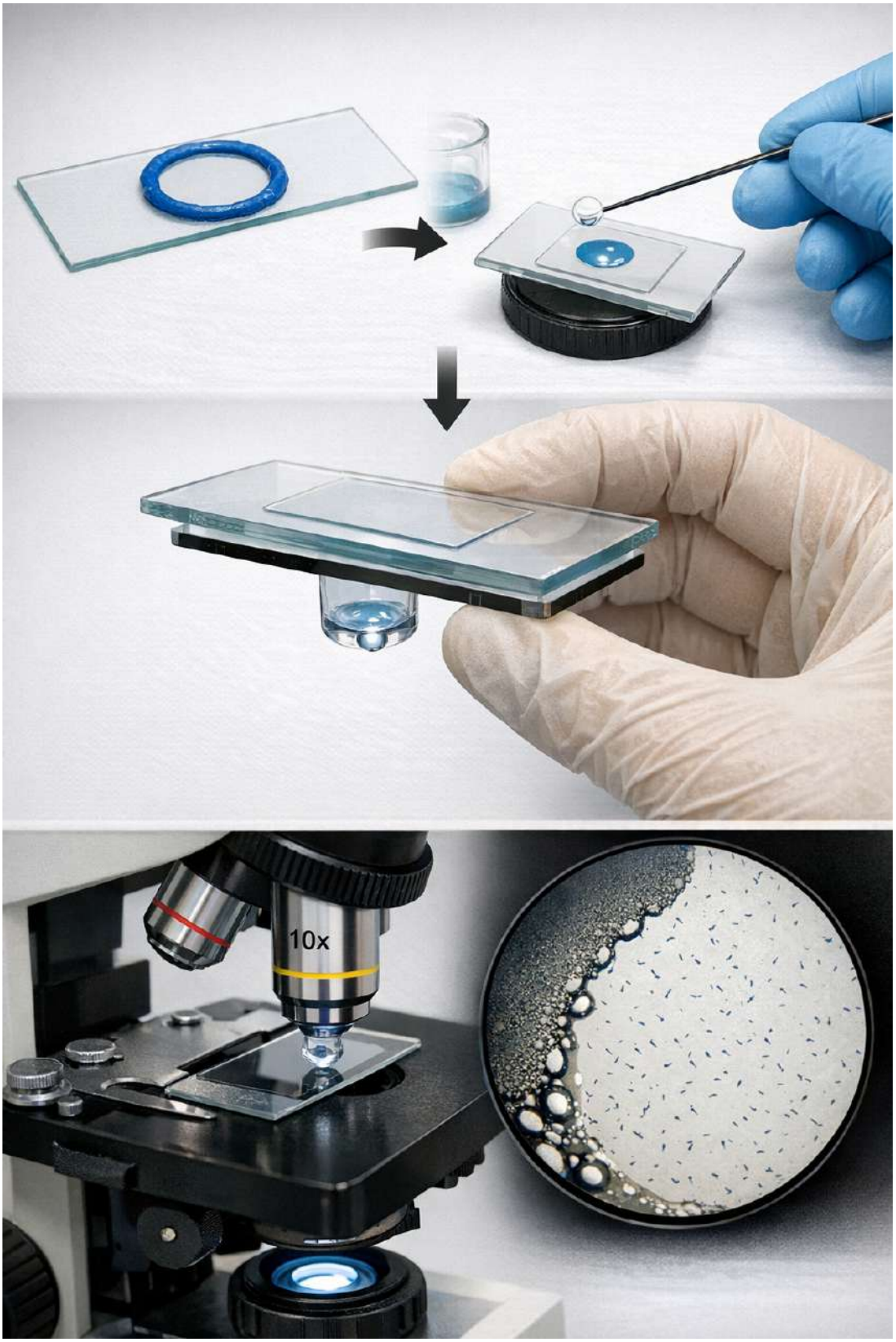
Limitations

1. Brownian motion may be confused with true motility.
2. Old or damaged cultures may show reduced or absent motility.
3. The hanging drop method carries a higher risk of aerosol exposure.
4. The method does not indicate the type or arrangement of flagella

Utility and clinical significance:

1. The motility test is useful in the preliminary identification of bacteria in clinical microbiology.
2. It helps differentiate closely related organisms such as Salmonella and Shigella.
3. Motility is often associated with increased virulence and invasiveness of pathogens.
4. Culture-based motility methods are preferred in routine diagnostic laboratories for safety and reliability, while microscopic methods are useful for rapid screening.





Step By Step Hanging Drop Method

Student Task:

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Practical # 8

BIOCHEMICAL TESTS

Introduction:

Biochemical tests are laboratory procedures used to identify and differentiate bacteria based on their metabolic activities and enzyme production. They help in diagnosis, treatment planning, and epidemiological studies. In routine diagnostic laboratories, biochemical tests form a bridge between culture characteristics and definitive bacterial identification.

Significance of Biochemical Tests:

- Help in identification and differentiation of bacteria
- Assist in confirmation of pathogenic organisms
- Useful in guiding appropriate antimicrobial therapy
- Important for academic learning and practical examinations

CATALASE TEST

Principle:

Some bacteria produce the enzyme catalase, which breaks down hydrogen peroxide into water and oxygen. The release of oxygen in the form of bubbles indicates a positive reaction. This test is mainly used to differentiate staphylococci from streptococci.

Chemical reaction:

$$2\,H_2O_2 \xrightarrow{\text{Catalase}} 2\,H_2O + O_2$$

Hydrogen Peroxide — Water — Oxygen

Requirements:

- 3% hydrogen peroxide
- Clean glass slide or test tube
- Sterile wooden stick or glass rod
- Bacterial culture

Methods:

The test can be performed by slide method or tube method.

a. **Slide Method**
    - Place one drop of 3% hydrogen peroxide on a clean glass slide.
    - Using a sterile wooden stick or glass rod, pick a small amount of the test organism.
    - Mix the organism with hydrogen peroxide.
    - Observe for immediate effervescence.
b. **Tube Method**
    - Take a clean test tube and add 1 ml of 3 % hydrogen peroxide.
    - Using a sterile loop, add the test organism to the tube.
    - Observe for formation of oxygen bubbles.

Interpretation

- Immediate bubbling indicates catalase positive reaction.
- No bubble formation indicates catalase negative reaction.

Positive organisms

- Staphylococcus aureus
- Staphylococcus epidermidis
- Staphylococcus saprophyticus

Negative organisms

- Streptococcus species
- Enterococcus species

Controls:

- Positive control: Staphylococcus aureus
- Negative control: Streptococcus pyogenes

Catalase Test

1. Place a drop of 3% H_2O_2

2. Add bacterial colony using a sterile loop

3. H_2O_2 → H_2O, O_2

Interpretation

Staphyllococcus spp

POSITIVE

Coagulum forms

NEGATIVE

Staphylococcus spp

Staphyllococcus spp

NEGATIVE

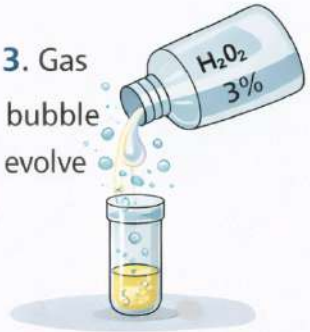
No bubbles ceem

Catalase Test (Tube Method)

1. Sterilize wire loop

2. Transfer the bacterial colony into the test tube containing 3% H_2O_2

3. Gas bubble evolve



Interpretation

TEST

Clotted plasma

Staphyllococcus spp

NEGATIVE

Unclotted plasma

Streptococcus spp

COAGULASE TEST

Principle:

Coagulase is an enzyme that converts fibrinogen in plasma into fibrin, resulting in clot formation. This test is used to differentiate Staphylococcus aureus from other staphylococci.

Types of Coagulase:

- Bound coagulase (clumping factor) detected by slide test
- Free coagulase detected by tube test

Requirements:

- Fresh human or rabbit plasma
- Clean glass slide
- Test tubes
- Bacterial culture

Methods:

- The test can be performed by slide method or tube method.

a. Slide Method

- Place a drop of normal saline on two ends of a clean slide.
- Emulsify the test organism in both drops.
- Add a drop of plasma to one suspension.
- Mix gently and observe for clumping within 5–10 seconds.
- The second drop serves as control for autoagglutination.

b. Tube Method

- Take 0.5 ml of diluted plasma (1:6) in a test tube.
- Add 4–5 drops of broth culture or bacterial colony suspension.
- Incubate at 35–37°C.
- Examine for clot formation at 1, 3, and 6 hours.

Interpretation

- Clot formation indicates coagulase positive.
- No clot formation indicates coagulase negative.

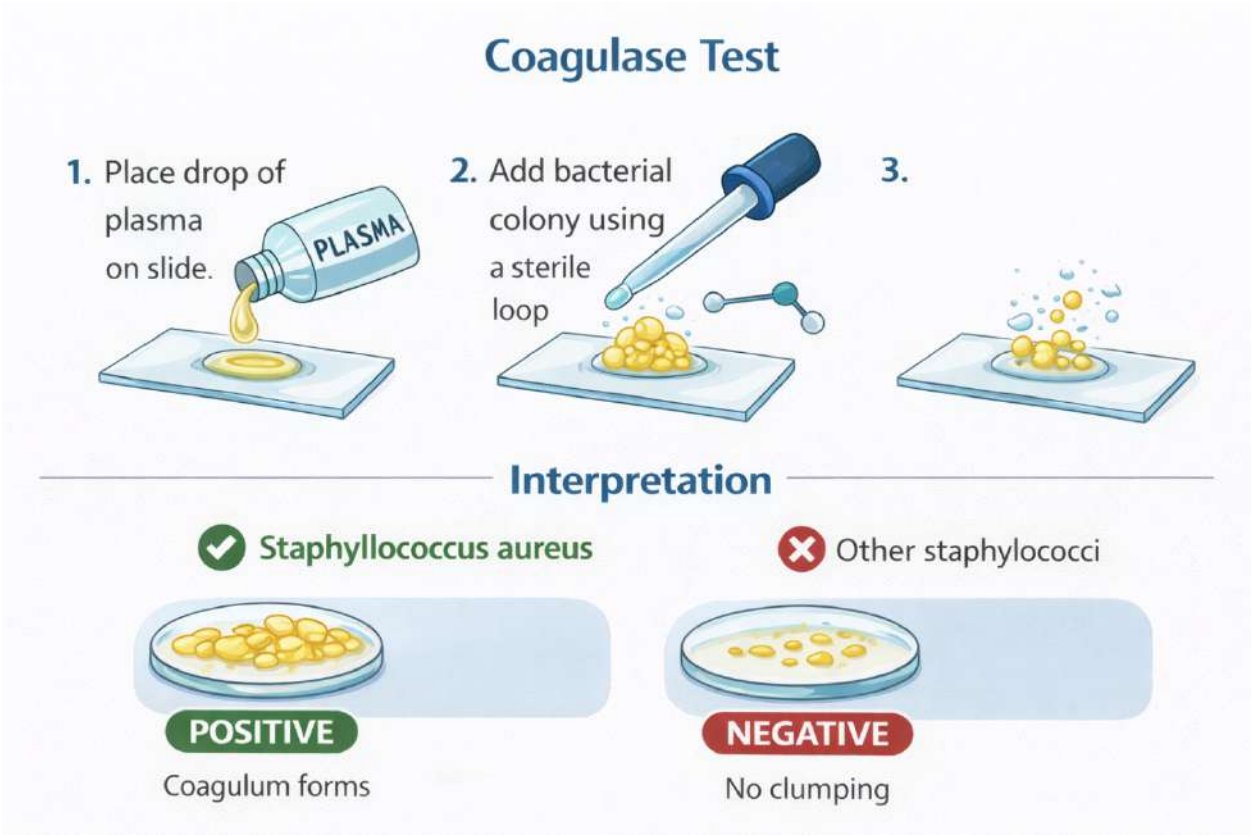
Positive organism

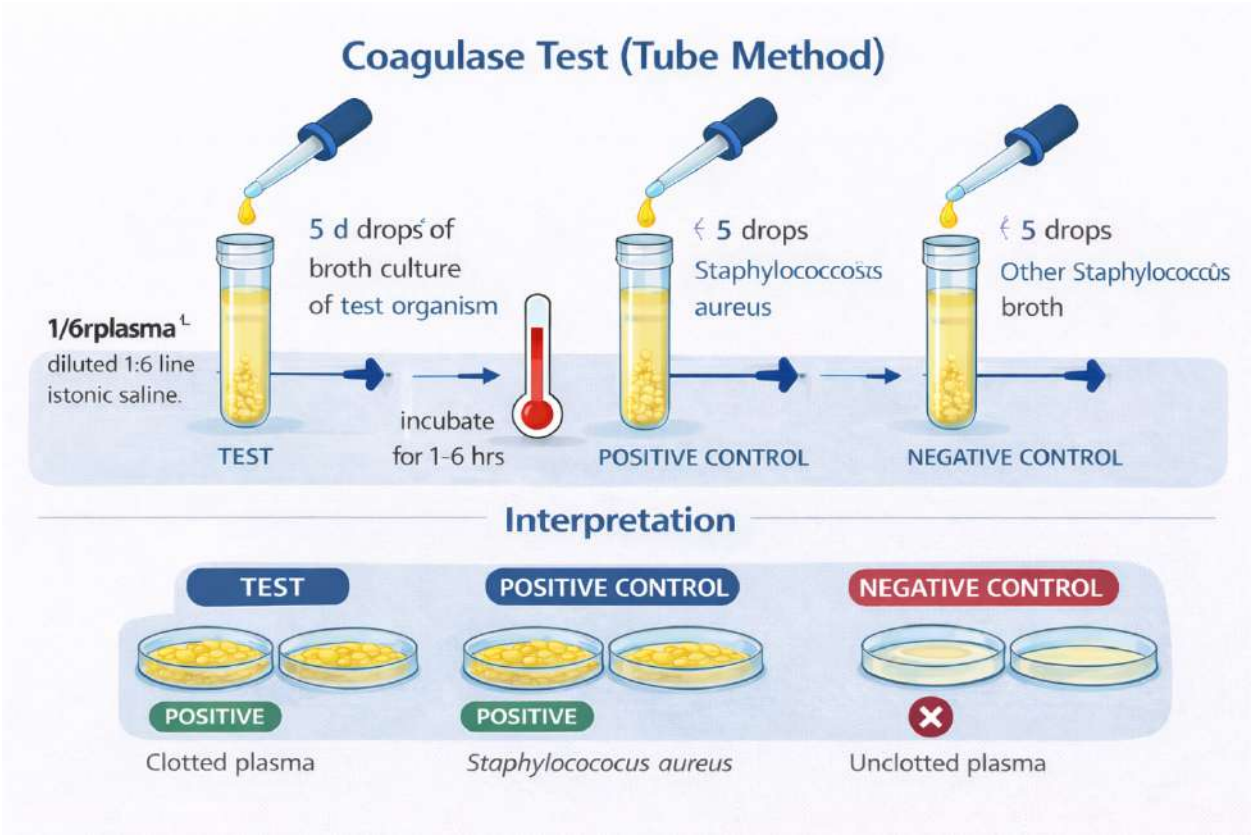
- Staphylococcus aureus

Negative organisms

- Staphylococcus epidermidis
- Staphylococcus saprophyticus

Note: *If slide test is negative, tube test must be performed before reporting the organism as coagulase negative.*





OXIDASE TEST

Principle:

The oxidase test detects the presence of cytochrome c oxidase enzyme in bacteria. Organisms producing this enzyme oxidize the reagent to produce a purple colored compound. This test helps in identification of organisms such as Pseudomonas, Neisseria, and Vibrio species.

Reagent:
Tetramethyl-p-phenylenediamine dihydrochloride [Freshly prepared 10 g/L solution of tetramethyl-p-phenylenediaminedihydrochloride (Sigma).]

Requirements:

- Oxidase reagent
- Filter paper or blotting paper
- Glass slide or petri dish
- Wooden stick or glass rod
- Bacterial culture

Procedure:

- Place a piece of filter paper on a clean slide or petri dish.
- Add 2–3 drops of oxidase reagent to the paper.
- Using a sterile wooden stick, pick a colony from culture plate.
- Smear the organism onto the reagent-soaked paper.
- Observe for color change within 5–10 seconds.

Interpretation:

- Development of blue or purple color indicates oxidase positive.
- No color change indicates oxidase negative.

Positive organisms:

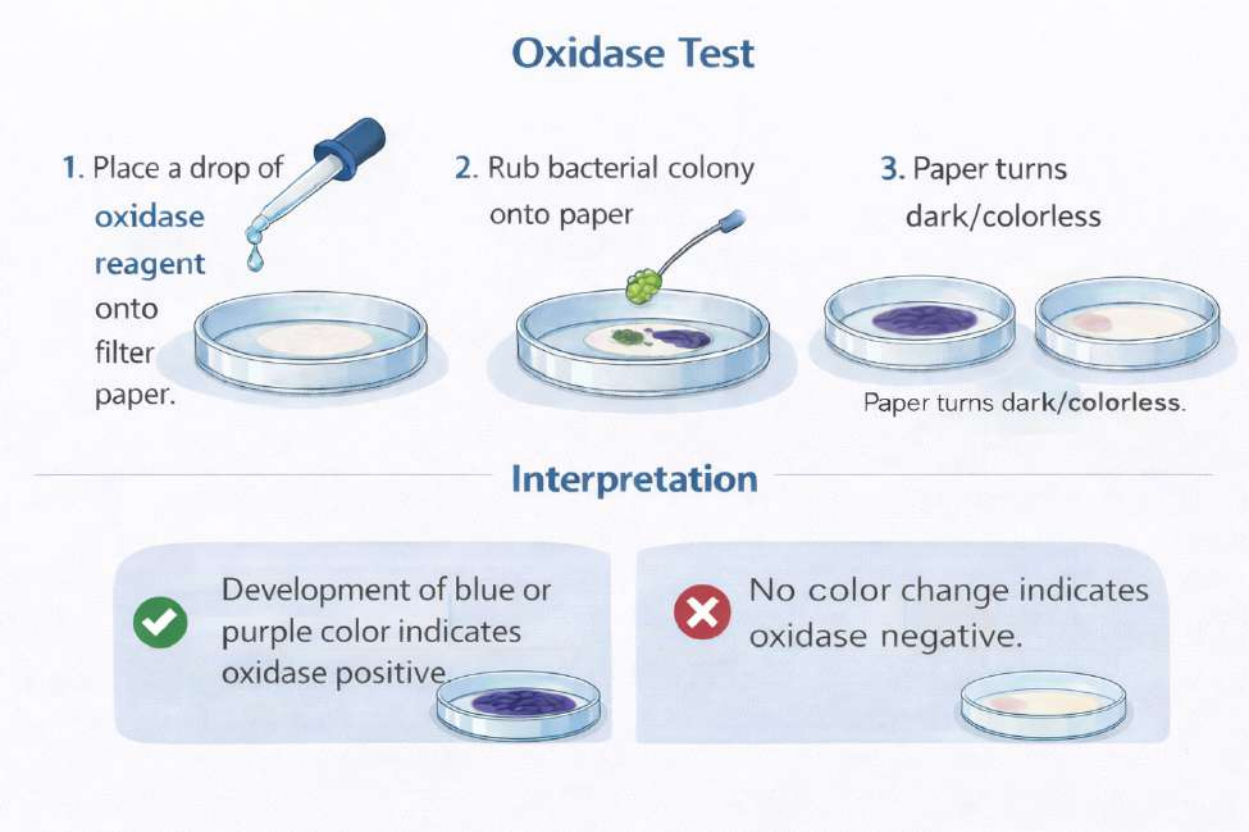
- Pseudomonas aeruginosa
- Neisseria gonorrhoeae
- Vibrio cholera
- Campylobacter jejuni

Negative organisms:

- Escherichia coli
- Klebsiella species
- Salmonella species

Controls:

- Positive control: Pseudomonas aeruginosa
- Negative control: Escherichia coli



Note:

- Use wooden stick instead of metal loop for oxidase test to avoid false positive results.
- Blood agar containing glucose may give false oxidase reactions.
- Tube catalase method is preferred when testing organisms from blood agar to avoid false positives due to red blood cells.

Biochemical tests such as catalase, coagulase, and oxidase are simple, rapid, and reliable methods for bacterial identification. Proper technique, correct interpretation, and use of controls are essential for accurate results. These tests are routinely asked in BDS practical examinations.

References

- Ananthanarayan and Paniker's Textbook of Microbiology, latest edition
- Levinson, Review of Medical Microbiology and Immunology, latest edition
- AFIP Manual of Laboratory Medicine
- CDC Laboratory Identification of Bacteria Guidelines

Student Task:

Instructor's signature:_____ **Dated: _____/_____/_____**

Practical # 9

PLASMODIUM – LIFE CYCLE AND IDENTIFICATION IN BLOOD SMEAR

Aim: To study the life cycle of Plasmodium and to identify malaria parasite in peripheral blood smear.

Organism: Plasmodium species causing malaria in humans.

- Plasmodium vivax,
- Plasmodium falciparum,
- Plasmodium malariae,
- Plasmodium ovale,
- Plasmodium knowlesi

Hosts:

- Definitive host: Female Anopheles mosquito (sexual cycle occurs)
- Intermediate host: Human (asexual cycle occurs)

Life cycle

The life cycle of Plasmodium is completed in two hosts and consists of three main phases:

1. Pre-erythrocytic (hepatic) schizogony,
2. Erythrocytic schizogony and
3. Sexual cycle (sporogony)

1. Human phase (asexual cycle)

A. Infective stage:

The infective stage for humans is the sporozoite. When an infected female Anopheles mosquito bites a human, sporozoites present in its saliva are injected into the bloodstream.

B. Pre-erythrocytic (hepatic) schizogony:

The sporozoites rapidly enter liver cells (hepatocytes). Inside the liver cells, they grow and multiply asexually to form schizonts over a period of 5–16 days depending on the species. Each schizont contains thousands of merozoites.

In Plasmodium vivax and Plasmodium ovale, some parasites remain dormant in the liver as hypnozoites, which may reactivate weeks or months later causing relapse.

C. Erythrocytic schizogony:

Merozoites are released into the bloodstream and invade red blood cells. Inside red blood cells, the parasite passes through ring form, trophozoite and schizont stages. The infected red blood cells rupture, releasing new merozoites which infect fresh red blood cells. This cyclic rupture causes fever and clinical manifestations of malaria.

The duration of erythrocytic cycle varies from 24 to 72 hours depending on species.

D. Gametocyte formation:

Some merozoites do not continue asexual multiplication. Instead, they differentiate into sexual forms called gametocytes, which circulate in the peripheral blood.

2. Mosquito phase (sexual cycle)

A. Ingestion of gametocytes:

When a female Anopheles mosquito bites an infected human, it ingests red blood cells containing gametocytes.

B. Gametogenesis and fertilization:

In the mosquito stomach, red blood cells rupture releasing gametocytes. Male gametocytes form microgametes and female gametocytes form macrogametes. Fusion of male and female gametes produces a diploid zygote.

C. Ookinete and oocyst formation:

The zygote elongates to form a motile ookinete, which penetrates the mosquito midgut wall and develops into an oocyst beneath the outer lining.

D. Sporogony:

Within the oocyst, repeated division occurs producing thousands of sporozoites. After 8–15 days, the oocyst ruptures releasing sporozoites into the mosquito body cavity. These sporozoites migrate to the salivary glands of the mosquito.

Infective Stage:

- Humans: Sporozoite
- Mosquito: Gametocyte

Pathogenesis: Destruction of red blood cells during erythrocytic schizogony leads to anemia, fever, chills and splenomegaly. Plasmodium falciparum may cause severe complications such as cerebral malaria.

Laboratory Diagnosis:

1. Peripheral blood smear examination
2. Rapid diagnostic tests detecting malarial antigens

Prevention and Control: Early diagnosis and complete treatment Use of insecticide-treated bed nets Indoor residual spraying Elimination of mosquito breeding sites

Malaria

Malaria is a protozoal disease caused by parasites of the genus Plasmodium and transmitted to humans by the bite of an infected female Anopheles mosquito. The disease is characterized by fever with chills, anemia and splenomegaly. Severity depends on the Plasmodium species and host immunity.

Important Species of Plasmodium

1. *Plasmodium vivax:* Most common species in India. Causes benign tertian malaria. Infects young red blood cells. Schüffner's dots present. Can cause relapse due to hypnozoites.
2. *Plasmodium falciparum:* Most dangerous species. Causes malignant tertian malaria. Infects red blood cells of all ages. No relapse but causes severe complications such as cerebral malaria. Appliqué forms and banana-shaped gametocytes seen.
3. *Plasmodium malariae:* Causes quartan malaria. Infects older red blood cells. Band-shaped trophozoites seen.
4. *Plasmodium ovale:* Rare. Causes mild tertian malaria. Oval red blood cells with fimbriated edges. Schüffner's dots present.
5. *Plasmodium knowlesi:* Zoonotic malaria. Causes daily fever (quotidian malaria). Morphology resembles Plasmodium malariae.

Identification in Peripheral Blood Smear

Peripheral blood smear examination is the gold standard for laboratory diagnosis of malaria.

Two types of blood films are prepared: Thick and thin

Thin blood film:

Used for species identification. Red blood cells remain intact. Parasite morphology is clearly seen.

Observe under microscope: Under oil immersion objective, red blood cells containing intracellular parasites are seen.

Ring-shaped trophozoites are observed inside RBCs.

In Plasmodium vivax and Plasmodium ovale, RBCs appear enlarged and show fine reddish granules known as Schüffner's dots.

In Plasmodium falciparum, multiple delicate ring forms may be seen within a single RBC and characteristic banana-shaped gametocytes may be observed.

In Plasmodium malariae, band-shaped trophozoites are seen stretching across the RBC.

Thick blood film:

Used for detection of malaria parasites when parasitemia is low. Red blood cells are lysed during staining. Parasites appear concentrated in the smear. Species identification is difficult.

Observe under microscope:

On examination, red blood cells are not visible.

Darkly stained malaria parasites are seen scattered in the field.

Ring forms, trophozoites or gametocytes may be observed as dense structures against a pale background.

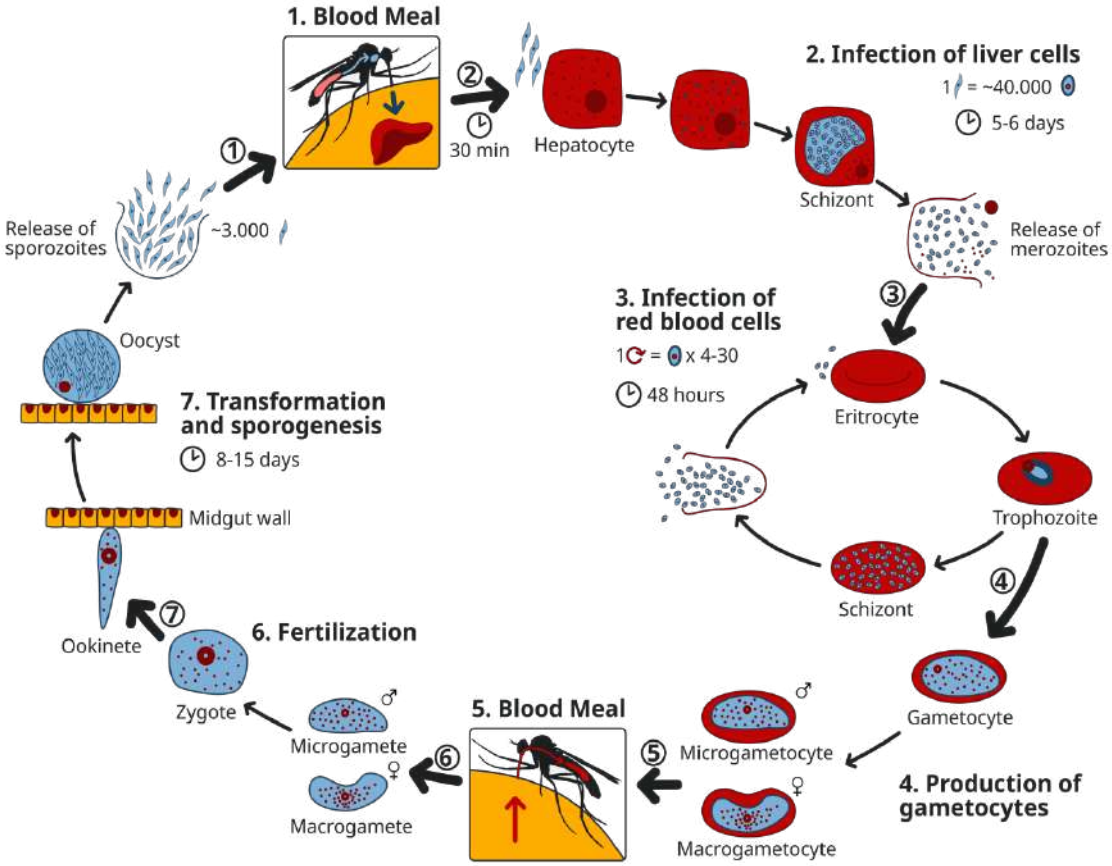
Thick film is mainly used to confirm presence of malaria parasite.

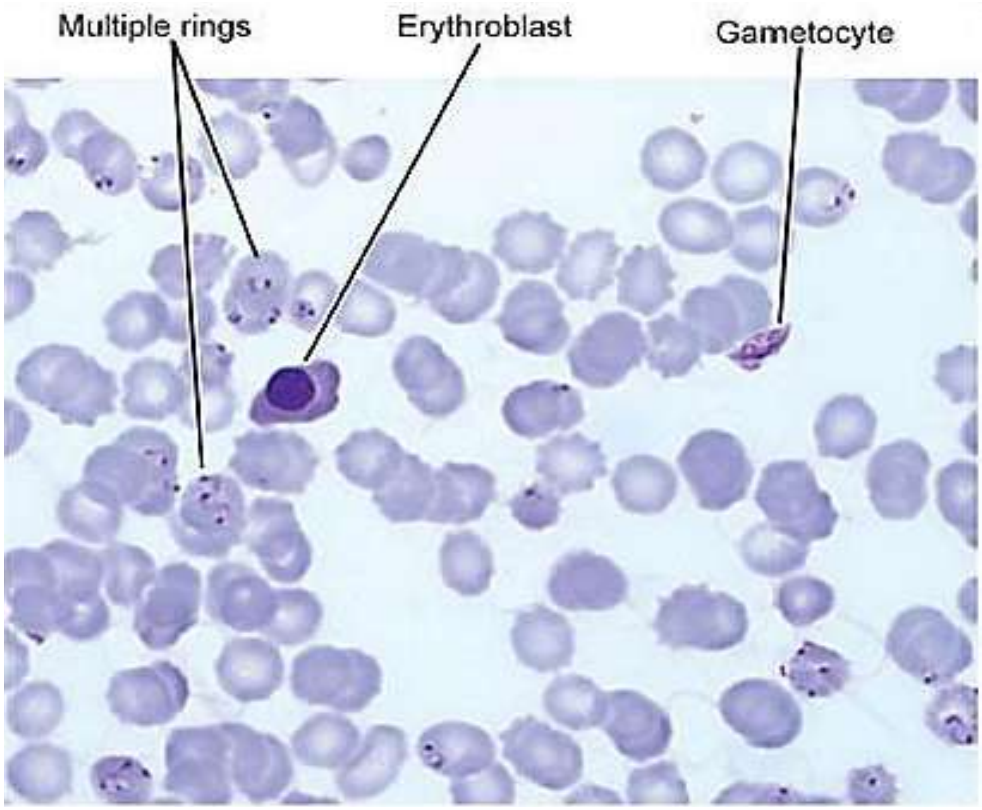
Practical Identification Points:

1. If ring forms are seen inside rbcs – malaria parasite present.
2. If multiple ring forms per RBC – suggest Plasmodium falciparum.
3. If enlarged rbcs with Schüffner's dots – Plasmodium vivax or Plasmodium ovale.
4. If banana-shaped gametocytes – Plasmodium falciparum.
5. If band-shaped trophozoites – Plasmodium malariae.

References

1. Levison W. Review of Medical Microbiology and Immunology. Mcgraw-Hill Education.
2. Ananthanarayan R, Paniker CKJ. Textbook of Microbiology. Universities Press.
3. World Health Organization. Malaria Fact Sheets and Guidelines.
4. Centers for Disease Control and Prevention. Malaria Biology and Life Cycle.
5. Text & Practical Manual of Pathology, Part 1


1. Blood Meal
2. Infection of liver cells
1 = ~40.000
5-6 days
30 min
Hepatocyte
Schizont
Release of merozoites
Release of sporozoites
~3.000
3. Infection of red blood cells
1 = x 4-30
48 hours
Eritrocyte
Trophozoite
Schizont
4. Production of gametocytes
Gametocyte
Microgametocyte
Macrogametocyte
5. Blood Meal
6. Fertilization
Microgamete
Macrogamete
Zygote
Ookinete
7. Transformation and sporogenesis
8-15 days
Midgut wall
Oocyst


Multiple rings
Erythroblast
Gametocyte

Student Task:

Instructor's signature:_____ **Dated: _____/_____/_____**

Practical # 10

LEISHMANIA

1. Introduction

Leishmaniasis is a vector-borne parasitic disease caused by obligate intracellular protozoa of the genus Leishmania. The disease is transmitted to humans by the bite of an infected female sandfly (genus Phlebotomus in the Old World and Lutzomyia in the New World).

Approximately 21 species pathogenic to humans are known. Important species include:

- Leishmania donovani complex – L. donovani, L. infantum
- Leishmania tropica
- Leishmania mexicana
- Leishmania braziliensis

Reservoir: Domestic animals, especially dogs, act as important reservoir hosts in many regions. In India, humans are the main reservoir for L. donovani.

2. Morphological Forms

A. Amastigote (Leishman–Donovan body)

- Seen in human tissues
- Shape: Round or oval, 2–4 µm
- Non-flagellated
- Found inside macrophages
- Contains nucleus and kinetoplast
- This is the diagnostic stage

B. Promastigote

- Seen in sandfly and in culture (NNN medium)
- Elongated, spindle-shaped body
- Free anterior flagellum present
- This is the infective stage for humans

3. Life Cycle of Leishmania

A. Human Host

1. Infected sandfly injects promastigotes during blood meal (infective stage)
2. Promastigotes are phagocytosed by neutrophils at the bite site

3. Parasites are released and taken up by macrophages
4. Inside macrophages, promastigotes transform into amastigotes (diagnostic stage)
5. Amastigotes multiply by binary fission and infect other reticuloendothelial cells of liver, spleen, and bone marrow

B. Sandfly Host

1. Sandfly ingests infected macrophages during blood meal
2. Amastigotes are released in the midgut of sandfly
3. They transform into promastigotes
4. Promastigotes multiply and migrate to foregut and proboscis
5. Sandfly becomes infective and transmits parasite during next bite

4. Types of Leishmaniasis

A. Visceral Leishmaniasis (Kala-azar)

- Caused by Leishmania donovani
- Incubation period: 2–8 months
- Affected organs: spleen, liver, bone marrow

Clinical features:

- Prolonged fever
- Massive splenomegaly
- Hepatomegaly
- Anemia and weight loss
- Darkening of skin in Indian kala-azar

Prognosis:

- Fatal if untreated

B. Cutaneous Leishmaniasis

- Caused by Leishmania tropica and Leishmania mexicana
- Produces skin ulcers at the site of bite

Clinical features:

- Painless ulcer with raised margins
- Heals slowly leaving scar

C. Mucocutaneous Leishmaniasis

- Caused by Leishmania braziliensis
- Occurs months to years after healing of skin lesion
- Involves mucous membranes of nose, palate, and pharynx

Clinical importance:

- Destructive lesions
- Does not heal spontaneously
- Requires treatment

5. Epidemiology and Transmission

- Vector: Female sandfly (Phlebotomus and Lutzomyia)
- Reservoirs:
    - Dogs, rodents, small carnivores in Africa, Middle East, China
    - Humans in India

6. Pathogenesis

- Amastigotes multiply within macrophages
- Destruction of reticuloendothelial cells
- Involvement of liver, spleen, and bone marrow
- Leads to immunosuppression

7. Laboratory Diagnosis

A. Direct Microscopy

- Demonstration of amastigotes inside macrophages
- Specimens used:
    - Bone marrow aspirate
    - Splenic aspirate
    - Skin lesion smear

B. Culture

- NNN (Novy–MacNeal–Nicolle) medium

C. Serological Tests

- rK39 dipstick test
- ELISA

D. Skin Test

- Montenegro test indicating past exposure

8. Points of Identification of Leishmania under

- Numerous intracellular amastigotes seen within macrophages
- Each amastigote is small, round to oval in shape
- Presence of nucleus and rod-shaped kinetoplast
- Organisms are non-flagellated
- Background shows macrophages of bone marrow or tissue smear

9. Treatment

- Sodium stibogluconate
- Liposomal Amphotericin B is drug of choice for visceral leishmaniasis
- Miltefosine is an effective oral drug

10. Prevention and Control

- Protection from sandfly bites
- Use of insecticides and vector control
- Early detection and treatment of cases
- No effective vaccine available

11. Important Points

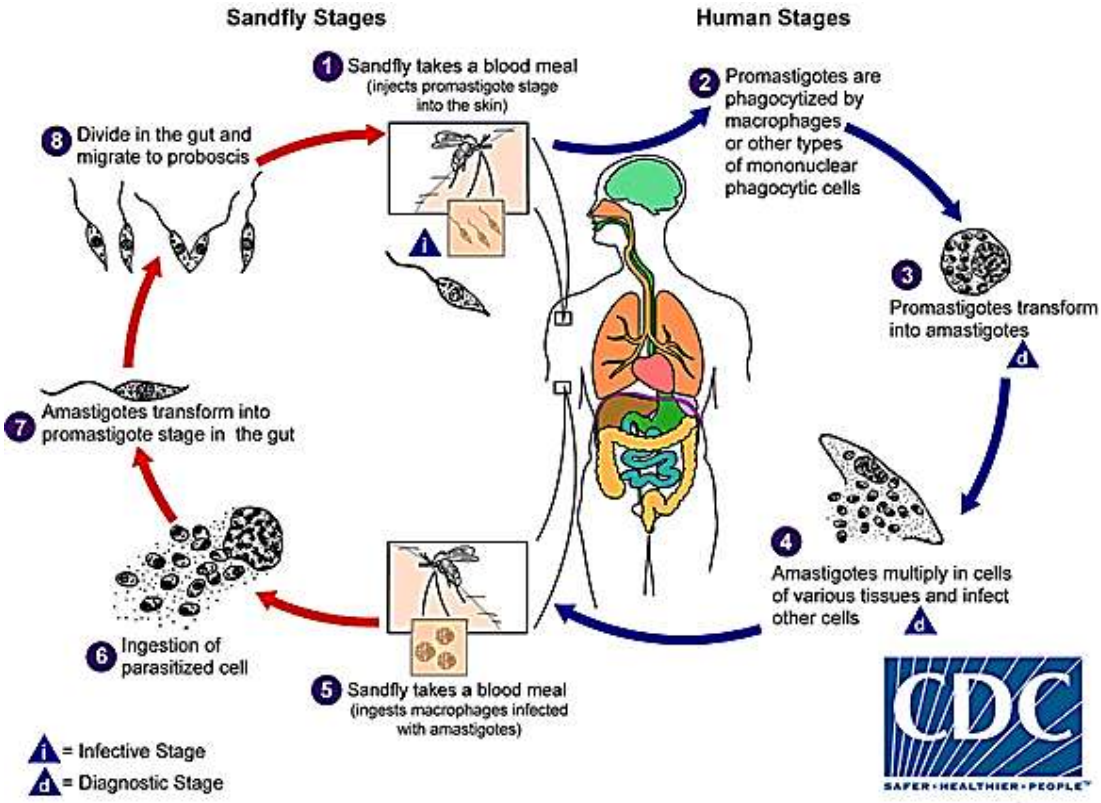
- Infective stage: Promastigote
- Diagnostic stage: Amastigote
- Vector: Female sandfly
- Disease caused by Leishmania donovani: Kala-azar
- Common practical slide: Bone marrow smear showing Leishman–Donovan bodies

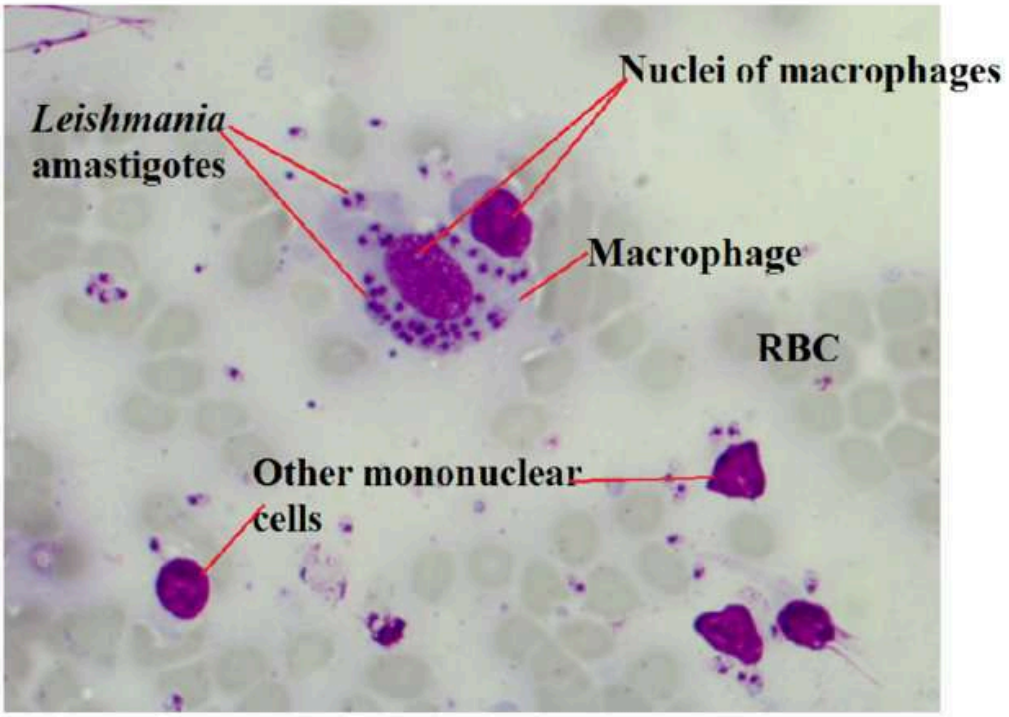
12. The **gold standard test** for diagnosis of leishmaniasis is:

- Demonstration of amastigotes (Leishman–Donovan bodies) in tissue aspirates by microscopy.

References

1. Ananthanarayan and Paniker's Textbook of Microbiology, latest edition
2. Levinson, Review of Medical Microbiology and Immunology, latest edition
3. Mandell, Douglas, and Bennett's Principles and Practice of Infectious Diseases
4. CDC – Leishmaniasis, Parasites and Health section
5. WHO Technical Report Series on Leishmaniasis


Sandfly Stages
Human Stages
1 Sandfly takes a blood meal
(injects promastigote stage
into the skin)
2 Promastigotes are
phagocytized by
macrophages
or other types
of mononuclear
phagocytic cells
3 Promastigotes transform
into amastigotes
4 Amastigotes multiply in cells
of various tissues and infect
other cells
5 Sandfly takes a blood meal
(ingests macrophages infected
with amastigotes)
6 Ingestion of
parasitized cell
7 Amastigotes transform into
promastigote stage in the gut
8 Divide in the gut and
migrate to proboscis
i = Infective Stage
d = Diagnostic Stage
CDC
SAFER·HEALTHIER·PEOPLE


Nuclei of macrophages
Leishmania
amastigotes
Macrophage
RBC
Other mononuclear
cells

Student Task:

Instructor's signature:_____ **Dated: _____/_____/_____**

Practical # 11

STERILIZATION AND DISINFECTION

Definitions

Sterilization: Complete killing of all microorganisms including bacterial spores and viruses on an object.

Disinfection: Killing most vegetative pathogenic microbes (does not reliably kill spores).

Antiseptics: Chemical agents safe for use on skin or mucous membranes (e.g., 70% alcohol, iodophors).

Classification of Methods

A. Physical Methods

1. Heat

- Dry heat: Flaming, red heat, hot air oven
- Moist heat: Boiling, pasteurization, autoclaving

2. Filtration

- Membrane filters (0.22 µm) remove microbes from fluids and air.
- Principle: Mechanical removal of microbes by porous filters (e.g., nitrocellulose 0.22 µm).
- Uses: Sterilizing heat-labile fluids (sera, IV solutions), air purification.
- Note: Does not remove toxins or very small viruses reliably.

3. Radiation

- Non-ionizing (UV): Low penetration; Surface sterilization, air cabinets; forms thymine dimers in DNA.
- Ionizing (X, gamma): Deep penetration; High-energy (gamma, X-rays) for bulk sterilization of disposables

Heat Sterilization (Most common in labs & clinics)

a) **<u>Dry Heat</u>**
   - Flaming / Red heat: Direct flame for needles, loops.
   - Hot Air Oven: 160 °C for 1–2 hours (glassware, oils, powders).
   - Mechanism: Oxidation & protein denaturation.

b) <u>Moist Heat</u>

- *Boiling (100 °C):* Kills vegetative forms but not spores.
- *Pasteurization:* Preserves food quality; used for milk/beverages
    - Batch: 62 °C for 30 min
    - Flash: 72 °C for 15 s
    - Ultra-pasteurization: 82 °C for 3 s
- *Autoclave (Standard):*
    - 121 °C, 15 psi, 15–20 min – kills spores reliably.
    - Higher cycles (e.g., 132–134 °C) shorten time.
    - Monitoring: mechanical, chemical, biological (spore) indicators recommended weekly.
- *Tyndallization/ fractional sterilization:* Intermittent steaming over 3 days for heat-sensitive media.

B. Chemical Methods

Ideal disinfectants/storylands should be: Broad spectrum, non-toxic, stable, not inactivated by organic matter.

A) Cell Membrane Damage
    - Alcohols: 70% ethanol/isopropyl – skin antiseptic.
    - Detergents: Benzalkonium chloride – surface antiseptic.
    - Phenolics: Lysol, chloroxylenol, chlorhexidine.

B) Protein & Enzyme Inactivation
    - Halogens: Iodine, povidone-iodine – skin prep.
    - Chlorine compounds: Hypochlorite (bleach).
    - Heavy metals: Silver nitrate/silver sulphadiazine.
    - Oxidizers: Hydrogen peroxide, potassium permanganate.
    - Aldehydes: Formaldehyde, glutaraldehyde (sporicidal).

C) Gaseous Sterilants
    - Ethylene oxide: For heat-sensitive equipment (plastics).
    - Formaldehyde gas: Irritant; occasional use for environments.

Object	Preferred Method
Surgical instruments	Autoclave
Rubber/ plastic catheters	Boiling / chemical sterilant
Heat-sensitive scopes	High-level disinfection / chemicals
Plastic syringes (disposable)	Gamma / ethylene oxide
Glassware, oils	Hot air oven
Skin prior to surgery	Alcohol + iodophor
Culture media	Autoclave / Tyndallization
Air	Filtration

Monitoring of Sterilization

Best practice (Centers for Disease Control and Prevention/ American Dental Association). (CDC/ADA):

- Use biological indicators (spore tests) regularly to confirm sterilization efficacy.
- Use chemical indicators inside every package to ensure exposure to sterilant conditions.
- Record mechanical parameters (temperature, time, pressure)

Cleaning & Disinfection Principles (CDC)

- Cleaning always precedes disinfection/sterilization.
- Remove visible soil to improve effectiveness.
- Critical items (penetrate sterile tissue) → sterilize.
- Semicritical (contact mucosa) → sterilize or high-level disinfect.
- Non-critical (contact intact skin) → surface disinfection

Equipment: AUTOCLAVE

Aim: To sterilize instruments, dressings, culture media and other materials using steam under pressure**.**

Principle:

Autoclave works on the principle of moist heat sterilization using saturated steam under pressure. When pressure is increased, the boiling point of water rises above 100°C. Steam at high temperature penetrates materials and coagulates and denatures proteins of microorganisms, including bacterial spores, leading to their death.

Temperature and Pressure Settings:

- Standard autoclave cycle: Temperature: 121°C Pressure: 15 lb/in² (15 psi) Time: 15–20 minutes
- Other cycles: 126°C for 10 minutes 132–134°C for short-duration sterilization of certain items

Parts of Autoclave:

1. Strong metallic chamber with lid
2. Pressure gauge
3. Temperature gauge
4. Safety valve
5. Steam release valve
6. Heating element
7. Water reservoir
8. Perforated tray or basket

Procedure:

1. Water is added to the autoclave chamber up to the required level.
2. Articles to be sterilized are wrapped or placed in perforated trays.
3. Lid is closed tightly to make the chamber air-tight.
4. Heating is started and steam is generated.
5. Air inside the chamber is expelled through the steam outlet.
6. Pressure and temperature rise to desired levels.
7. Articles are exposed to steam at 121°C under 15 psi pressure for 15–20 minutes.
8. After completion, heating is stopped and pressure is allowed to return to normal.
9. Lid is opened only after complete pressure release.

Characteristics of Effective Steam:

a. Steam should be saturated and free from air
b. Temperature should be near condensation point
c. No suspended water droplets

Items Sterilized by Autoclave:

- Culture media
- Surgical instruments
- Dressings, gauze and linen
- Rubber goods and gloves (like silicone/neoprene)
- Glassware (except heat-sensitive)

- Intravenous fluids

Items Not Suitable for Autoclaving:

- Oils and fats
- Powders
- Heat-sensitive plastics
- Sharp instruments prone to corrosion

Indicators Used in Autoclave:

1. Chemical indicators: Brown's tube: Colour change from red to green indicates proper temperature exposure Bowie–Dick test: Indicates adequate steam penetration and air removal
2. Biological indicators: Spores of Bacillus stearothermophilus Absence of growth after incubation indicates effective sterilization

Advantages:

a. Reliable and effective method of sterilization
b. Kills spores and all microorganisms
c. Non-toxic
d. Economical

Disadvantages:

a. Not suitable for heat-sensitive materials
b. Can corrode metal instruments if not dried properly
c. Requires proper monitoring

Precautions:

1. Do not overload the autoclave
2. Ensure complete removal of air
3. Follow recommended temperature and time
4. Allow pressure to return to zero before opening

Utility in Hospital and Laboratory

1. Routine sterilization in microbiology laboratories
2. Sterilization of surgical supplies
3. Preparation of sterile culture media
4. Infection control in hospitals

References:

1. Levison W. Review of Medical Microbiology and Immunology. McGraw-Hill Education.
2. Ananthanarayan R, Paniker CKJ. Textbook of Microbiology.
3. CDC Guidelines for Disinfection and Sterilization in Healthcare Facilities.
4. Text & Practical Manual of Pathology, Part 1.

Student Task:

Instructor's signature:_____ **Dated: _____/_____/_____**

Practical # 12

ZIEHL NEELSEN STAINING (ZN STAINING)

Introduction:

Ziehl Neelsen staining is a differential staining technique used for demonstrating acid fast bacilli, mainly Mycobacterium species. It was developed by Ziehl and Neelsen between 1881 and 1883. This stain is routinely used for the diagnosis of tuberculosis, leprosy, and other infections caused by acid fast organisms.

Mycobacteria are aerobic, non-motile, rod-shaped bacteria measuring about 0.5–10 micrometers in length. They contain large amounts of complex lipids, waxes, and mycolic acid in their cell wall, which makes them resistant to decolorization by acid-alcohol. In stained smears, the bacilli are often seen lying parallel to each other.

ZN staining is a standard method for demonstrating acid fast bacilli in clinical specimens such as sputum, pus, tissue sections, and body fluids.

Organisms Demonstrated by ZN Stain

1. Mycobacterium tuberculosis
2. Mycobacterium leprae
3. Mycobacterium ulcerans
4. Nocardia species (weakly acid fast)
5. Legionella species (weakly acid fast)

Principle:

When mycobacteria are treated with a strong basic dye such as carbol fuchsin containing phenol, the dye penetrates the lipid-rich cell wall. Once stained, these organisms resist decolorization by acid or acid-alcohol. Hence, they are called acid fast bacilli. Non–acid fast organisms lose the primary stain during decolorization and take up the counterstain, providing a contrasting background.

Acid Fast Bacilli Acid fast bacilli are organisms that retain carbol fuchsin even after treatment with acid decolorizing agents. The red color of the bacilli is due to the primary stain, while the background color is provided by the counterstain.

Reagents:

1. Primary stain: Carbol fuchsin
    a. Basic fuchsin (dye)

    b. Phenol or carbolic acid (mordant)
2. Decolorizer: Acid alcohol
    a. Sulphuric acid 20 percent
    b. Ethyl alcohol 95 percent
3. Counterstain:
    a. Methylene blue or malachite green

Requirements

1. Microscope
2. Clean glass slides
3. Spirit lamp
4. Slide rack
5. Clinical specimen
6. Staining reagents

Specimens

1. Sputum
2. Pus
3. Tissue sections
4. Body fluids
5. Skin smears (for leprosy)

Procedure

1. Prepare a thin smear on a clean glass slide, air dry, and fix by gently passing through flame.
2. Flood the smear with carbol fuchsin and heat until steam rises. Do not boil or allow the stain to dry. Keep the stain on the slide for about 5 minutes, reheating intermittently.
3. Rinse the slide gently with water.
4. Decolorize with acid alcohol for 2–5 minutes or until the smear appears pale pink.
5. Wash with water.
6. Apply counterstain methylene blue for 1–2 minutes.
7. Wash with water, air dry, and examine under microscope.

Microscopic Examination

- First examine the smear under low power to assess distribution.
- Then examine under oil immersion objective for acid fast bacilli.

Result:

- Acid fast bacilli appear bright red or pink
- Background appears blue or green depending on counterstain used

Grading of AFB in Smear:

- More than 100 bacilli per field: +++
- 10–100 bacilli per field: ++
- 1–10 bacilli per field: +
- 1–9 bacilli per entire smear: scanty (numbering done)
- No bacilli seen: negative

Identification under Microscope:

- Slender, red-colored rod-shaped bacilli
- Seen against blue or green background
- Bacilli may appear singly or in parallel groups

Modifications of Ziehl Neelsen Staining:

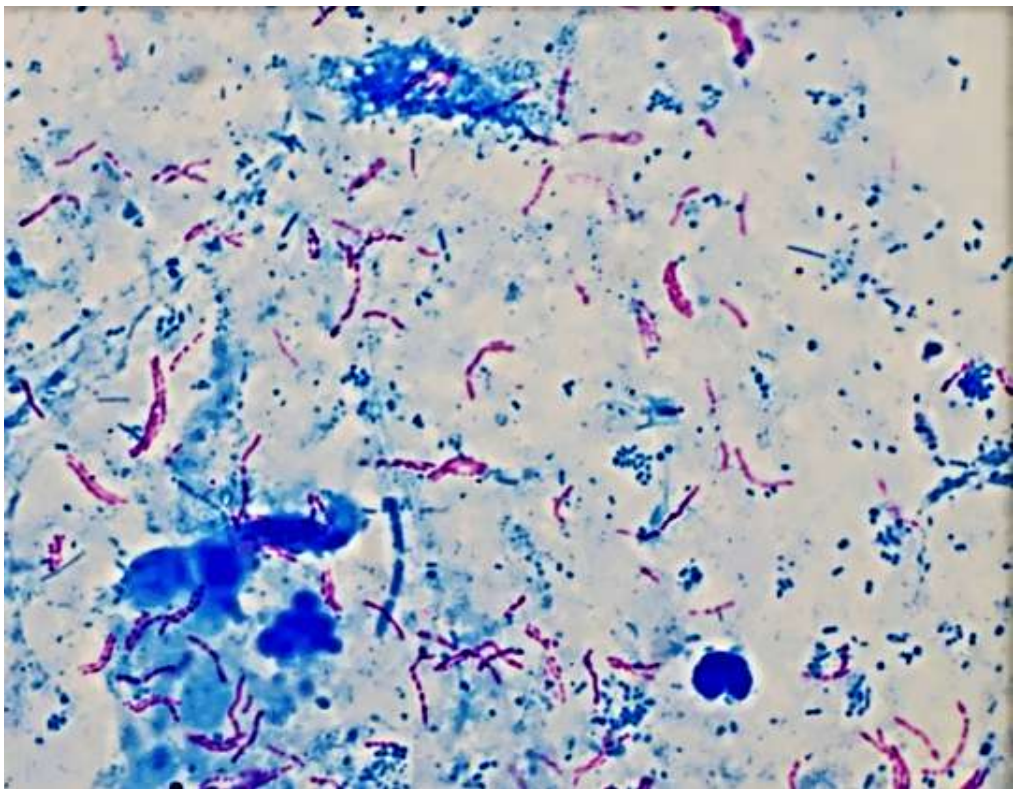
- For Mycobacterium leprae: decolorization with 5 percent sulphuric acid
- For Nocardia and Legionella in tissue sections: decolorization with 1 percent sulphuric acid

Precautions:

- Do not allow carbol fuchsin to boil or dry on slide
- Adequate heating is necessary for proper staining
- Proper decolorization is essential to avoid false results

References

4. Levinson W. Review of Medical Microbiology and Immunology.
5. Prescott LM, Harley JP, Klein DA. Microbiology.
6. AFIP Manual of Laboratory Medicine



Beaded Acid Fast Bacilli

Student Task:

Instructor's signature:_____ **Dated: _____/_____/_____**

Practical # 13

CHRONIC CHOLECYSTITIS

Introduction

Chronic inflammation:

Chronic inflammation is inflammation of prolonged duration, lasting for weeks to months, in which active inflammation, tissue injury, and healing occur simultaneously. It may follow acute inflammation or arise insidiously without a preceding acute phase.

Causes of chronic inflammation:

- Persistent infections by microorganisms
- Immune-mediated diseases such as autoimmune disorders
- Prolonged exposure to toxic agents
- Recurrent episodes of acute inflammation

General features of chronic inflammation:

- Infiltration with mononuclear cells such as lymphocytes, plasma cells, and macrophages
- Tissue destruction caused by persistent inflammatory cells
- Attempts at healing by fibrosis and angiogenesis

Chronic inflammatory cells

- *Macrophages:* Derived from blood monocytes. They perform phagocytosis, antigen presentation, cytokine secretion, and play a major role in tissue destruction and repair.
- *Lymphocytes:* Include B lymphocytes and T lymphocytes. B cells produce antibodies via plasma cells, while T cells mediate cellular immunity and regulate immune responses.
- *Plasma cells:* Derived from B lymphocytes and responsible for antibody production.
- *Eosinophils:* Seen in allergic conditions, parasitic infections, and some malignancies.
- *Fibroblasts:* Responsible for collagen production and fibrosis during healing.
- *Giant cells:* Formed by fusion of macrophages when phagocytosis is ineffective. Types include Langhans giant cells, foreign body giant cells, and Touton giant cells.

Effects of chronic inflammation:

- Fibrosis leading to scarring and loss of normal organ architecture
- Organ dysfunction due to replacement of parenchyma by fibrous tissue
- Persistent immune activation as seen in autoimmune diseases

CHRONIC CHOLECYSTITIS:

It is a classic example of chronic inflammation where persistent injury leads to fibrosis, architectural distortion, and loss of normal function of gall bladder. Histopathological examination using H&E stain is essential for diagnosis and identification of characteristic features such as chronic inflammatory infiltrate and Rokitansky–Aschoff sinuses.

Etiology:

- Persistence or recurrence of acute cholecystitis
- Chronic irritation by gallstones
- Recurrent mechanical trauma to gallbladder mucosa
- Bacterial infection, commonly by intestinal organisms such as Escherichia coli

Morphology:

Gross pathology:

- The gallbladder is usually contracted.
- The serosa is smooth and glistening or may appear dull due to fibrosis.
- The wall is thickened and firm with a grey-white appearance.
- The lumen often contains clear or greenish mucoid bile with gallstones.

Microscopic features (H&E stain)

- Gallbladder wall shows chronic inflammatory cell infiltration predominantly lymphocytes, plasma cells, and macrophages
- Mucosa may be flattened or focally ulcerated
- Marked fibrosis of the wall
- Presence of Rokitansky–Aschoff sinuses, which are outpouchings of mucosal epithelium extending into the muscular layer
- Muscular hypertrophy may be present

Point of identification of H&E slide:

- Thickened gallbladder wall
- Infiltration by lymphocytes and plasma cells
- Fibrosis of the muscular layer
- Rokitansky–Aschoff sinuses lined by columnar epithelium
- Absence of neutrophil-rich acute inflammatory infiltrate

Complications of chronic Cholecystitis:

- Porcelain gallbladder due to extensive calcification
- Gallbladder empyema
- Perforation of gallbladder
- Cholecystoenteric fistula
- Increased risk of gallbladder carcinoma
- Obstructive jaundice due to stone migration

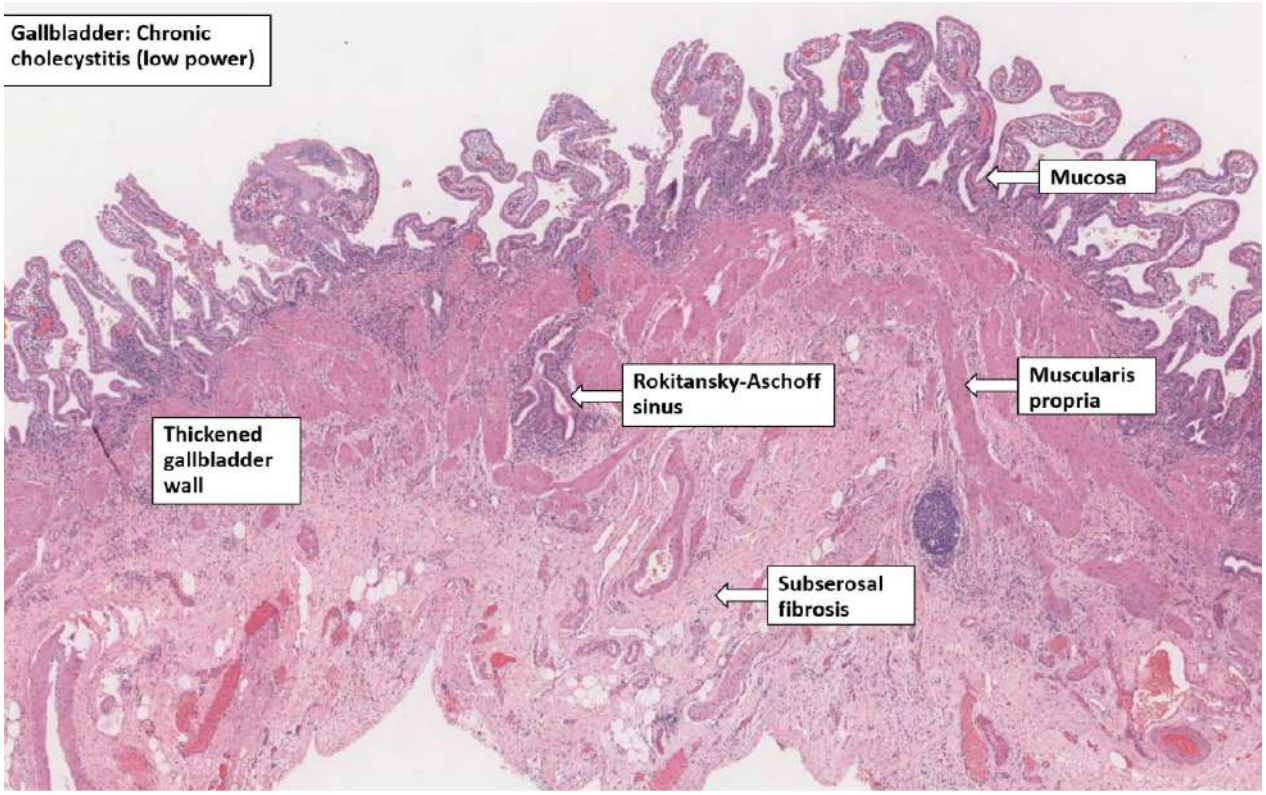
Clinical significance:

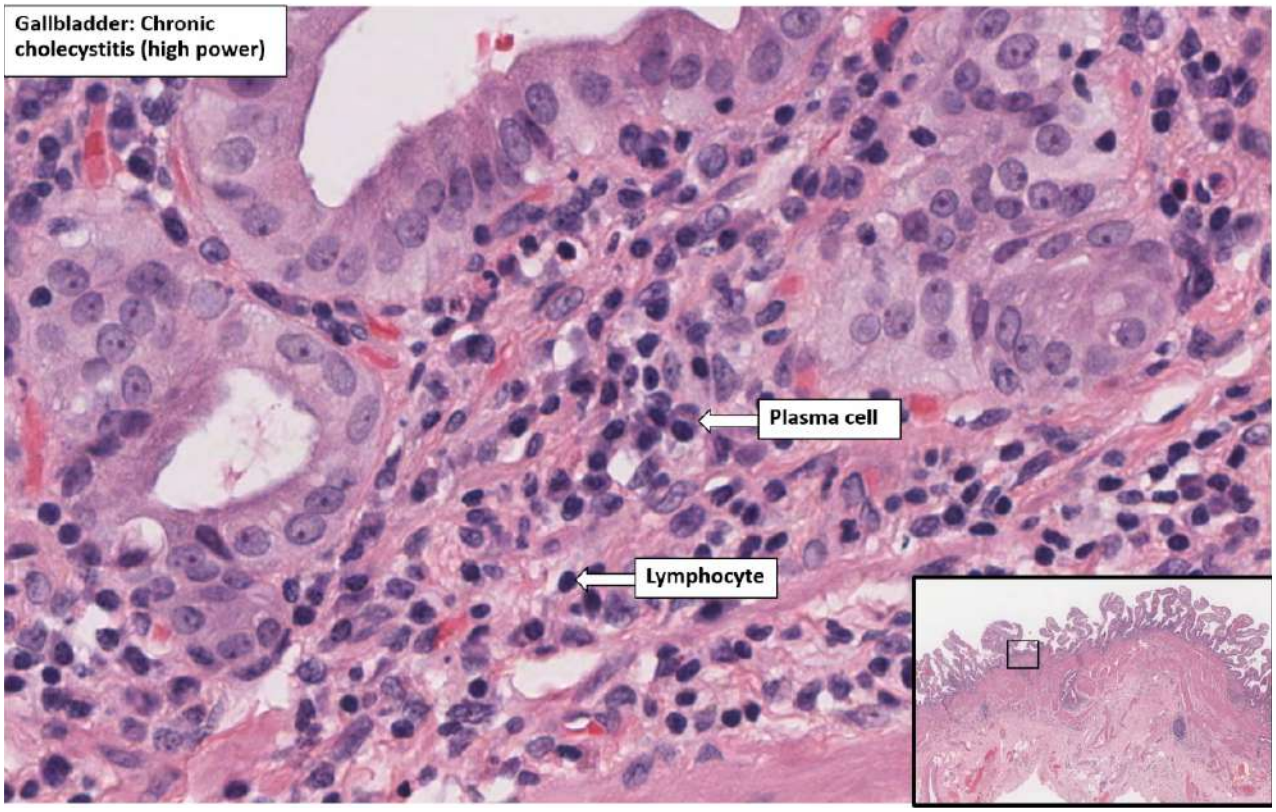
Chronic cholecystitis is a common cause of recurrent right upper quadrant abdominal pain. Long-standing disease may lead to serious complications and is an important risk factor for gallbladder carcinoma.

Chronic cholecystitis represents a classic example of chronic inflammation where persistent injury leads to fibrosis, architectural distortion, and loss of normal function. Histopathological examination using H&E stain is essential for diagnosis and identification of characteristic features such as chronic inflammatory infiltrate and Rokitansky–Aschoff sinuses.

References:

1. Robbins and Cotran, Basic Pathology
2. Harsh Mohan, Textbook of Pathology
3. Kumar, Abbas, Aster – Robbins Basic Pathology


Gallbladder: Chronic cholecystitis (low power)
Mucosa
Rokitansky-Aschoff sinus
Muscularis propria
Thickened gallbladder wall
Subserosal fibrosis


Gallbladder: Chronic cholecystitis (high power)
Plasma cell
Lymphocyte

Student Task:

Instructor's signature:_____ **Dated: _____/_____/_____**

Practical # 14

GRANULOMA

Introduction

Granuloma is a special form of chronic inflammation characterized by the formation of a localized collection of activated macrophages called epithelioid cells, usually surrounded by lymphocytes and fibroblasts. Granuloma formation occurs when the body attempts to contain and isolate a persistent agent that is difficult to eradicate. Tuberculosis is the most common cause of granulomatous inflammation encountered in routine pathology practice.

Definition of granuloma:

A granuloma is a circumscribed microscopic collection of epithelioid macrophages, often associated with multinucleated giant cells and surrounded by a rim of lymphocytes and fibroblasts.

Types of granuloma

1. Immune granuloma
    - Formed in response to persistent antigenic stimuli
    - Example: tuberculosis, leprosy, fungal infections
    - Often shows central caseous necrosis
2. Foreign body granuloma
    - Formed in response to non-antigenic material
    - Example: sutures, silica, talc
    - Giant cells are prominent and necrosis is usually absent

Tuberculosis as the most common cause:

Tuberculosis is a chronic specific granulomatous inflammation caused by Mycobacterium tuberculosis. The granuloma formed in tuberculosis is called a tubercle. It typically shows central caseous necrosis surrounded by epithelioid cells, Langhans giant cells, lymphocytes, and fibrosis depending on the stage.

Etiology Granulomatous Inflammation:

Category	Examples
Bacterial	Mycobacterium tuberculosis, Mycobacterium leprae, Treponema pallidum
Fungal	Histoplasma capsulatum, Cryptococcus neoformans, Coccidioides immitis
Parasitic	Schistosoma species
Foreign body	Silica, asbestos, sutures, talc
Immune mediated	Sarcoidosis, Crohn's disease
Others	Wegener granulomatosis, berylliosis

Pathogenesis:

Persistent injurious agent
(e.g. Mycobacterium tuberculosis, foreign body)
↓
Agent resists destruction by host immune response
↓
Chronic inflammation with recruitment of macrophages and T lymphocytes
↓
Activation of CD4+ Th1 cells by IL-12 from macrophages and dendritic cells
↓
Secretion of IFN-γ and TNF-α by Th1 cells and NK cells
↓
IFN-γ mediated activation of macrophages (M1 type)
↓
Activated macrophages show increased microbicidal activity and antigen presentation
↓
Macrophages transform into epithelioid cells
↓
Fusion of epithelioid cells to form multinucleated giant cells
↓
Formation of granuloma with central epithelioid cells and giant cells surrounded by lymphocytes.

Cell Types in Granuloma:

1) Epithelioid cells: Modified macrophages with elongated pale nuclei and eosinophilic cytoplasm
2) Giant cells: Formed by fusion of macrophages

    Types of giant cells

    1. Langhans giant cells
        - Nuclei arranged peripherally in a horseshoe or ring pattern
        - Seen commonly in tuberculosis
    2. Foreign body giant cells
        - Nuclei scattered irregularly throughout cytoplasm
        - Seen in foreign body granulomas
3) Lymphocytes: Form a rim around the granuloma
4) Fibroblasts: Seen in healing stages causing fibrosis

Microscopic features of granuloma (H&E stain)

- Central area may show caseous necrosis, especially in tuberculosis
- Surrounding zone of epithelioid cells
- Presence of multinucleated giant cells
- Peripheral rim of lymphocytes
- Fibrosis may be present in older lesions

Point of identification of granuloma on H&E slide

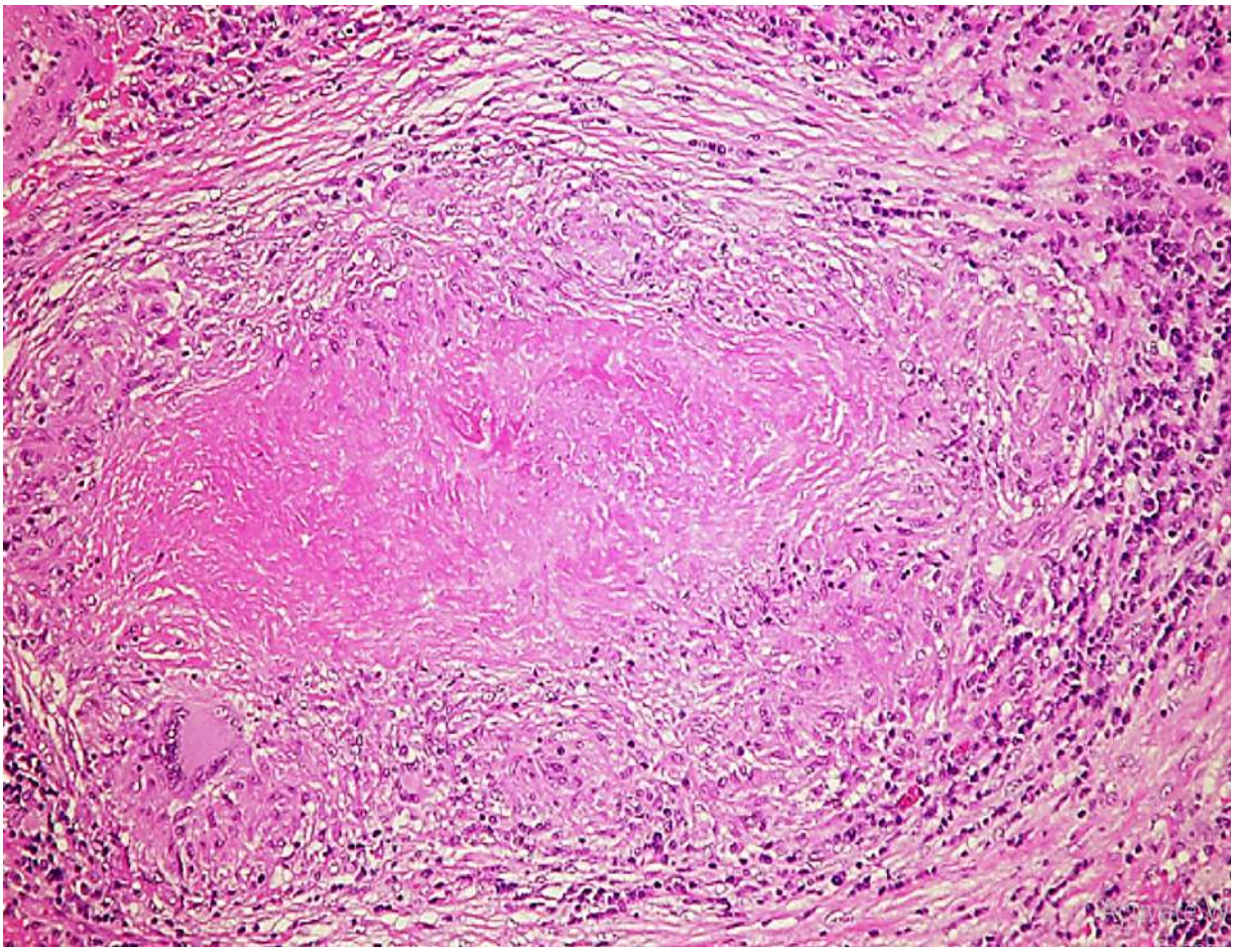
- Well-defined circumscribed lesion
- Aggregates of epithelioid macrophages
- Presence of multinucleated giant cells
- Peripheral rim of lymphocytes
- Central caseous necrosis may or may not be present
- Features consistent with chronic granulomatous inflammation

Note: Histopathological features are suggestive of granulomatous inflammation, most commonly due to tuberculosis in endemic areas. Acid fast bacilli are not seen on routine H&E stain and require Ziehl–Neelsen staining for confirmation in tuberculous granuloma.

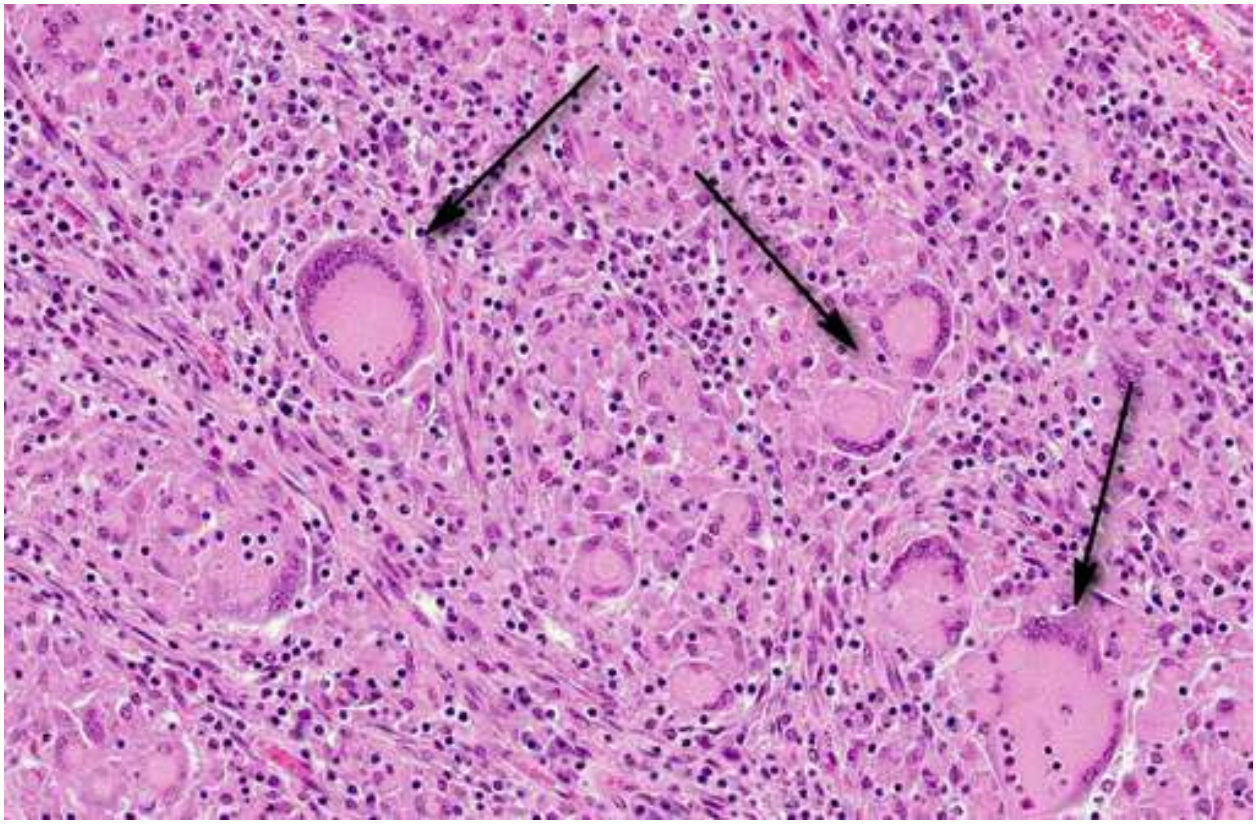
References:

1) Robbins and Cotran Pathologic Basis of Disease, latest edition
2) Levinson W. Review of Medical Microbiology and Immunology, latest edition

3) Harsh Mohan, Textbook of Pathology, latest edition



Typical Tuberculous granuloma with central caseous necrosis and Langhans type giant cells



Multinucleated giant cells of the Langhans type

Student Task:

Instructor's signature:_____ **Dated: _____/_____/_____**

BLOCK – F

PRE-CLINICAL DENTISTRY I

(Healing, Repair & Dental Restorations -I)

Practical # 15

VARIOUS LABORATORY INSTRUMENTS AND MACHINE

A. Microscope:

A microscope is a precision optical and imaging instrument that uses a system of lenses and illumination to produce a magnified, high-resolution image of minute structures such as cells, microorganisms, tissues, and crystals, which are not visible to the unaided human eye.

Types of microscopes and uses:

- *Compound light microscope:* Most commonly used type. Routine examination of stained and unstained specimens.
- *Oil immersion microscope:* Detailed study of bacteria and fine cellular structures.
- *Dark field microscope:* Visualization of thin, unstained organisms such as spirochetes.
- *Phase contrast microscope:* Observation of living, unstained cells with good contrast.
- *Fluorescent microscope:* Detection of fluorochrome-stained organisms and antigens.
- *Immunofluorescence microscope:* Identification of specific antigens or antibodies.
- *Electron microscope:* Study of viruses and ultrastructure of cells.
- *Transmission electron microscope:* Examination of intracellular details.
- *Scanning electron microscope:* Study of surface morphology in three dimensions.
- *Confocal microscope:* Optical sectioning and three-dimensional imaging in research.

Parts of a Compound light microscope

1. *Foot piece (base):* Provides stability to the microscope and houses the light source.
    a. Light source / illuminator: Provides illumination for the specimen; usually an inbuilt LED or halogen lamp in modern microscopes.
    b. Power switch and brightness control knob: Used to switch the microscope on or off and adjust light intensity.
2. *Body:* Supports the optical and mechanical components and includes the following:
    a. Sub-stage condenser: Concentrates and focuses light on the specimen; diaphragm controls intensity and field of illumination.
        i. Iris diaphragm lever: Controls the amount of light entering the condenser to improve contrast.
        ii. Field diaphragm: Controls the diameter of the light beam and helps in proper illumination alignment.
    b. Stage: Platform for holding the specimen slide; may be fixed or mechanical to allow movement in horizontal planes.
        i. Mechanical stage controls: Allow precise movement of the slide in horizontal (x and y) directions.
        ii. Stage clips: Hold the slide in position on a fixed stage.
    c. Nosepiece: Revolving part that holds objectives of different magnifications.

d. Objectives: Lens systems that provide primary magnification: Scanner x4, low power x10, high power x40, oil immersion x100.
e. Focusing knobs:
    i. Coarse adjustment knob: It is used for rapid focusing by moving the stage or body tube up and down. It is mainly used with scanner and low-power objectives and should not be used with high-power or oil immersion objectives to avoid damage to the slide or lens.
    ii. Fine adjustment knob: It is used for precise and accurate focusing by producing small vertical movements of the stage. It is essential for high-power and oil immersion objectives to obtain a sharp and clear image.

3. *Eyepiece:* Used to view the image formed by the objective; commonly x 10 magnifications. May be monocular or binocular.
4. *Body tube / head:* Maintains proper distance between objective and eyepiece and aligns the optical path.

Uses of compound microscope:

1. Examination of stained blood smears for red blood cells, white blood cells, and platelets.
2. Identification of bacteria and fungi in stained preparations.
3. Observation of parasites, ova, cysts, and larvae in clinical specimens.
4. Study of histological tissue sections in pathology.
5. Examination of urine sediments and crystals.
6. Study of cells and cellular morphology in cytology.
7. Observation of microorganisms in microbiology practical work.
8. Routine teaching and diagnostic purposes in medical and dental laboratories.

Oil immersion microscope:

- Oil immersion microscopy is used for the examination of very small structures such as bacteria and fine cellular details that cannot be resolved clearly under dry objectives. In this method, a special oil immersion objective of x100 magnification is used along with immersion oil.
- The immersion oil has a refractive index similar to that of glass. When oil is placed between the cover slip and the objective, it replaces air in the light path and reduces light refraction and scattering. This allows more light to enter the objective, thereby improving resolution and image clarity.
- Oil immersion microscopy is commonly used in bacteriology for examination of gram stained smears, acid-fast bacilli, and blood parasites.
- After observation, the oil should be cleaned immediately from the slide and the objective to prevent damage to the lens.

Care of the microscope:

1. Protect the microscope from heat, dust, moisture, and direct sunlight.
2. Clean lenses daily using lens paper or soft tissue; wipe gently, do not rub.

3. Clean oil immersion objective immediately after use.
4. Cover the microscope when not in use.
5. Switch off power and unplug after use.

Troubleshooting:

- No light: Loose power connection, fused bulb, closed diaphragm, or improper objective position.
- Insufficient light: Low illumination setting, condenser too low, dirty lenses.
- Too bright light: Excessive illumination for the objective in use.
- Flickering light: Loose electrical connections or defective bulb.
- No focus under high power: Slide placed upside down.
- Bubbles in oil immersion: Insufficient oil contact; clean and re-apply oil.

References:

1. AFIP Manual of Laboratory Medicine
2. Ananthanarayan and Paniker's Textbook of Microbiology, latest edition
3. Bancroft and Gamble, Theory and Practice of Histological Techniques
4. Davidson's Principles and Practice of Medicine (laboratory techniques section)

Compound Microscope

B. Hematology Analyzer

A hematology analyzer is an automated laboratory instrument used for quantitative and qualitative analysis of blood cells to perform complete blood count (CBC), including red blood cells, white blood cells, platelets, hemoglobin, and related indices. It plays a crucial role in diagnosis, monitoring, and screening of hematological and systemic diseases.

Types of hematology analyzers:

Based on automation

- Fully automated analyzers: Blood sample is directly aspirated and processed by the instrument with minimal operator intervention. Used in medium to large laboratories.
- Semi-automated analyzers: Require manual steps such as dilution. Limited parameters. Largely obsolete.

Based on WBC differentiation

1. *3-part differential analyzers:* Classify WBCs into lymphocytes, monocytes, and granulocytes. Used for routine screening in small laboratories and clinics.
2. *5-part differential analyzers:* Differentiate neutrophils, lymphocytes, monocytes, eosinophils, and basophils using flow cytometry and light scatter. Used in hospitals and diagnostic centers for detailed evaluation.
3. *Advanced / 6-part analyzers:* Provide additional parameters such as reticulocyte count, nucleated RBCs (NRBC), immature granulocytes, and abnormal cell flags. Used in tertiary care centers and hematology reference labs.

Basic principles of operation:

- *Electrical impedance (Coulter principle):* Cells suspended in an electrolyte pass through a small aperture. Each cell causes a change in electrical resistance, generating a pulse. Pulse number indicates cell count and pulse height reflects cell size. Used for RBC, WBC, and platelet counting.
- *Optical / light scattering method*: Cells pass single-file through a laser beam. Light scattered at different angles reflects size, granularity, and nuclear complexity. Used for WBC differential counts.
- *Flow cytometry:* Combines hydrodynamic focusing with light scatter and fluorescence to precisely identify and differentiate cells.
- *Fluorescence technology:* Fluorescent dyes bind to DNA or RNA, enabling detection of reticulocytes, NRBCs, and abnormal cells.
- *Photometry (spectrophotometry):* Hemoglobin is measured after RBC lysis by converting hemoglobin into a stable compound and measuring light absorbance.

Common parts of a hematology analyzer:

- Sample aspiration system / autoloader
- Reagent system (diluent, lysing reagent, stains)
- Hydraulic system for fluid movement and waste disposal
- Detection chambers (aperture, flow cell)
- Data processing unit and software
- Display and user interface
- Printer and LIS connectivity

Tests performed by hematology analyzer

1. *Complete blood count (CBC)*
    a. Hemoglobin concentration
    b. Red blood cell count (RBC)
    c. White blood cell count (WBC)
    d. Platelet count
2. *Red cell indices*
    a. Mean corpuscular volume (MCV)
    b. Mean corpuscular hemoglobin (MCH)
    c. Mean corpuscular hemoglobin concentration (MCHC)
    d. Red cell distribution width (RDW)
3. *White cell analysis*
    a. Total leukocyte count
    b. Differential leukocyte count (3-part or 5-part)
4. *Platelet parameters*
    a. Mean platelet volume (MPV)
    b. Platelet distribution width (PDW)
    c. Plateletcrit (PCT)
5. *Advanced parameters (in advanced analyzers)*
    a. Reticulocyte count
    b. Nucleated red blood cells (NRBC)
    c. Immature granulocytes
    d. Abnormal cell flags and histograms

Uses with clinical relevance

1. Diagnosis
    - Anemia (iron deficiency, megaloblastic, hemolytic)
    - Infections (bacterial, viral, parasitic)
    - Leukemia and other hematological malignancies
    - Bleeding and platelet disorders
2. Monitoring:

- Chemotherapy and radiotherapy response
- Chronic diseases such as renal failure and inflammatory disorders

3. Screening
    - Routine health check-ups
    - Pre-operative evaluation
    - Antenatal screening
4. Blood banking
    - Donor screening and component preparation

Identification points:

- Automated CBC report with histograms and scattergrams
- RBC indices (MCV, MCH, MCHC, RDW)
- WBC differential count
- Platelet count and platelet indices
- Abnormal cell flags prompting peripheral smear review

Care and maintenance:

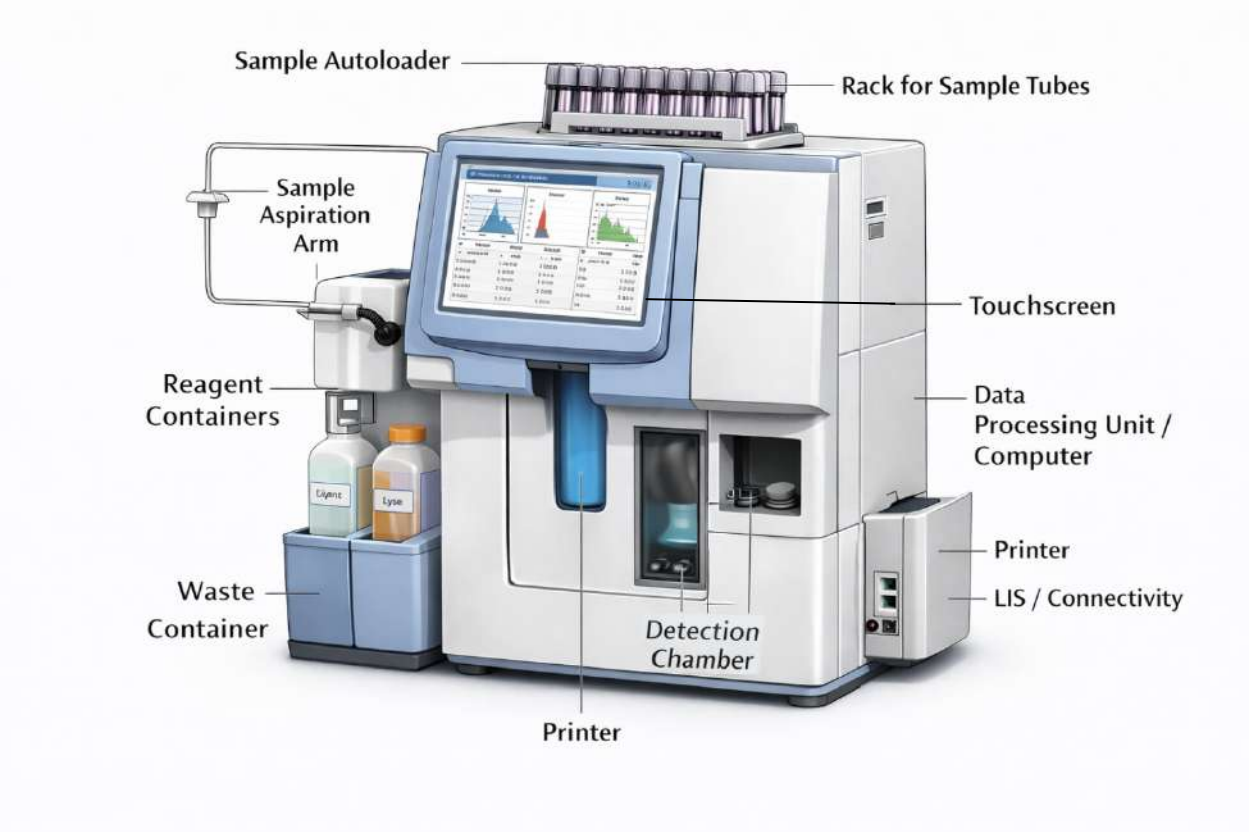
- Use EDTA anticoagulated blood samples only
- Run daily internal quality control samples
- Perform regular cleaning cycles and reagent replacement
- Calibrate as per manufacturer's guidelines
- Ensure proper temperature control and power supply
- Regular preventive maintenance and service support

Examples of hematology analyzers:

- Beckman Coulter series
- Sysmex analyzers
- Abbott Cell-Dyn series
- Roche Cobas systems

References

- Dacie and Lewis Practical Haematology
- Bain BJ. Blood Cells: A Practical Guide
- CLSI guidelines on hematology analyzers
- AFIP Manual of Laboratory Medicine



Hematology Analyzer

C. Clinical Chemistry Analyzer

A clinical chemistry analyzer is an automated laboratory instrument used to quantitatively measure biochemical constituents in biological fluids such as serum, plasma, urine, and cerebrospinal fluid. It plays a vital role in diagnosis, monitoring, and prognosis of metabolic, endocrine, hepatic, renal, and cardiovascular disorders.

Types of chemistry analyzers

1. Based on automation

    a. Semi-automated analyzers: Require manual pipetting of samples and reagents. Used in small laboratories with low workload.
    b. Fully automated analyzers: Perform sample aspiration, reagent dispensing, incubation, measurement, calculation, and reporting automatically. Used in hospitals and reference laboratories.
2. Based on throughput

    a. Low-throughput analyzers – small clinics
    b. Medium-throughput analyzers – diagnostic centers

c. High-throughput analyzers – tertiary care hospitals

3. Based on analytical technology

    a. Colorimetric / spectrophotometric analyzers
    b. Ion-selective electrode (ISE) based analyzers
    c. Immunochemistry analyzers
    d. Advanced systems using tandem mass spectrometry (LC-MS/MS)

4. Based on sample and reagent handling systems
    a. Continuous flow analyzers – obsolete
    b. Discrete (random access) analyzers – most commonly used
    c. Centrifugal analyzers – limited use

Common basic laboratory chemistry analyzers include:

- Semi-auto chemistry analyzer
- Fully automated chemistry analyzer
- Photometric (colorimetric) analyzer
- Spectrophotometer
- Electrolyte analyzer (ISE based)
- Blood gas analyzer
- Random access chemistry analyzer
- Batch chemistry analyzer
- Dry chemistry analyzer (slide-based systems, e.g., Vitros)

Principle of operation

Most clinical chemistry analyzers are based on colorimetry and spectrophotometry, governed by the Beer–Lambert law.

Beer–Lambert law
The absorbance of light by a solution is directly proportional to the concentration of the absorbing substance and the path length of light through the solution.
Absorbance = $\varepsilon \times c \times l$
where ε is molar absorptivity, c is concentration, and l is path length.

Colorimetry: Colorimetry measures the intensity of color produced when an analyte reacts with a reagent to form a colored compound. A filter is used to select a broad wavelength band in the visible spectrum corresponding to maximum absorption of the colored product.

Uses:

- Glucose estimation

- Urea
- Creatinine
- Total protein
- Bilirubin

Limitations

- Lower specificity
- Interference from hemolysis, lipemia, and turbidity

Spectrophotometry

Spectrophotometry is an advanced and more precise form of colorimetry. A monochromator (prism or diffraction grating) isolates a very narrow and specific wavelength of light. Measurements can be performed in ultraviolet, visible, and infrared ranges.

Advantages over colorimetry

- Higher accuracy and sensitivity
- Better wavelength specificity
- Reduced analytical interference

Advanced spectrometric techniques

1. UV spectrophotometry: Used for enzyme assays such as ALT, AST, LDH by measuring change in absorbance of NADH/NAD^+.
2. Reflectance spectrophotometry: Used in dry chemistry analyzers.
3. Mass spectrometry (LC-MS/MS): Highly specific and sensitive method used for therapeutic drug monitoring, hormones, toxicology, and newborn screening.

Basic tests commonly performed by chemistry analyzer

1. *Carbohydrate metabolism*
    - Blood glucose
2. *Renal function tests*
    - Urea
    - Creatinine
    - Uric acid
3. *Liver function tests*
    - Total bilirubin
    - Direct bilirubin
    - AST (SGOT): Aspartate aminotransferase (Serum glutamic oxaloacetic transaminase)

- ALT (SGPT): Alanine aminotransferase (Serum glutamic pyruvic transaminase)
- Alkaline phosphatase (ALP)

4. *Total protein*
    - Albumin
5. *Lipid profile*
    - Total cholesterol
    - Triglycerides
    - HDL cholesterol
    - LDL cholesterol (calculated or direct)
6. *Electrolytes and minerals*
    - Sodium
    - Potassium
    - Calcium
    - Chloride
    - Phosphorus
7. *Enzymes*
    - Amylase
    - Lipase
    - Creatine kinase (CK)

Uses with clinical relevance

1. Liver function tests:
    - ALT, AST, ALP, bilirubin – hepatitis, cirrhosis, obstructive jaundice
2. Renal function tests:
    - Urea, creatinine – acute and chronic kidney disease
3. Metabolic disorders:
    - Glucose – diabetes mellitus
    - Uric acid – gout
4. Lipid profile
    - Cholesterol, triglycerides – cardiovascular risk assessment
5. Electrolytes and minerals
    - Sodium, potassium, calcium – fluid and electrolyte imbalance
6. Therapeutic drug monitoring
    - Antiepileptics, antibiotics, immunosuppressants

Care and maintenance

- Use clean, non-hemolyzed samples
- Perform daily calibration and quality control
- Maintain reagent storage temperature
- Clean probes and cuvettes regularly
- Follow manufacturer’s preventive maintenance schedule

Quality control significance:

- Ensures accuracy and reproducibility
- Detects systematic and random errors
- Prevents clinical misinterpretation
- Modern analyzers use automated *Levey–Jennings charts* and *Westgard rules*

Examples of chemistry analyzers:

- Roche Cobas series
- Beckman Coulter AU series
- Abbott Architect
- Siemens Dimension systems

References

1. Tietz Textbook of Clinical Chemistry and Molecular Diagnostics
2. Bishop ML. Clinical Chemistry: Principles, Techniques, and Correlations
3. AFIP Manual of Laboratory Medicine

Chemistry Analyzer

D. Incubator

An incubator is a laboratory instrument designed to maintain controlled environmental conditions such as temperature, humidity, and specific gas concentrations within an enclosed chamber to allow optimal growth and maintenance of microorganisms, cells, and biological materials.

Principle and working

Incubators work by maintaining a stable internal environment using an electric heating system regulated by thermostats and microprocessor-controlled sensors. Heat is distributed uniformly by air circulation fans or liquid circulation systems. Humidity is maintained by water reservoirs, and gas concentration (CO_2, N_2) is regulated through external gas cylinders and flow regulators. Modern incubators use digital displays and alarm systems to monitor deviations from preset conditions.

Types of incubators with uses

1. Simple (hot air) incubator
    a. Controls temperature only, usually between 25–60°C.
    b. Uses: routine bacterial culture, incubation of biochemical tests such as Widal and Coombs test.
2. Anaerobic incubator
    a. Provides oxygen-free environment by replacing air with nitrogen or gas mixtures.
    b. Uses: cultivation of anaerobic bacteria such as Clostridium species.
3. CO_2 incubator
    a. Maintains 5–10% CO_2 with controlled humidity and temperature.
    b. Uses: culture of fastidious organisms and tissue/cell cultures.
4. Cell culture incubator
    a. Precisely controls temperature, humidity, and CO_2 concentration.
    b. Uses: mammalian cell culture, virology, research applications.
5. Shaking incubator (advanced)
    a. Provides controlled temperature with continuous agitation.
    b. Uses: aerobic microbial growth, enzyme and fermentation studies.

Common temperature settings:

- 37°C – human pathogenic bacteria
- 25–28°C – fungi
- 55°C – thermophilic organisms

Clinical and laboratory uses:

- Growth and isolation of bacteria, fungi, and yeast
- Maintenance of microbial and cell cultures
- Incubation of serological and biochemical reactions
- Research in microbiology, pathology, and biotechnology
- Quality control testing in pharmaceutical and diagnostic labs

Care and maintenance

- Clean and disinfect chamber periodically with detergent, disinfectant, and alcohol
- Avoid unnecessary opening of door
- Monitor temperature, humidity, and gas levels regularly
- Check gas cylinders daily for adequate supply
- Ensure proper calibration of sensors

Troubleshooting (common)

- No temperature rise – faulty heating element or thermostat
- Uneven temperature – fan malfunction or overcrowding
- Contamination – improper cleaning or frequent door opening
- CO_2 fluctuation – empty gas cylinder or faulty regulator

Identification points

- Insulated chamber with shelves
- Thermostat and digital display
- Temperature and gas sensors
- Used for microbial culture at controlled temperature

References:

1. AFIP Manual of Laboratory Medicine
2. Mackie & McCartney Practical Medical Microbiology
3. WHO Laboratory Biosafety Manual

Incubator

E. BACTEC Blood Culture System (BD)

The BACTEC system (Becton, Dickinson and Company) is a widely used automated blood culture system designed for the rapid detection of bacteria and fungi in blood and other normally sterile clinical specimens. It uses specialized culture bottles with enriched media and continuously monitors microbial growth by detecting carbon dioxide (CO_2) production, enabling early diagnosis and prompt initiation of appropriate antimicrobial therapy.

Principle of Detection

- Microorganisms growing in the culture bottle metabolize nutrients and produce CO_2.
- The CO_2 concentration increases, leading to a chemical or fluorescent change in a sensor embedded at the bottom of the bottle.
- This change is detected by the instrument using fluorescence-based detection technology.
- When a predefined threshold is reached, the bottle is flagged as positive.

Operational Mechanism

Media Bottles

- Uses proprietary blood culture bottles such as:
    - BACTEC Plus Aerobic/F
    - BACTEC Plus Anaerobic/F
- Bottles contain enriched broth, resins to neutralize antibiotics, and a CO_2-sensitive fluorescent sensor.

Continuous Monitoring

- Inoculated bottles are loaded into automated instruments (e.g., BD BACTEC FX, FX40).
- Bottles are incubated and monitored automatically.
- Each bottle is scanned at frequent intervals (approximately every 10 minutes) for changes indicating microbial growth.

Detection and Alert

- Once growth is detected, the instrument:
    - Flags the bottle as positive
    - Generates an audible and visual alert
- Positive bottles are removed for:
    - Gram staining
    - Subculture
    - Identification and antimicrobial susceptibility testing

Benefits

- **Speed**: Significantly reduces time to detection (TTD) compared to conventional manual blood culture methods, which is critical for early targeted antibiotic therapy.
- **High Sensitivity**: Capable of detecting low-level bacteremia and fungemia.
- **Automation**: Continuous incubation and monitoring reduce manual workload and human error.
- **Scalability**: Available in different configurations (e.g., FX, FX40) to suit small to large laboratory workloads.

Applications

- **Blood cultures**: Primary application for detection of:
    - Bacteremia
    - Septicemia
    - Fungemia

- **Sterility testing**:
    - Screening platelet concentrates and other sterile biological products
- **Detection of fastidious organisms**:
    - Effective for organisms such as *Brucella spp.*, *HACEK group*, and certain slow-growing bacteria

Note:

- Mycobacterial detection is performed using **separate BACTEC systems** with different media and detection principles.
- *BACTEC systems for tuberculosis*
    1. BACTEC 460 TB (radiometric system) (Older, largely discontinued)
        - Principle: detects release of radioactive CO_2 produced from metabolism of ^{14}C-labelled palmitic acid by Mycobacterium tuberculosis.
    2. BACTEC MGIT 960 (non-radiometric system) - (Most commonly used)
        - Principle: detects mycobacterial growth by fluorescence due to oxygen consumption in MGIT tubes.
- **GeneXpert MTB/RIF is the gold-standard rapid molecular test for MTB.**

GeneXpert MTB/RIF is a cartridge-based, automated real-time PCR assay used for rapid detection of Mycobacterium tuberculosis complex directly from clinical specimens. It simultaneously detects MTB DNA and rifampicin resistance by targeting the rpoB gene. The test provides results within about 2 hours, has high sensitivity and specificity, and is recommended by WHO as the initial diagnostic test for pulmonary tuberculosis, especially in HIV-infected patients and suspected drug-resistant TB.

References

1. AFIP Manual of Laboratory Medicine
2. Mackie & McCartney Practical Medical Microbiology
3. CDC Laboratory Guidelines for Mycobacterial Diagnostics

F. BIOSAFETY CABINET

In microbiology, a biosafety cabinet (BSC) is a ventilated laboratory enclosure that uses controlled airflow and HEPA filtration to provide a contained work area, protecting laboratory personnel, the environment, and the specimen from exposure to infectious aerosols generated while handling microorganisms such as bacteria, viruses, and fungi. It ensures operator safety and maintains aseptic conditions during microbiological procedures.

Functions:

- Personnel protection: prevents inhalation of infectious aerosols during handling of pathogens such as Mycobacterium tuberculosis, Brucella, and viral cultures
- Product/sample protection: maintains sterility of cultures, media, and clinical specimens
- Environmental protection: filters exhaust air to prevent laboratory contamination

Working principle – General

- Room air is drawn through the front opening, forming an inward airflow barrier
- Air flows across the work surface, capturing aerosols generated during procedures
- Contaminated air passes through HEPA filters that remove 99.97–99.99% of particles ≥0.3 microns
- Filtered air is either exhausted outside or recirculated depending on cabinet class

Types of biosafety cabinets with uses:

Class I

- Provides personnel and environmental protection only
- No protection for the product
- HEPA-filtered exhaust air
- Used for procedures involving low-to-moderate risk agents where sterility is not critical

Class II

- Provides personnel, product, and environmental protection
- Most commonly used in microbiology laboratories
- Uses HEPA-filtered vertical laminar airflow
- Subtypes A1, A2, B1, B2 differ in exhaust pattern and chemical handling capacity
- Used for routine bacteriology, virology, mycology, cell culture, and diagnostic specimen processing

Class III

- Maximum containment cabinet
- Totally enclosed, gas-tight system with glove ports
- Exhaust air is double HEPA-filtered
- Used for high-risk pathogens (BSL-4) such as Ebola virus (reference standard)

Clinical and laboratory uses with examples

- Processing sputum for tuberculosis culture and smear preparation
- Handling blood and body fluid specimens suspected of HIV or hepatitis viruses
- Subculturing bacterial isolates like Salmonella and Shigella
- Viral culture work and cell line maintenance
- Aerosol-generating procedures such as vortexing, pipetting, and centrifuge loading

Care and maintenance

- Cabinet should be placed away from doors, windows, and high-traffic areas
- HEPA filters must be certified and tested periodically
- Work surface should be disinfected before and after use
- Avoid overcrowding and rapid hand movements
- UV light (if present) used only when cabinet is not in operation

Troubleshooting (practical points)

- Alarm sounding: check airflow obstruction or sash position
- Contamination of cultures: ensure proper aseptic technique and airflow integrity
- Reduced airflow: check filter status and cabinet certification

References

4. AFIP Manual of Laboratory Medicine
5. Mackie & McCartney Practical Medical Microbiology
6. CDC Laboratory Guidelines for Mycobacterial Diagnostics

G. Tissue processor

A tissue processor is an automated laboratory instrument that carries fixed tissue specimens through dehydration, clearing, and wax impregnation to prepare them for embedding and sectioning.

Types and uses

1. Manual tissue processor
    a. Tissues are transferred manually between reagents.
    b. Use: Small laboratories, low workload.
2. Automatic tissue processor
    a. Reagent changes, timing, agitation, and temperature are computer controlled.
    b. Use: Routine histopathology laboratories for biopsy and surgical specimens.

Clinical relevance:

- Uniform processing of tissues
- Reduced processing time
- Improved tissue morphology
- Essential for accurate histopathological diagnosis

Automated Tissue Processor

H. Embedding station

- Used to embed processed tissues in molten paraffin wax to form blocks for sectioning.

I. Microtome

- Used to cut thin, uniform tissue sections (3–5 µm) for microscopic examination.

J. Water bath

- Used to float and flatten paraffin tissue sections before mounting on glass slides.

K. Centrifuge

- Used to separate components of blood, urine, and other body fluids based on density.

L. Biosafety cabinet / laminar airflow

- Used to provide a sterile and safe working environment while handling infectious or sensitive biological materials.

Rapid Diagnostic Tests in Clinical Laboratory

Introduction

Rapid tests are simple diagnostic assays that provide results within minutes, require minimal equipment, and are useful in emergency situations and resource-limited settings. They are mainly used as screening tests. Because of limitations such as false negatives, inability to quantify pathogen load, or species differentiation, positive or doubtful results should be confirmed by appropriate gold standard tests like microscopy, ELISA, or PCR.

1. Immunochromatographic test (ICT) for malaria

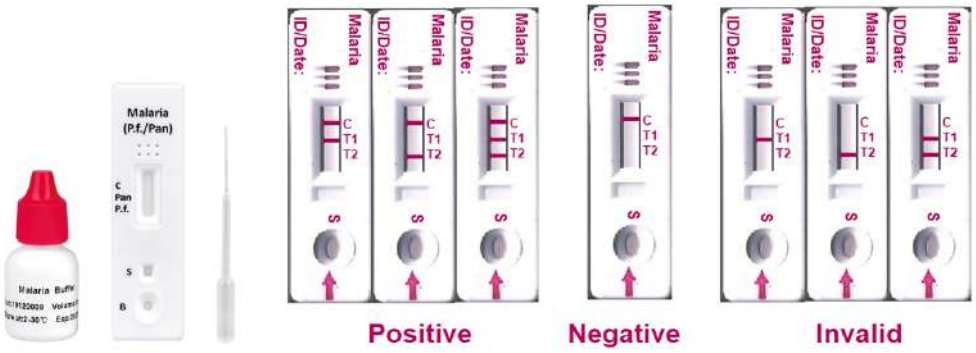
Principle: Lateral flow immunoassay that detects malaria parasite antigens in whole blood. The immuno-chromatographic (ICT) test device is coated with monoclonal antibodies to histidine-rich protein-2 (specific to P. falciparum) and pan-specific or species-specific plasmodium lactate dehydrogenase (specific to all four plasmodium species- pLDH or aldolase). Antigen–antibody reaction produces a visible colored test line, with a control line indicating test validity.

Interpretation:

- Negative: only control line present
- Positive: control line with one or more test lines (species dependent)
- Invalid: control line absent

Uses: Rapid screening and diagnosis of malaria in endemic areas and emergencies, especially where microscopy is not immediately available.

Gold standard: Microscopic examination of thick and thin blood smears. PCR is used in low parasitemia or for species confirmation.



2. Hepatitis B and C Immunochromatographic Test (ICT based)

Principle: Lateral flow immunoassays detecting HBsAg (hepatitis B) or anti-HCV antibodies (hepatitis C) use antigen–antibody reactions on a membrane. ICT tests (also known as lateral

flow immunoassays) are qualitative tests that typically use a blood sample (serum, plasma, or whole blood) and provide results within 10-20 minutes without the need for sophisticated laboratory equipment.

Hepatitis B (HBV): The tests typically detect the Hepatitis B surface antigen (HBsAg), a protein present on the virus's surface, indicating a current infection.

Hepatitis C (HCV): The tests detect antibodies to the Hepatitis C virus (anti-HCV). A positive antibody test indicates exposure to the virus but does not distinguish between a past resolved infection and a current active one; a separate molecular (PCR or RNA) test is needed to confirm active infection.

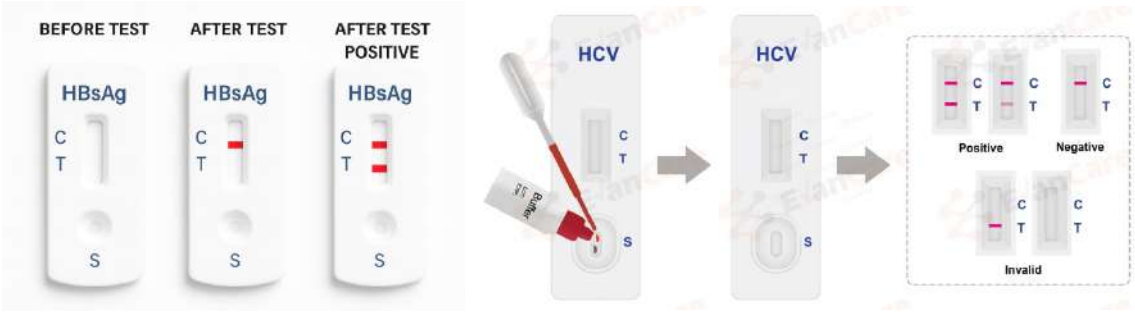
Interpretation

- Positive: both control and test lines visible
- Negative: only control line visible

Uses: Initial screening of hepatitis B and C in clinical and field settings.

Limitations: Rapid tests less effective at detecting low viral loads, distinguishing infection stages, or identifying new infections during the "window period" (the time between infection and the appearance of detectable antibodies or antigens) compared to molecular techniques

Gold standard: ELISA for serological confirmation and PCR for detection of viral DNA/RNA and assessment of active infection.



3. ELISA for Hepatitis B and C

Principle: Enzyme-linked immunosorbent assay (ELISA) is an immunological method used to detect specific viral antigens such as HBsAg or antibodies such as anti-HCV in serum or plasma. It is based on a specific antigen–antibody reaction on a solid phase, usually a microtiter plate. The patient sample binds to the immobilized antigen or antibody, after which an enzyme-labeled conjugate is added to form an immune complex. Following washing steps, a

chromogenic substrate is added, and the enzyme–substrate reaction produces a color change. The intensity of the color is proportional to the amount of antigen or antibody present and is measured spectrophotometrically for qualitative or quantitative interpretation.

Interpretation: Optical density (absorbance) is measured by an ELISA reader and compared with a cutoff value. Values above cutoff are reactive.

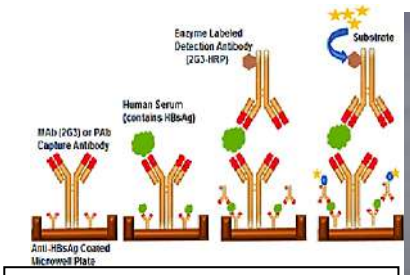
- Absorbance > cutoff → Positive
- Absorbance < cutoff → Negative

Uses: Laboratory-based screening of blood donors and patients with higher sensitivity than rapid tests.

Gold standard: PCR or nucleic acid testing to confirm active infection. For HBV, additional serological markers are assessed.

Uses of ELISA other than virology:

- Detection of bacterial and parasitic infections (e.g., typhoid, toxoplasmosis, amoebiasis)
- Diagnosis of autoimmune disorders by detecting autoantibodies (e.g., ANA, anti-dsDNA, rheumatoid factor)
- Detection of hormones such as hCG, insulin, and thyroid hormones
- Allergy testing by measurement of specific IgE antibodies
- Tumor marker estimation (e.g., PSA, AFP, CA-125)
- Screening for blood transfusion–related infections and compatibility testing
- Therapeutic drug monitoring and measurement of cytokines and other biomarkers



ELISA Basic principle

ELISA Microplate

ELISA Microplate

4. Polymerase Chain Reaction (PCR) for HBV, HCV, and HIV

Principle: A molecular technique that detects viral infections by amplifying specific target sequences of viral DNA or RNA. The viral nucleic acid is first extracted from the sample and then amplified through repeated thermal cycles using sequence-specific primers and a thermostable polymerase. This amplification increases even minute quantities of viral genetic material to detectable levels, allowing highly sensitive and specific identification of the pathogen, with real-time PCR also enabling quantification of viral load.

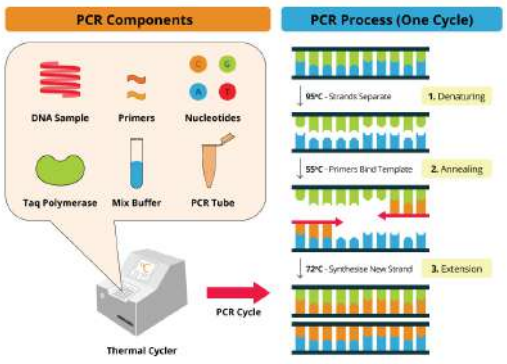
Interpretation: Presence or absence of viral genome; real-time PCR also provides viral load and cycle threshold values.

Uses: Confirmation of active infection, early diagnosis, monitoring treatment response, and assessing virological cure or suppression.

Gold standard: PCR itself is considered the gold standard for confirming active viral replication.

Uses of PCR other than virology

- Detection and identification of bacterial, fungal, and parasitic infections (e.g., Mycobacterium tuberculosis, Chlamydia, Plasmodium)
- Diagnosis of genetic disorders by detecting gene mutations or deletions
- Prenatal and neonatal screening for inherited diseases
- Oncology: detection of oncogenes, tumor suppressor gene mutations, and minimal residual disease
- Forensic medicine: DNA fingerprinting and individual identification
- Transplant medicine: HLA typing and graft monitoring
- Detection of antimicrobial resistance genes
- Research applications including gene cloning and expression analysis



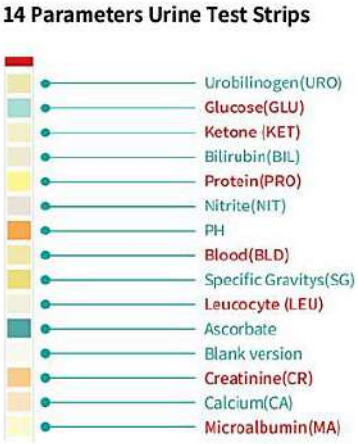
5. Urine Dipstick Test

Principle: A urine dipstick is a plastic reagent strip containing multiple chemically impregnated pads, each specific for a particular urinary constituent such as glucose, protein, blood, ketones, nitrites, leukocyte esterase, and pH. When the strip is immersed in urine, these pads undergo specific enzymatic or chemical reactions with the corresponding analytes, resulting in characteristic color changes. The color intensity correlates with the concentration of the substance present and is interpreted by visual comparison with a standardized color chart or by an automated reader, allowing rapid screening for metabolic, renal, and urinary tract disorders.

Interpretation: Color changes are compared visually with a standard chart at specified times.

Uses: Screening for urinary tract infection, diabetes mellitus, renal disorders, and liver disease.

Gold standard: Microscopic urine examination, urine culture for UTI, and specific biochemical tests such as blood glucose or 24-hour urine protein.



6. Pregnancy test

Principle: Lateral flow immunoassay detecting human chorionic gonadotropin (hCG) in urine or blood.

Interpretation:

- Positive: Test line along with control line
- Negative: Control line only
- Invalid: Control line absent

Uses: Rapid detection of pregnancy.

Gold standard: Quantitative serum hCG estimation and ultrasonography.

Test	Principle	Interpretation	Use	Gold Standard
ICT Malaria	Detects specific antigens (HRP-2 for *P. falciparum* or pLDH/Aldolase for all species) using gold-labeled antibodies.	Presence of a Test (T) line and Control (C) line is positive; C line only is negative.	Emergency screening and field diagnosis.	**Microscopy** (Thick/Thin blood films).
Rapid Hep B (HBsAg)	Lateral flow immunoassay detecting the Hepatitis B surface antigen.	Two lines (C and T) = Positive; One line (C) = Negative.	Initial screening for HBV infection.	**ELISA** or **PCR** (for viral load).
Rapid Hep C (Anti-HCV)	Detects antibodies against the Hepatitis C virus using immobilized antigens.	Visible pink dots or lines at test sites indicate reactivity.	Screening for exposure to HCV.	**PCR** (HCV RNA) to confirm active infection.
Pregnancy Test (uHCG)	Detects human chorionic gonadotropin (hCG) hormone in urine.	Two lines = Pregnant; One line = Not pregnant.	Early detection of pregnancy.	**Serum HCG** (quantitative) or Ultrasound.
Urine Dipstick	Chemical reagents on pads change color (e.g., glucose oxidase for glucose, diazonium salt for nitrites).	Color change matched against a manufacturer's chart.	Screening for UTIs, diabetes, and kidney disorders.	**Urine Culture** (for UTI) or **24-hour urine protein**.

Student Task

S. No.	Equipment / Instrument Observed	Clinical Use Explained (Yes/No)	Basic Principle Understood (Yes/No)	Demonstration Attended (Yes/No) Lecturer Signature
1	Compound microscope (binocular)			
2	Microbiology incubator			
3	CO_2 / anaerobic incubator			
4	Automated hematology analyzer			
5	Clinical chemistry analyzer			
6	BACTEC Blood Culture System (BD)			
7	Tissue processor			
8	Embedding station			
9	Microtome			
10	Water bath			
11	Centrifuge			
12	Biosafety cabinet / laminar airflow			

Dated:_____

S. No.	Tests Observed	Lecturer signature	Remarks
1	ICT for Malaria		
2	Rapid Hepatitis B test (HBsAg)		
3	Rapid Hepatitis C test (Anti-HCV)		
4	Urine pregnancy test (hCG)		
5	Urine dipstick test		
6	ELISA (HBsAg / Anti-HCV)		
7	PCR (HBV / HCV / HIV)		

Dated:_____/_____/_____

Practical # 16

Sample collection and Transportation

Introduction

Proper sample collection and transport are crucial for accurate laboratory diagnosis. Errors at this stage can lead to false results irrespective of test quality. The basic steps include correct patient identification and documentation, proper specimen collection using aseptic techniques, appropriate labeling, and timely transport to the concerned laboratory section under recommended conditions.

General steps in specimen handling

Patient documentation and registration

The patient is registered at the reception with details including hospital number, name, age, sex, unit/address, and investigations requested. Identity and entitlement are verified. A receipt mentioning tests and report timing is issued before specimen collection.

Specimen collection

Specimens must be collected from the correct site, in adequate quantity, using sterile containers, preferably before starting antimicrobial therapy. Proper labeling with patient details, date, time, and type of specimen is mandatory. Relevant clinical information should be mentioned on the request form.

1. Blood specimen collection (venepuncture):

1) Verify patient identity using name, hospital number, and request form.
2) Explain the procedure to the patient and obtain cooperation.
3) Wash hands thoroughly and wear disposable gloves.
4) Arrange all required materials (syringe/vacutainer, needle, tourniquet, antiseptic swabs, and labeled tubes).
5) Seat the patient comfortably with the arm supported.
6) Apply tourniquet and select a suitable vein, preferably the antecubital vein.
7) Clean the puncture site with 70% alcohol using circular motion from center outward and allow to dry.
8) For blood culture, disinfect the site with iodine or povidone-iodine, allow to act, then remove with alcohol.
9) Do not touch the cleaned site again to avoid contamination.
10) Insert the sterile needle into the vein and withdraw required volume of blood gently to prevent hemolysis.
11) Release tourniquet once blood flow is established.
12) Withdraw the needle and apply firm pressure with sterile swab until bleeding stops.
13) Transfer blood into pre-labeled containers without touching the rim or inside of the tube.

14) Dispose of needle and sharps immediately in puncture-proof container.
15) Remove gloves and perform hand hygiene.

Avoiding contamination in blood collection

- Use sterile, single-use needles and syringes
- Proper skin antisepsis and adequate drying time
- Avoid touching needle, puncture site, or container openings
- Use aseptic technique especially for blood culture samples

Transport: Whole blood is stored at 4°C, serum at 2–8°C, and frozen at –20°C or below for reference laboratories when required.

Blood for culture

Blood for culture is collected under strict aseptic conditions and preferably before initiation of antibiotic therapy to improve pathogen recovery. Two or more blood culture samples are recommended, collected from different venepuncture sites (preferably from different veins) and at different times, to increase diagnostic yield and to help differentiate true bacteremia from skin contamination.

Tube Cap Color	Additive / Preservative	Primary Use
Purple / Lavender	**EDTA (Ethylenediaminetetraacetic acid)**	Hematology (e.g., CBC, ESR, blood films)
Light Blue	**Sodium Citrate (3.2% or 3.8%)**	Coagulation studies (PT, APTT, D-dimer)
Red	**No additive / Clot activator**	Serum tests (e.g., electrolytes, LFTs, RFTs)
Green	**Heparin (Lithium or Sodium Heparin)**	Plasma chemistry (e.g., ammonia, some hormones)
Gray	**Sodium fluoride + Potassium oxalate**	Glucose estimation, lactate, ethanol levels

2. Sputum specimen

1) Explain the purpose and procedure of sputum collection to the patient.
2) Collect the specimen preferably in the early morning before eating, drinking, or brushing teeth.
3) Collect it near an open window or balcony or in an open bathroom with good ventilation or Outdoors, if possible, away from other people. The patient should avoid closed rooms and crowded areas to reduce the risk of spreading infection, especially in suspected tuberculosis or respiratory infections.
4) Ask the patient to rinse the mouth thoroughly with clean water only; antiseptic mouthwash should not be used.
5) Provide a clean, sterile, wide-mouthed, leak-proof container and instruct the patient not to touch the inside of the container or lid.
6) Ask the patient to take 2–3 deep breaths to expand the lungs.
7) Instruct the patient to cough deeply from the chest and bring up sputum (phlegm), not saliva.
8) Expectorate the sputum directly into the container without contaminating the rim or inner surface.
9) Ensure the sample is thick, purulent sputum rather than clear saliva.
10) Close the container immediately and tightly after collection.
11) Label the container with patient name, date, time, and type of specimen.
12) Send the specimen to the laboratory promptly; if delay is unavoidable, store at 2–8°C.
13) If the patient is unable to cough up sputum, chest physiotherapy, steam inhalation, or nebulization may be used to induce sputum. In infants or uncooperative patients, gastric aspirate may be collected under medical supervision.
14) For diagnosing conditions like tuberculosis (TB), the standard protocol is to collect three sputum specimens over two to three days.

Prevention of contamination

- Rinse mouth with water before collection to remove food debris
- Avoid saliva, nasal secretions, and postnasal discharge
- Use only sterile containers
- Do not touch the inner surface of container or lid
- Transport specimen without delay

3. Urine specimen

Purpose of Urine Collection

- To diagnose infections (e.g., UTI), kidney diseases, metabolic disorders.

- To perform tests like urine culture, routine examination, proteinuria screening, etc.

Types of Urine Specimens

1. Midstream clean-catch: Culture for UTI, routine tests
2. First morning urine: Pregnancy test, concentrated sample
3. Catheterized sample: If patient is catheterized
4. Suprapubic aspiration: Pediatric patients, when contamination must be avoided
5. 24-hour urine collection: Protein, creatinine clearance, etc.
6. Random urine sample: Often used for routine screening

Instructions to the Patient (Midstream Clean-Catch)

1. Wash hands thoroughly.
2. Clean genital area with clean water or antiseptic wipes
    a. Females: Front to back.
    b. Males: Retract foreskin if applicable.
3. Begin urinating, discard the first few milliliters, and collect the midstream urine in a sterile, screw-cap container.
4. Close the container tightly without touching the inside of the lid or cup.

Transport Guidelines

- Label the container clearly: name, date, time of collection.
- Transport to the lab within 1 hour of collection.
- If delay exceeds 1–2 hours, refrigerate the sample at 2–8°C to prevent bacterial overgrowth.
- For culture, do not freeze and avoid using preservatives unless specified.
- Use urine transport tubes (with boric acid) if refrigeration isn't possible and transport will take longer.

Common Errors to Avoid

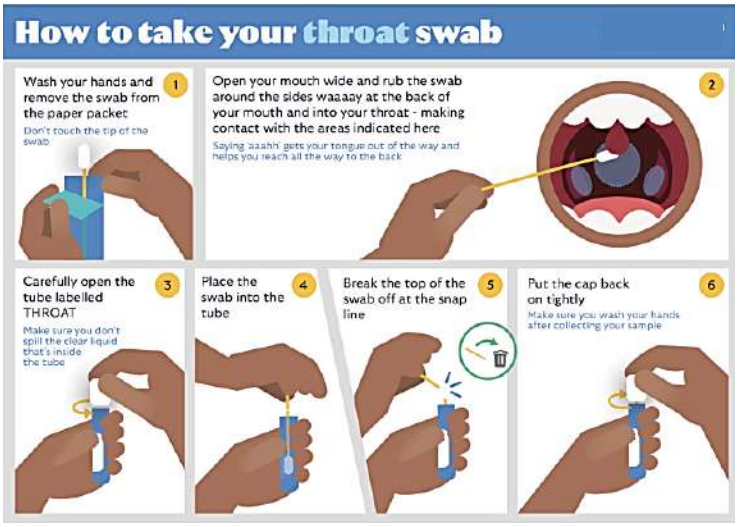
- Using non-sterile containers
- Collecting only the first voided urine (may lead to contamination)
- Delayed transport without refrigeration
- Labeling errors or missing patient info

4. Throat and Nasal swab

- Throat swabs are collected under good illumination and direct vision using a sterile swab, preferably before starting antibiotics. The swab is gently rubbed over areas of

inflammation, exudate, ulcers, or tonsillar crypts while avoiding contact with the tongue, cheeks, or teeth to prevent contamination with oral flora. The procedure should be quick and gentle to minimize discomfort and gag reflex.

- Nasopharyngeal swabs are collected by trained personnel using flexible, sterile swabs. The swab is inserted gently along the floor of the nasal cavity until resistance is felt at the nasopharynx, rotated gently to absorb secretions, and then withdrawn slowly. This method provides a higher yield for respiratory pathogens, including viruses.
- After collection, swabs are immediately placed into *appropriate transport media* (such as Stuart, Amies, or viral transport medium) to preserve organism viability. Specimens are labeled correctly and transported promptly to the laboratory, preferably at recommended temperatures, to ensure accurate culture or molecular testing.



5. Biopsy and Surgical specimens

Specimens are placed in wide-mouthed containers with sufficient fixative. Routine specimens are fixed in **10% neutral buffered formalin (NBF),** and employing a fixative-to-specimen volume ratio of at least **10:1**. Frozen section samples are sent in normal saline without fixative. Containers are properly labeled, and request forms include site of biopsy and brief clinical history. Bone specimens are accompanied by radiographs when indicated.

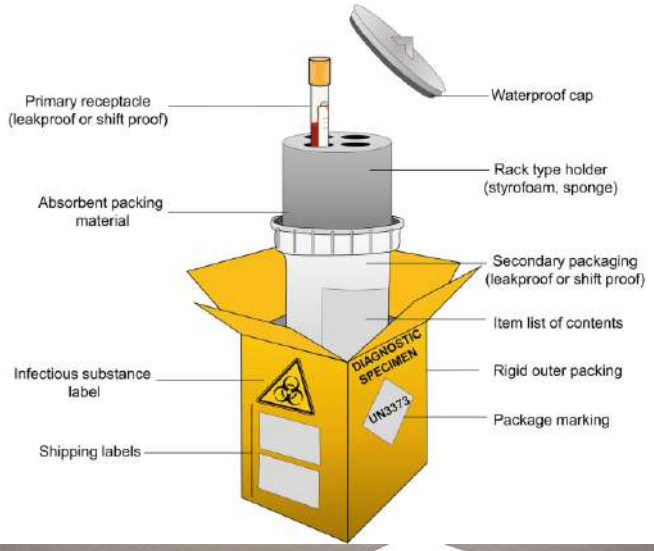
Transport of Specimens

- All laboratory specimens should be considered potentially infectious and handled with standard precautions to ensure safety, specimen integrity, and accurate results.

- *Safety:* Standard precautions must be followed during transport, including hand hygiene and use of appropriate personal protective equipment. Needles and sharps should never be transported with specimens and must be disposed of immediately after use.
- *Specimen integrity:* Correct specimen type, appropriate container, and proper handling are essential. Blood samples must be collected in the correct tubes and transported without undue delay to prevent hemolysis, clotting, or degradation of analytes.
- *Temperature control:* Specimens must be transported at recommended temperatures. Some samples are transported at room temperature, others require refrigeration at 2–8°C, and certain specimens need freezing at –20°C or below. Insulated containers with ice packs or gel packs are used when required.
- *Triple packaging system:* Specimen transport follows the triple packaging system.
    - The primary container is a leak-proof, securely closed specimen container.
    - The secondary container is a leak-proof protective covering with absorbent material to contain spills.
    - The outer container is a rigid box that protects against physical damage during transport.
- *Labeling and documentation:* Each specimen container must be labeled immediately after collection with patient name, identification number, date, and time. The request form with clinical details should be placed separately from the specimen to avoid contamination.
- *Regulatory compliance:* Most routine diagnostic specimens are classified as Category B (biological substances that are not in a form generally capable of causing life-threatening disease in otherwise healthy individuals) and transported according to standard guidelines. Proper labeling of the outer container and availability of responsible contact details are essential.
- *Coordination:* Urgent or special specimens should be communicated to the laboratory in advance to ensure timely and appropriate processing.
- *Adherence to these principles* ensures reliable results, protects healthcare personnel, and maintains laboratory quality standards.
- *Example:* Sputum for tuberculosis should be transported promptly or refrigerated at 2–8°C to prevent overgrowth of commensals, while blood culture bottles must be kept at room temperature and not refrigerated. Viral swabs require transport in viral transport medium under cold conditions to maintain infectivity for accurate detection.

Specimen	Transport medium	Temperature	Urgency
Blood (routine	Plain/anticoagulant tube	Room	Immediate

tests)		temperature	
Blood culture	Culture bottle	Room temperature	Immediate
Sputum	Sterile container	2–8°C if delayed	Prompt
Urine	Sterile container	2–8°C if delayed	Within 1–2 hours
Throat/nasal swab	Transport medium	2–8°C	Immediate
Biopsy specimen	**10% neutral buffered formalin (NBF)**	Room temperature	Prompt



Triple Packaging

Student task

S.No.	Type of Specimen	Sample Collection and Transport Method	Lecturer signature	Remarks
1	Blood (venepuncture)	Peripheral venous blood collection		
2	Blood for culture	Aseptic collection from two sites		
3	Sputum	Early morning deep cough method		
4	Urine	Midstream clean-catch method		
5	Throat swab	Swab from tonsillar area		
6	Nasopharyngeal swab	Deep nasal swab technique		
7	Biopsy specimen	Surgical tissue in fixative		
8	Sample transport	Triple Packing System		

Dated:_____/_____/_____

Practical # 17

GRANULATION TISSUE

Introduction

Wound healing is a complex, well-coordinated biological process that restores tissue integrity following injury. It involves a sequence of overlapping phases: inflammation, proliferation, and remodeling. Healing occurs by two main mechanisms: regeneration, where lost cells are replaced by the same type of cells, and repair, where damaged tissue is replaced by fibrous tissue (scar formation). The choice of mechanism depends on the type of tissue injured and the extent of damage. In most clinical wounds, healing occurs predominantly by repair, with granulation tissue playing a central role.

Types of wound healing

- *Healing by primary intention:* occurs in clean, incised wounds with minimal tissue loss; characterized by minimal granulation tissue and small scar.
- *Healing by secondary intention:* occurs in large wounds with extensive tissue loss; characterized by abundant granulation tissue, wound contraction, and larger scar.
- *Healing by tertiary intention (delayed primary closure):* wound is left open initially and closed later after infection is controlled.

Granulation tissue is newly formed, young mesenchymal tissue that develops during wound healing. It is composed of proliferating capillaries, fibroblasts, and inflammatory cells, and fills the gap between wound edges. It appears pink and granular grossly due to abundant neovascularization.

Granulation tissue is essential for wound repair as it:

- Fills the tissue defect and provides a scaffold for further healing
- Supplies oxygen and nutrients through newly formed capillaries
- Supports re-epithelialization over the wound surface
- Serves as the precursor to mature fibrous scar tissue

Components of granulation tissue:

- Newly formed capillaries (angiogenesis)
- Proliferating fibroblasts
- Inflammatory cells, mainly macrophages, with lymphocytes and occasional neutrophils
- Loose extracellular matrix with early collagen deposition

Formation:

- 0–3 days: Inflammation with neutrophils and macrophages
- 3–7 days: Proliferation of fibroblasts and endothelial cells, formation of granulation tissue
- 1–2 weeks onwards: collagen deposition, reduction in vascularity
- Weeks to months: remodeling and maturation into fibrous scar

Morphology:

Gross features

- Pink to red, soft, moist tissue
- Granular appearance due to abundant capillaries
- Bleeds easily on touch
- Seen at the base of healing wounds

Microscopic features (H&E stain) [Points of identification]

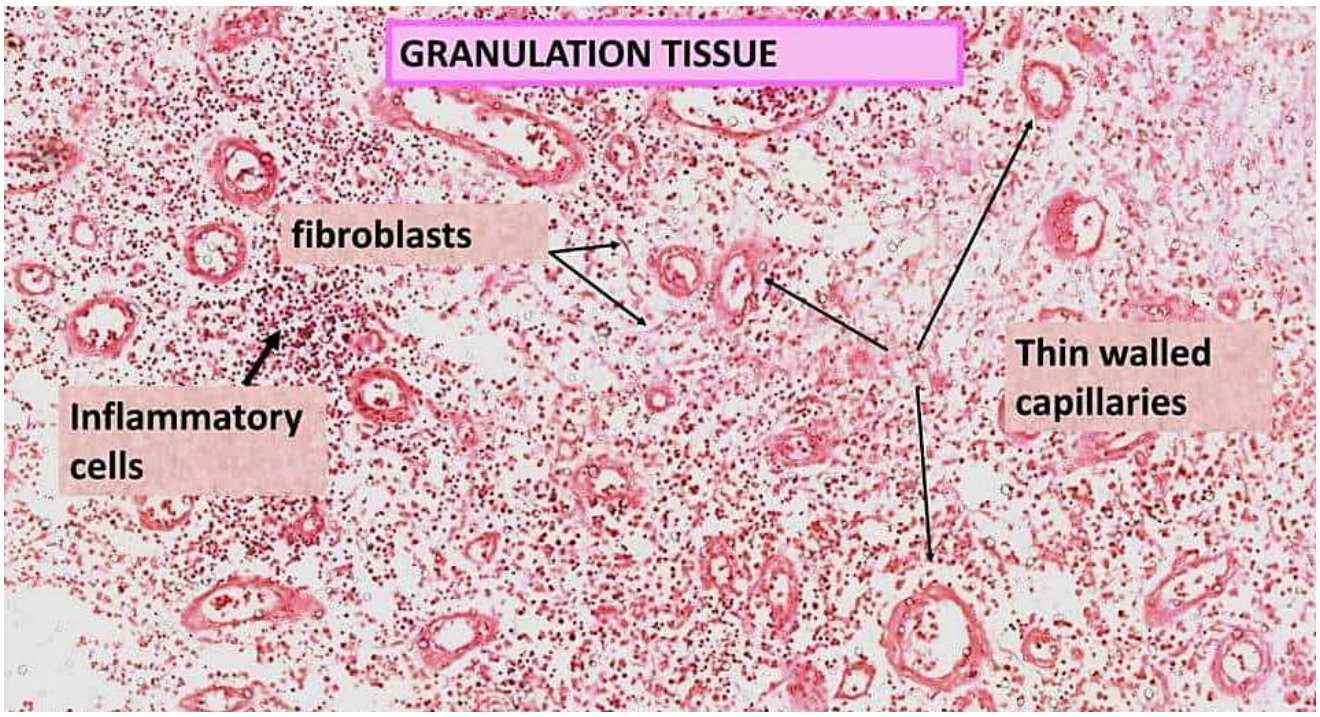
- Numerous newly formed, thin-walled capillaries lined by plump endothelial cells (angiogenesis)
- Proliferating plump fibroblasts arranged loosely in the stroma
- Loose, edematous extracellular matrix with early collagen (mainly type III)
- Mixed inflammatory infiltrate, predominantly macrophages, with lymphocytes and plasma cells
- Absence of dense, organized collagen bundles seen in mature scars.

Abnormalities and Complications of Wound Healing

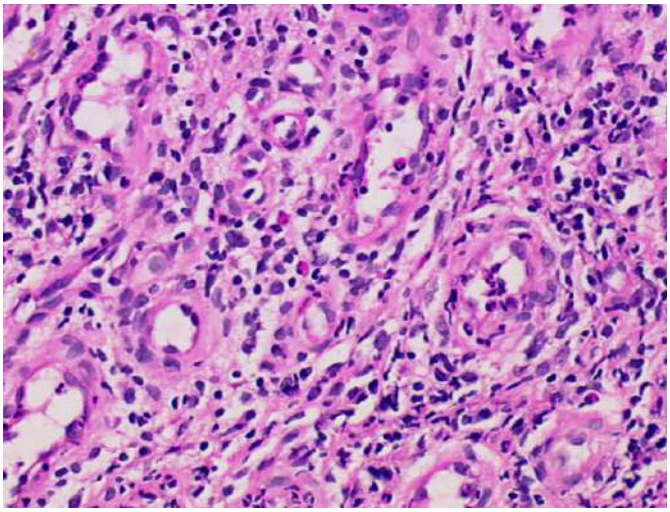
a. Defective healing (chronic wounds):
    - Venous ulcers due to chronic venous insufficiency
    - Arterial and diabetic ulcers due to ischemia and neuropathy
    - Pressure sores due to prolonged pressure and ischemia
b. Excessive repair:
    - Hypertrophic scar: raised, collagen-rich scar confined to wound margins
    - Keloid: excessive collagen extending beyond wound boundaries
    - Exuberant granulation tissue (proud flesh): excess granulation tissue preventing re-epithelialization
c. Other complications
    - Wound dehiscence: reopening of wound due to infection, malnutrition, obesity, or increased intra-abdominal pressure
    - Contractures: excessive wound contraction causing deformity, commonly after burns

References

4. Robbins and Cotran, Basic Pathology
5. Harsh Mohan, Textbook of Pathology
6. Kumar, Abbas, Aster – Robbins Basic Pathology



H&E Slide Granulation Tissue (Low Power)



H&E Slide Granulation Tissue (High Power)

Student Task:

Instructor's signature:_____ **Dated: _____/_____/_____**

BLOCK – G

PRE-CLINICAL DENTISTRY II

(Neoplasia & Dental Rehabilitation)

Practical # 18

ASCARIS LUMBRICOIDES

Introduction

Stool examination is a simple, inexpensive, and essential laboratory procedure used for the detection of intestinal parasites. Ascaris is the largest intestinal nematode infecting humans and is highly prevalent in areas with poor sanitation. Microscopic examination of stool provides direct evidence of infection. As per CDC DPDx guidelines, stool microscopy remains the standard and most reliable diagnostic method for intestinal Ascaris infection. The presence of eggs indicates active intestinal infection and ongoing transmission potential.

Aim: To identify the eggs of Ascaris lumbricoides in stool by microscopic examination.

Specimen: Fresh stool sample collected in a clean, dry, urine-free container.

Important Precautions for Stool Examination

- Stool should be fresh and examined as early as possible
- Avoid contamination with urine or water
- Antiseptics should not be used for cleaning the container
- Warm stools are preferable for parasite detection
- Do not refrigerate stool meant for ova and parasite examination
- If blood or mucus is present, that portion should be examined
- Ideally, three consecutive stool samples should be examined to rule out infestation

Method of Stool Examination

- Naked eye (gross) examination
- Microscopic examination

Naked eye examination significance

1. *Presence of adult worms:* Direct evidence of heavy Ascaris infection.
2. *Mucus without blood:* Suggests intestinal irritation seen in helminthic infestation rather than bacterial dysentery.
3. *Greasy or oily appearance:* Indicates malabsorption due to chronic parasitic infection.
4. *Undigested food particles:* Suggests impaired digestion or rapid intestinal transit.
5. *Altered consistency (intermittent loose stools):* Seen in chronic worm infestation affecting gut motility (helminthic)

Microscopic examination:

- Direct saline smear
- Iodine (Lugol's iodine) preparation

In saline preparation, motility of parasites can be observed. Iodine preparation enhances visualization of ova and cysts by staining internal structures.

Stool Examination significance:

Stool examination helps in detecting:

- Ova, larvae, cysts, trophozoites of parasites
- Presence of RBCs and WBCs
- Fat globules in malabsorption
- Occult blood in gastrointestinal pathology

ASCARIS LUMBRICOIDES

Classification

Phylum: Nematoda

Common name: Roundworm

Habitat: Adult worms are found in the lumen of the small intestine (jejunum) of humans.

Geographical distribution: Worldwide, more common in tropical and subtropical regions with poor sanitation.

Hosts

- Definitive host: Human
- Intermediate host: None

Mode of transmission: Ingestion of embryonated (infective) eggs present in contaminated soil, water, or raw vegetables.

Disease caused: Ascariasis

Life cycle:

- Adult female worms lay eggs in the intestine
- Eggs are passed in feces
- In soil, fertilized eggs embryonate and become infective
- Humans ingest infective eggs
- Larvae hatch in intestine, migrate via bloodstream to lungs
- Larvae ascend trachea, are swallowed, and return to intestine
- They mature into adult worms and continue the cycle

Morphology of eggs of Ascaris lumbricoides

Types of eggs seen in stool

1. *Fertilized eggs (with double shell)*
    - Shape: Oval or round
    - Size: Approximately 50–70 µm
    - Color: Yellow-brown
    - Shell: Thick, rough, mammillated albuminous outer coat and smooth inner shell
    - Contents: Single unsegmented ovum with granular cytoplasm
2. *Unfertilized eggs*
    - Shape: Elongated
    - Size: Approximately 50–90 µm
    - Shell: Thin and irregular
    - Contents: Coarse granular material, no organized ovum
3. *Decorticated fertilized eggs*
    - Albuminous outer coat absent
    - Shell appears smooth and colorless
    - Internal ovum clearly visible

Points of Identification of Ascaris Egg

- Oval or round egg with thick shell
- Yellow-brown color (if albuminous coat present)
- Mammillated outer layer in fertilized eggs
- Large size compared to other helminthic eggs
- Presence of unsegmented ovum with granular cytoplasm

Clinical Features:

- Often asymptomatic in mild infection
- Abdominal pain, malnutrition, anemia
- Protein malnutrition in children
- Löffler's syndrome during larval lung migration (cough, fever, eosinophilia)
- Intestinal obstruction in heavy infestation
- Allergic manifestations such as rashes

Complications:

- Intestinal obstruction
- Volvulus or intussusception
- Biliary or pancreatic duct obstruction
- Growth retardation and malnutrition in children
- Pulmonary eosinophilia

Laboratory Diagnosis:

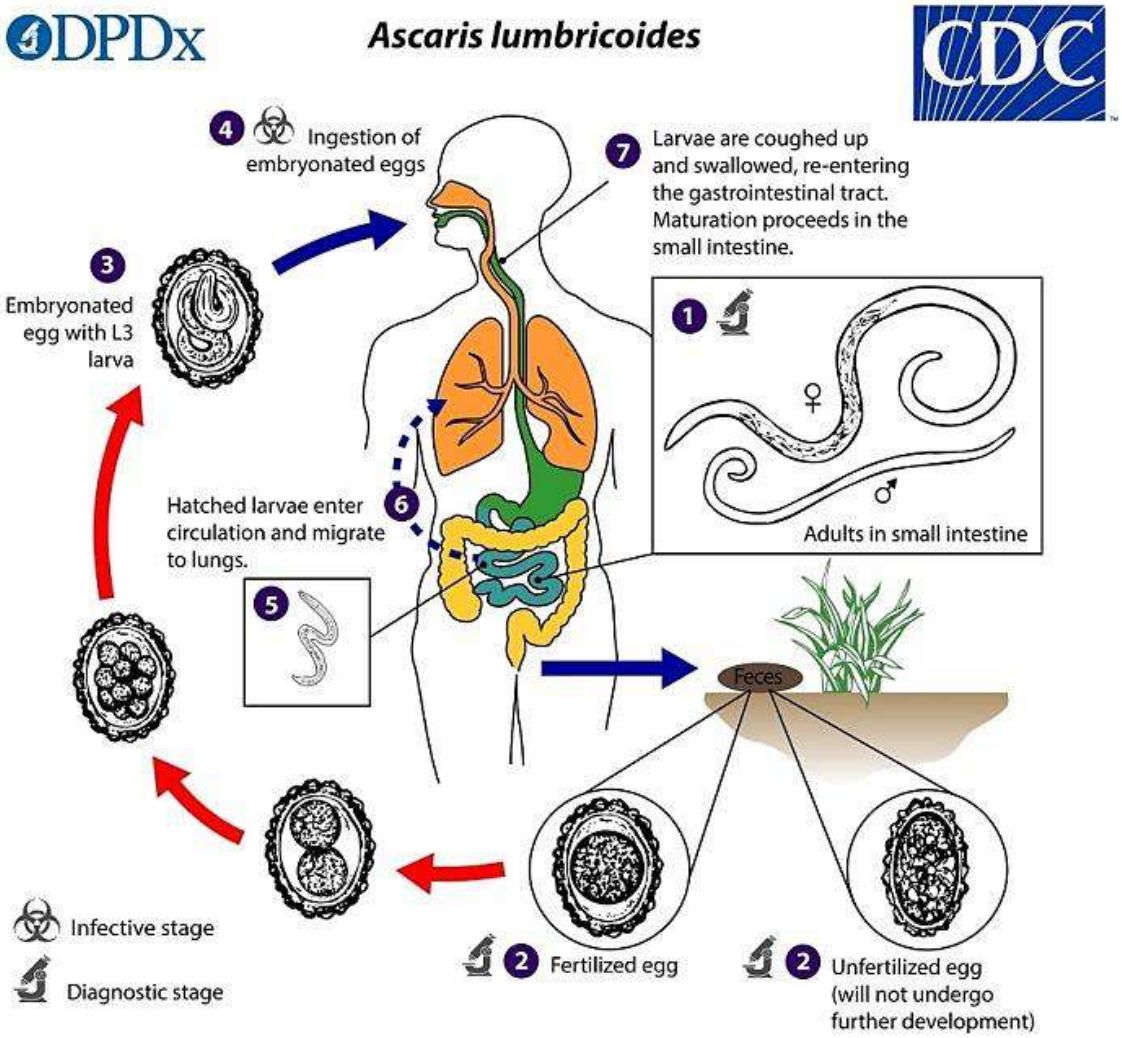
- Microscopic demonstration of eggs in stool (saline or iodine mount)
- Adult worms may be passed in stool or vomitus
- Peripheral blood eosinophilia

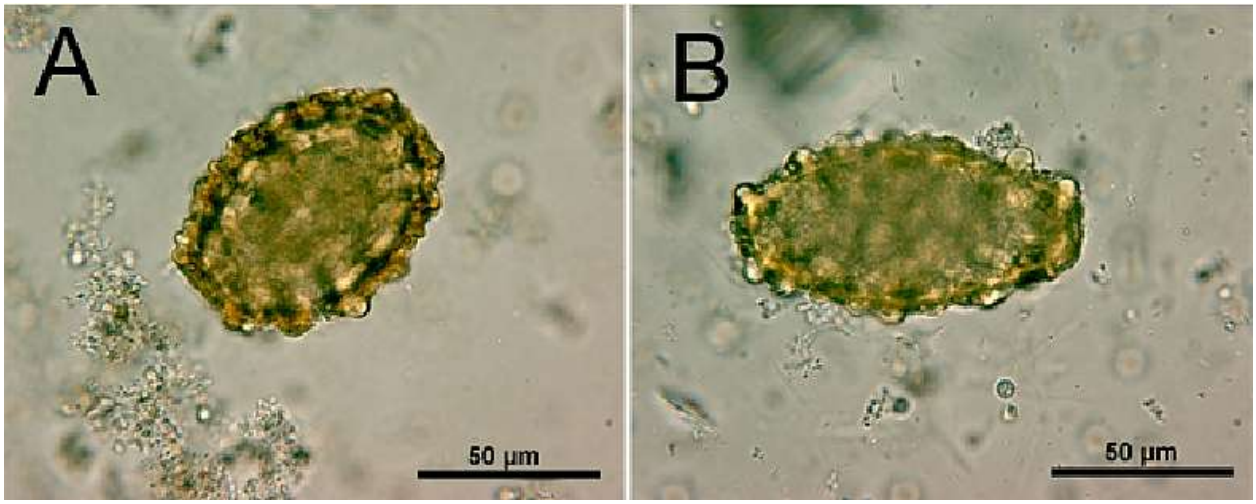
Prophylaxis and Prevention:

- Proper disposal of human feces
- Improved sanitation and safe drinking water
- Washing of vegetables thoroughly
- Personal hygiene and hand washing
- Health education

References:

1. Robbins and Cotran. Pathologic Basis of Disease. Elsevier
2. Levinson W. Review of Medical Microbiology and Immunology. McGraw-Hill
3. AFIP Laboratory Manual


DPDx
Ascaris lumbricoides
CDC
4 Ingestion of embryonated eggs
7 Larvae are coughed up and swallowed, re-entering the gastrointestinal tract. Maturation proceeds in the small intestine.
3 Embryonated egg with L3 larva
1
♀
♂
Adults in small intestine
Hatched larvae enter circulation and migrate to lungs.
6
5
Feces
Infective stage
Diagnostic stage
2 Fertilized egg
2 Unfertilized egg (will not undergo further development)



Microscopic images of A.lumbricoides eggs: fertilized (A) and non-fertilized (B)

Student Task:

Instructor's signature:_____ Dated: _____/_____/_____

Practical # 19

ANKYLOSTOMA DUODENALE

Introduction

Stool examination is an essential diagnostic procedure for detecting intestinal helminths. In hookworm infection, diagnosis is made by identifying characteristic eggs of Ancylostoma duodenale in stool under the microscope. Hookworm infection is a major cause of iron deficiency anemia, especially in tropical and subtropical regions with poor sanitation. Microscopic identification of eggs in stool remains the standard method for laboratory diagnosis.

Aim: To identify hookworm eggs (Ancylostoma duodenale / Necator americanus) in stool by microscopic examination.

Specimen: Fresh stool sample collected in a clean, dry, urine-free container.

Classification

Phylum: Nematoda

Ancylostoma duodenale: Common name: Old World hookworm

Necator americanus: Common name: New World hookworm

Disease: Hookworm disease / Hookworm infection

Habitat: Adult worms live attached to the mucosa of the small intestine of humans.

Geographical distribution: Widely distributed in tropical and subtropical regions where warm, moist soil favors larval development.

Hosts

- Definitive host: Human
- Intermediate host: None

Mode of transmission

- Infection occurs by skin penetration of infective filariform larvae present in fecally contaminated soil, commonly through bare feet.

Life cycle:

- Eggs are passed in feces
- Eggs hatch in soil to release rhabditiform larvae
- Larvae develop into infective filariform stage
- Filariform larvae penetrate skin
- Larvae migrate via bloodstream to lungs
- Ascend trachea, swallowed, and reach small intestine
- Mature into adult worms and attach to intestinal wall
- Eggs are produced and passed in feces

Morphology of hookworm egg

- Shape: Oval or elliptical
- Size: Approximately 60–65 µm × 40 µm
- Color: Colorless
- Shell: Thin, transparent hyaline shell
- Contents: Segmented ovum with 4–16 blastomeres
- Clear space present between shell and embryo

Points of Identification

- Oval, colorless egg
- Thin transparent shell
- Segmented ovum (4–16 blastomeres)
- Clear space between embryo and shell
- Eggs of Ancylostoma and Necator are morphologically indistinguishable

Pathogenesis:

- Adult worms attach to intestinal mucosa and suck blood
- Continuous blood loss leads to iron deficiency

Clinical Features:

- Ground itch at site of skin penetration
- Cough and bronchitis during larval lung migration
- Abdominal pain and diarrhea
- Weight loss
- Eosinophilia
- Microcytic hypochromic anemia

Complications:

- Severe iron deficiency anemia
- Protein-energy malnutrition
- Growth retardation in children
- Cardiac failure in severe anemia

Laboratory Diagnosis:

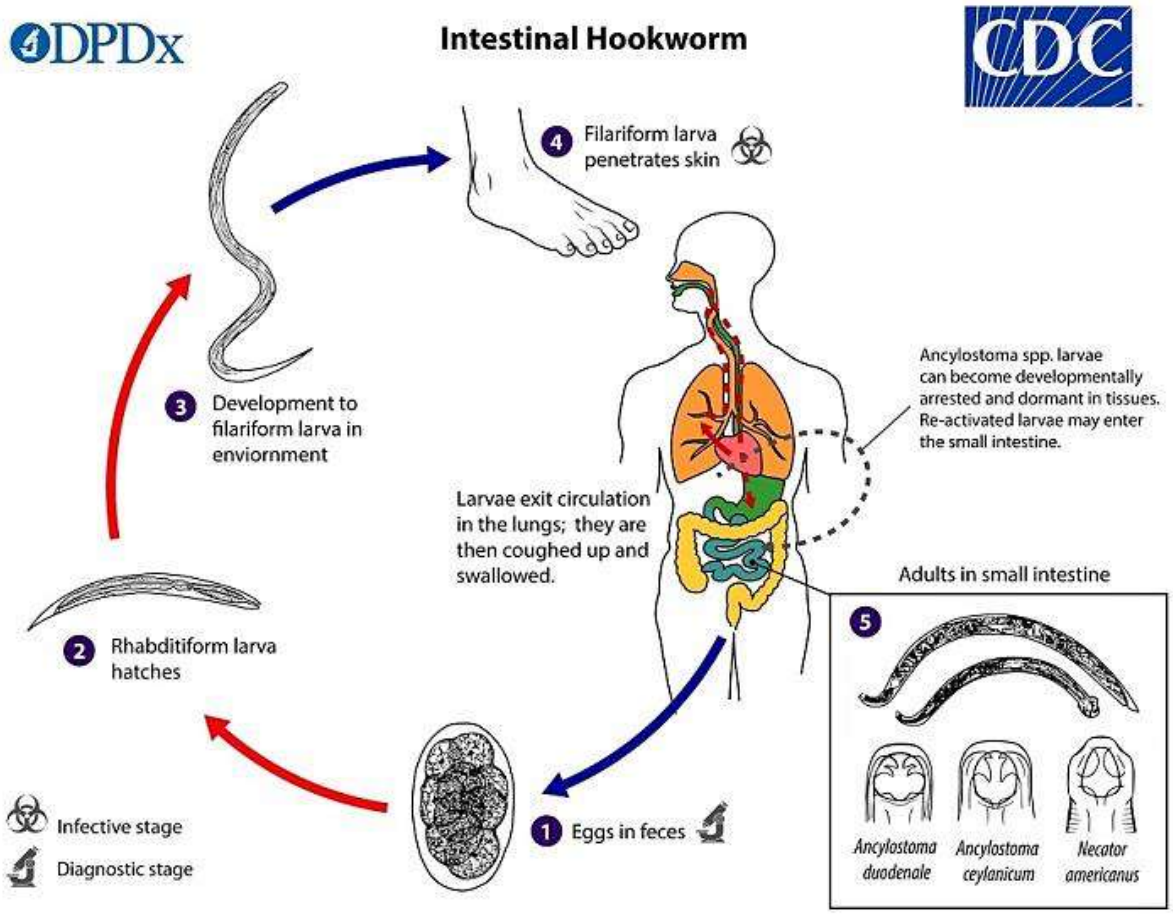
- Microscopic detection of eggs in stool (saline or iodine mount)
- Peripheral eosinophilia
- Reduced hemoglobin levels

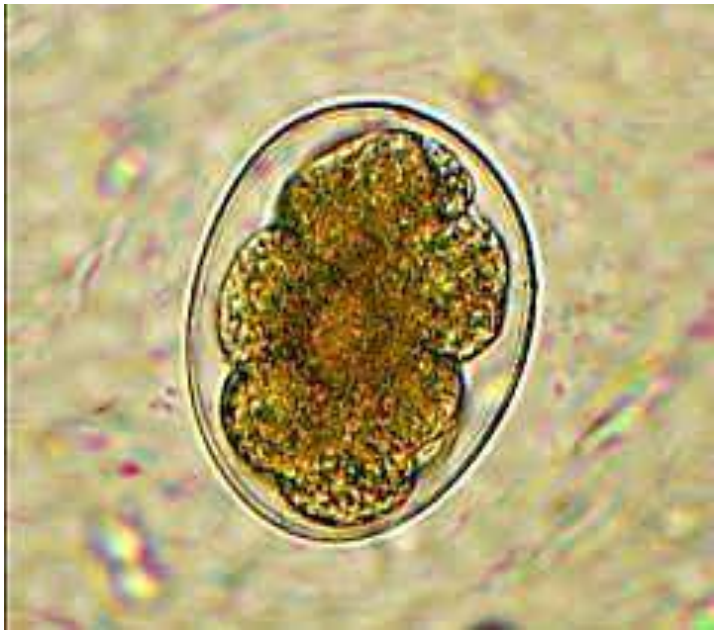
Prevention and Control:

- Wearing footwear
- Proper disposal of human feces
- Improved sanitation
- Health education

References:

1. Robbins and Cotran. Pathologic Basis of Disease. Elsevier
2. Levinson W. Review of Medical Microbiology and Immunology. McGraw-Hill
3. AFIP Laboratory Manual





Microscopic images of Hookworm

Student Task:

Instructor's signature:_____ **Dated: _____/_____/_____**

Practical # 20

ENTROBIUS VERMICULARIS

Introduction:

Enterobius vermicularis is a common intestinal nematode causing pinworm infection, especially in children. Diagnosis is usually made by demonstrating characteristic eggs collected from the perianal region rather than routine stool examination. Rapid maturation of eggs and frequent reinfection make enterobiasis a common community infection worldwide.

Aim: To identify eggs of Enterobius vermicularis under the microscope.

Common Name:

Pinworm / Threadworm

Specimen: Perianal sample collected using transparent adhesive tape (Scotch tape method) or stool sample in selected cases.

Classification:

Phylum: Nematoda

Geographical distribution: Worldwide (cosmopolitan), more common in children, overcrowded settings, and institutionalized populations.

Habitat: Adult worms reside in the caecum, appendix, colon, and rectum of humans.

Hosts:

- Definitive host: Human
- Intermediate host: None

Mode of transmission:

- Ingestion of embryonated eggs from contaminated hands, food, or fomites
- Autoinfection by scratching perianal area and transferring eggs to mouth
- Person-to-person transmission through contaminated clothes, bedding, and surfaces
- Retroinfection may occur when larvae hatch on perianal skin and migrate back into rectum

Disease: Enterobiasis (pinworm infection)

Life cycle:

- Eggs are ingested by humans
- Larvae hatch in the small intestine
- Adult worms develop in the colon
- Gravid females migrate at night to perianal region
- Eggs are deposited on perianal skin
- Eggs become infective within 4–6 hours
- Reinfection is common

Morphology of Enterobius egg:

- Shape: Asymmetrical, ovoid
- Size: Approximately 50 µm × 20 µm
- Color: Transparent and colorless
- Shell: Thin, double-layered shell
- One side flattened (planoconvex)
- Contents: Coiled larva or granular mass

Points of Identification of Enterobius Egg:

- Asymmetrical ovoid shape
- One side flattened and the other convex
- Transparent, colorless egg
- Thin double-layered shell
- Presence of developing larva

Adult worm: Adult worms are small, white, thread-like. Females measure 8–13 mm and males 2–5 mm in length.

Clinical Features:

- Intense perianal itching, especially at night
- Disturbed sleep and insomnia
- Teeth grinding in children
- Abdominal pain
- Irritability and restlessness

Complications:

- Secondary bacterial infection due to scratching
- Vulvovaginitis in females

- Appendicitis
- Recurrent infection due to autoinfection

Laboratory Diagnosis:

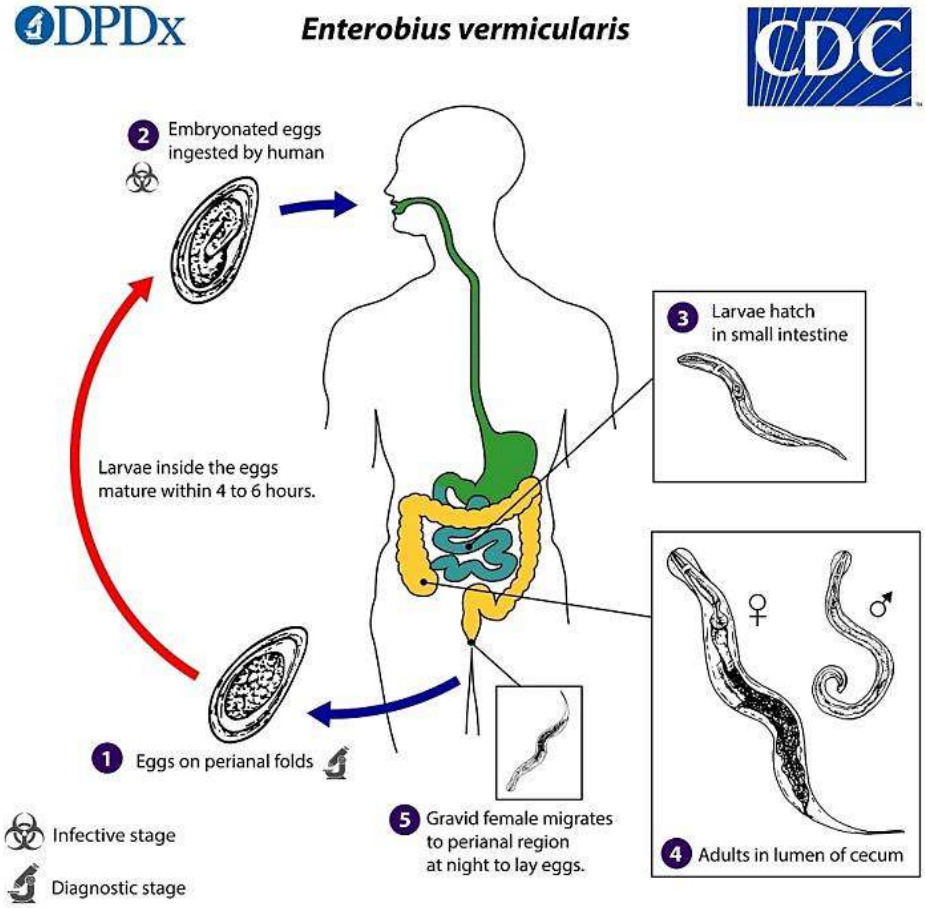
- Scotch tape method showing characteristic eggs
- Adult worms may be seen in diapers or perianal region
- Stool examination usually negative

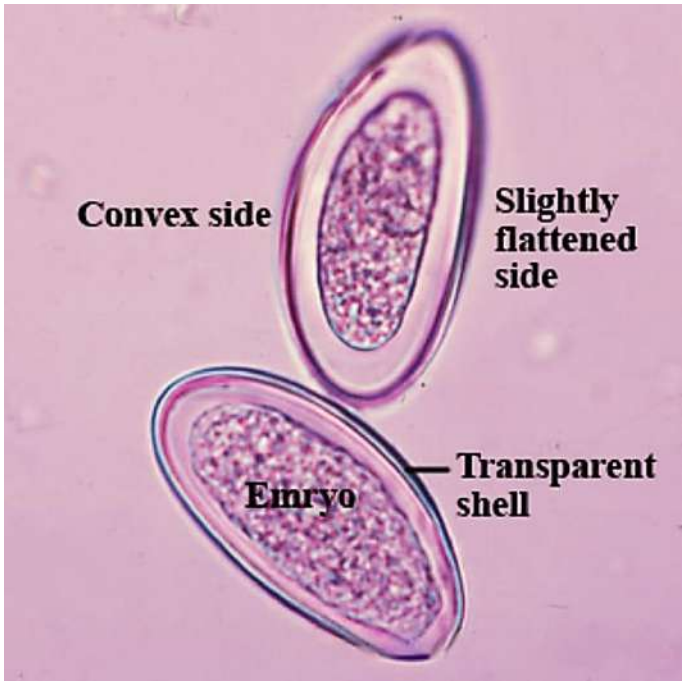
Prevention and Control

- Proper hand hygiene
- Regular washing of clothes and bed linen
- Trimming of fingernails
- Simultaneous treatment of family members

References:

1. Robbins and Cotran. Pathologic Basis of Disease. Elsevier
2. Levinson W. Review of Medical Microbiology and Immunology. McGraw-Hill
3. AFIP Laboratory Manual





Enterobius Egg

Student Task:

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Practical # 21

TAENIA SOLIUM AND TAENIA SAGINATA

Introduction:

Stool examination is an important laboratory investigation for the diagnosis of intestinal cestode infections. Taenia saginata and Taenia solium are common tapeworms infecting humans. In routine parasitology, Taenia infection is identified by demonstrating characteristic eggs or gravid proglottids in stool under the microscope. Although the eggs of both species are morphologically identical, correct identification is important because Taenia solium can cause cysticercosis, a serious tissue infection.

Aim: To identify eggs of Taenia saginata / Taenia solium in stool by microscopic examination.

Specimen: Fresh stool sample collected in a clean, dry, urine-free container.

Common names:

- Taenia saginata – Beef tapeworm
- Taenia solium – Pork tapeworm

Classification:

- Phylum: Platyhelminthes
- Class: Cestoda

Habitat: Adult worms reside in the small intestine of humans.

Geographical distribution: Worldwide; endemic in parts of Asia, Latin America, and Europe.

Hosts:

- Definitive host: Human
- Intermediate host:
    - Cattle for Taenia saginata
    - Pig for Taenia solium
- Humans may also act as intermediate hosts in Taenia solium infection.

Mode of transmission:

- Taeniasis is acquired by ingestion of raw or undercooked beef (T. saginata) or pork (T. solium) containing cysticerci
- Cysticercosis occurs by ingestion of Taenia solium eggs through fecally contaminated food or water

Diseases:

- Taeniasis
- Cysticercosis (only with Taenia solium)

Morphology of Taenia egg:

- Shape: Spherical
- Size: 30–40 µm in diameter
- Color: Yellow to brown
- Shell: Thick, dark, radially striated embryophore
- Contents: Hexacanth embryo with three pairs of hooklets
- Eggs of Taenia saginata and Taenia solium are morphologically identical

Points of Identification of Taenia Egg:

- Spherical yellow-brown egg
- Thick radially striated shell
- Presence of hexacanth embryo
- Three pairs of hooklets
- Species differentiation not possible by egg morphology

Adult worm morphology:

Taenia saginata

- Scolex with four suckers and no hooks (unarmed)
- Gravid proglottids have 15–20 uterine branches
- Adult worm length usually 5–8 m
- Causes only intestinal taeniasis

Taenia solium

- Scolex with four suckers and a double row of hooks (armed)
- Gravid proglottids have 5–10 uterine branches
- Adult worm length 2–4 m

- Causes taeniasis and cysticercosis

Life cycle:

- Eggs or gravid proglottids are passed in human feces
- Cattle or pigs ingest eggs from contaminated vegetation
- Oncospheres hatch, penetrate intestinal wall, and migrate to muscles
- Develop into cysticerci
- Humans ingest cysticerci in undercooked meat
- Cysticerci develop into adult worms in the intestine
- In Taenia solium, ingestion of eggs by humans leads to cysticercosis

Clinical Features:

- Often asymptomatic
- Abdominal discomfort
- Diarrhea or constipation
- Flatulence
- Weight loss
- Passage of proglottids

Complications:

Taenia saginata

- Intestinal obstruction (rare)
- Appendicitis
- Nutritional deficiency

Taenia solium

- Cysticercosis
- Neurocysticercosis causing seizures
- Raised intracranial pressure
- Visual impairment

Laboratory Diagnosis:

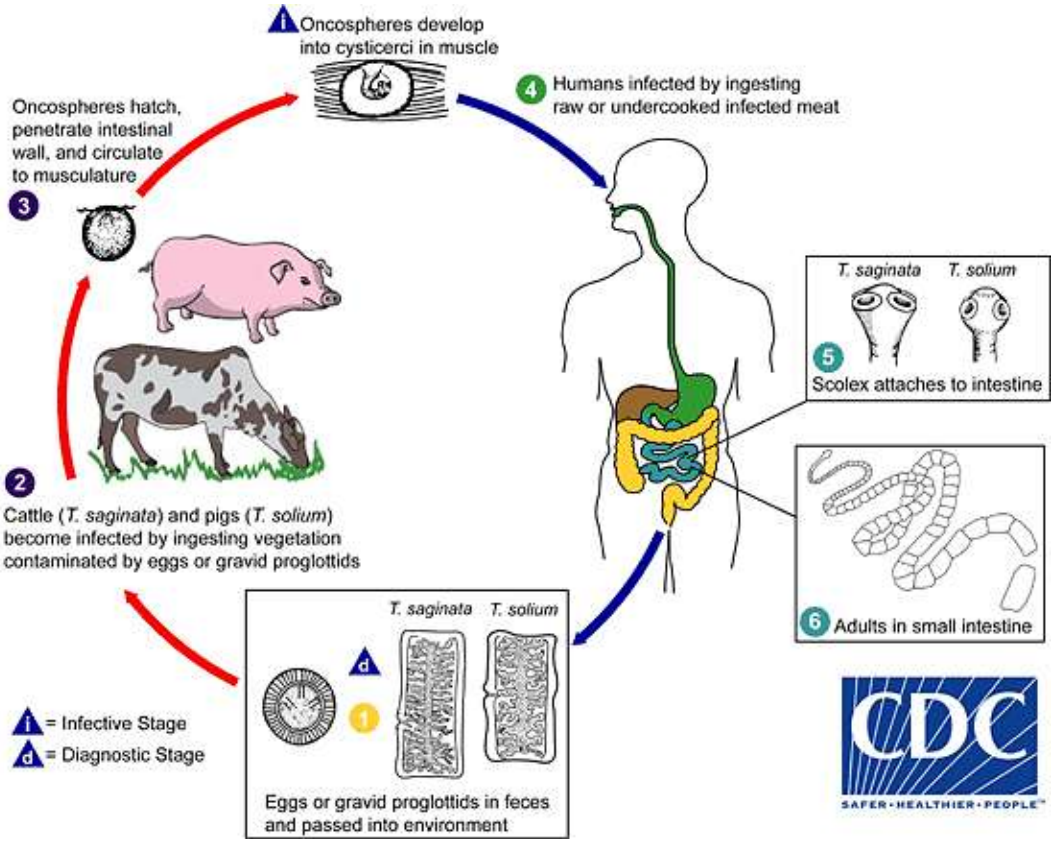
- Microscopic demonstration of Taenia eggs in stool
- Detection of gravid proglottids
- History of passage of segments

Prevention and Control:

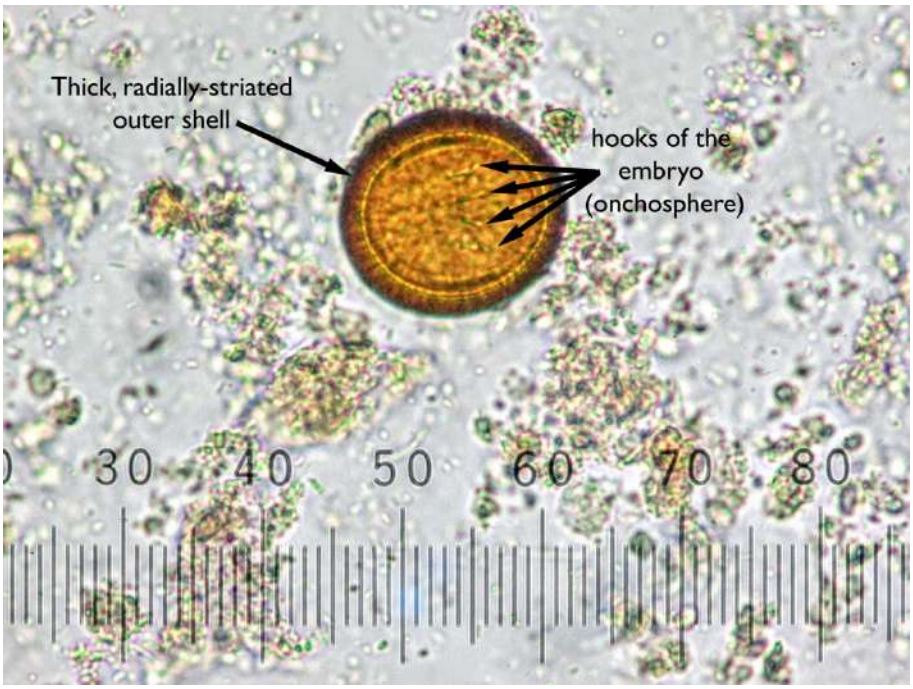
- Adequate cooking of beef and pork
- Meat inspection
- Proper disposal of human feces
- Personal hygiene and sanitation

References:

1. Robbins and Cotran. Pathologic Basis of Disease. Elsevier
2. Levinson W. Review of Medical Microbiology and Immunology. McGraw-Hill
3. AFIP Laboratory Manual



Taenia life cycle



Taenia egg under microscope

Student Task:

Instructor's signature:_____ **Dated: _____/_____/_____**

Practical # 22

HYDATID CYST

Introduction:

Hydatid disease is a zoonotic parasitic infection caused by the larval stage of Echinococcus granulosus. The cyst is a pathological structure formed in human tissues as a result of accidental ingestion of parasite eggs. Humans act as dead-end intermediate hosts, and the disease commonly affects liver and lungs. Identification is based on the gross appearance of the cyst and its contents.

Aim: To study and identify a hydatid cyst specimen with naked eye.

Common name

- Dog tapeworm
- Hydatid tapeworm

Specimen: Hydatid cyst obtained from an affected organ, commonly liver or lung.

Classification:

- Phylum: Platyhelminthes
- Class: Cestoda

Causative organism: Echinococcus granulosus

Habitat:

- Adult worm lives in the small intestine of dogs and other canines
- Larval stage (hydatid cyst) occurs in tissues of sheep and humans

Hosts:

- Definitive host: dog
- Intermediate host: sheep
- Accidental intermediate (dead-end) host: human

Mode of transmission:

- Ingestion of eggs through food, water, or hands contaminated with dog feces
- Hand-to-mouth transmission after contact with infected dogs

Disease:

- Hydatid cyst disease (echinococcosis)

Morphology of Hydatid cyst (gross)

- *Size:* Small (under 5 cm) to "giant" (>10 cm or even several liters)
- *Shape:* Typically spherical or ovoid
- *Color:* Usually pearly white, grayish, or yellowish
- *Layers*:
    - Outer Layer: A firm, fibrous, and opaque outer wall called the pericyst
    - Middle Layer: A white, elastic, laminated, and avascular middle layer (ectocyst/laminated membrane)
    - Inner Layer: A thin, delicate, transparent, germinal inner layer (endocyst)
- *Contents:* Clear, colorless, watery fluid (hydatid fluid) inside the cyst
- *Daughter Cysts:* Smaller, spherical secondary cysts sometimes found floating freely within the main cyst fluid or attached to the germinal layer
- *Hydatid Sand:* A fine, gritty sediment visible at the bottom of a jar (if the specimen is in fluid), consisting of free protoscolices and hooklets

Points of identification of hydatid cyst specimen

- Large fluid-filled cyst
- Thick laminated outer wall
- Inner germinal layer
- Daughter cysts present inside the parent cyst
- Hydatid sand seen as fine granular sediment
- Usually obtained from liver or lung

Life cycle:

- Dogs ingest organs of sheep containing hydatid cysts
- Adult worms develop in dog intestine and pass eggs in feces
- Sheep and humans ingest eggs from contaminated environment
- Eggs release larvae that migrate to organs and form hydatid cysts
- Life cycle is completed only in dogs

Pathogenesis:

- Hydatid cyst acts as a space-occupying lesion
- Pressure effects depend on organ involved
- Rupture of cyst may release antigens causing severe allergic reactions

Clinical features:

- Often asymptomatic for years
- Liver involvement: abdominal pain, hepatomegaly
- Lung involvement: cough, chest pain, breathlessness

Complications:

- Rupture of cyst leading to anaphylactic shock
- Secondary infection of cyst
- Compression of vital organs
- Spread of daughter cysts

Laboratory diagnosis:

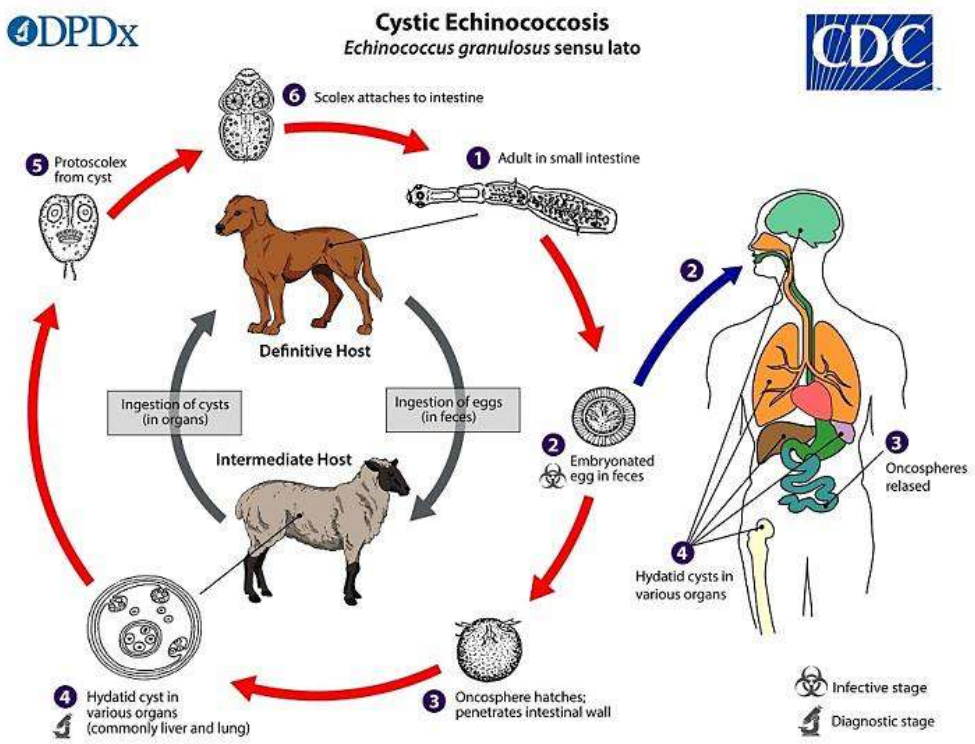
- Eggs are not found in human stool
- Imaging techniques such as ultrasound, CT scan
- Serological tests including ELISA and indirect hemagglutination
- Demonstration of hydatid sand in aspirated fluid

Prevention and Control:

- Proper disposal of sheep viscera
- Prevent dogs from eating raw offal
- Regular deworming of dogs
- Personal hygiene and hand washing

References:

1. Robbins and Cotran. Pathologic Basis of Disease. Elsevier
2. Levinson W. Review of Medical Microbiology and Immunology. McGraw-Hill
3. AFIP Laboratory Manual



Hydatid Cyst

Student Task:

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Practical # 23

PLEOMORPHIC ADENOMA

Introduction to Neoplasia:

Neoplasia is defined as an abnormal mass of tissue formed due to uncontrolled, excessive, and uncoordinated cell proliferation that persists even after removal of the stimulus.

Benign tumors

- Slow growing
- Well circumscribed or encapsulated
- Do not invade surrounding tissues
- Do not metastasize
- Cells resemble normal tissue

Malignant tumors

- Rapid growth
- Poorly circumscribed and infiltrative
- Invade surrounding tissues
- Can metastasize
- Cellular atypia and mitoses present

Pleomorphic Adenoma:

Pleomorphic adenoma is the most common benign salivary gland tumor. It is classically called a mixed tumor because it shows epithelial and mesenchymal-like components, although it arises from a single germ layer (ectoderm). More than one neoplastic cell type—mixed tumors, usually derived from one germ cell layer.

Common site

- Parotid gland – most common
- Submandibular gland
- Minor salivary glands, especially palate

Nature of tumor

- Benign salivary gland neoplasm
- Mixed tumor with epithelial and myoepithelial differentiation
- Single cell origin from ductal reserve cells or myoepithelial cells

Morphology:

Gross features

- Well-circumscribed, rounded mass
- Usually less than 6 cm
- Cut surface is gray-white
- Myxoid, cartilaginous, or translucent areas present

Histological features

- Marked morphological heterogeneity
- Mixture of epithelial and stromal components
- Duct-like structures lined by cuboidal or columnar cells
- Myoepithelial cells arranged in sheets or strands
- Abundant myxoid, chondroid, or hyaline stroma
- Islands of cartilage-like tissue
- No cellular atypia or significant mitotic activity

Point of identification

1. Mixed appearance with epithelial ducts and myxoid/chondroid stroma
2. Presence of ductal and myoepithelial cells
3. Cartilage-like areas within tumor
4. Well circumscribed benign pattern

Clinical features

- Painless, slow-growing swelling
- Firm, mobile mass
- Usually asymptomatic

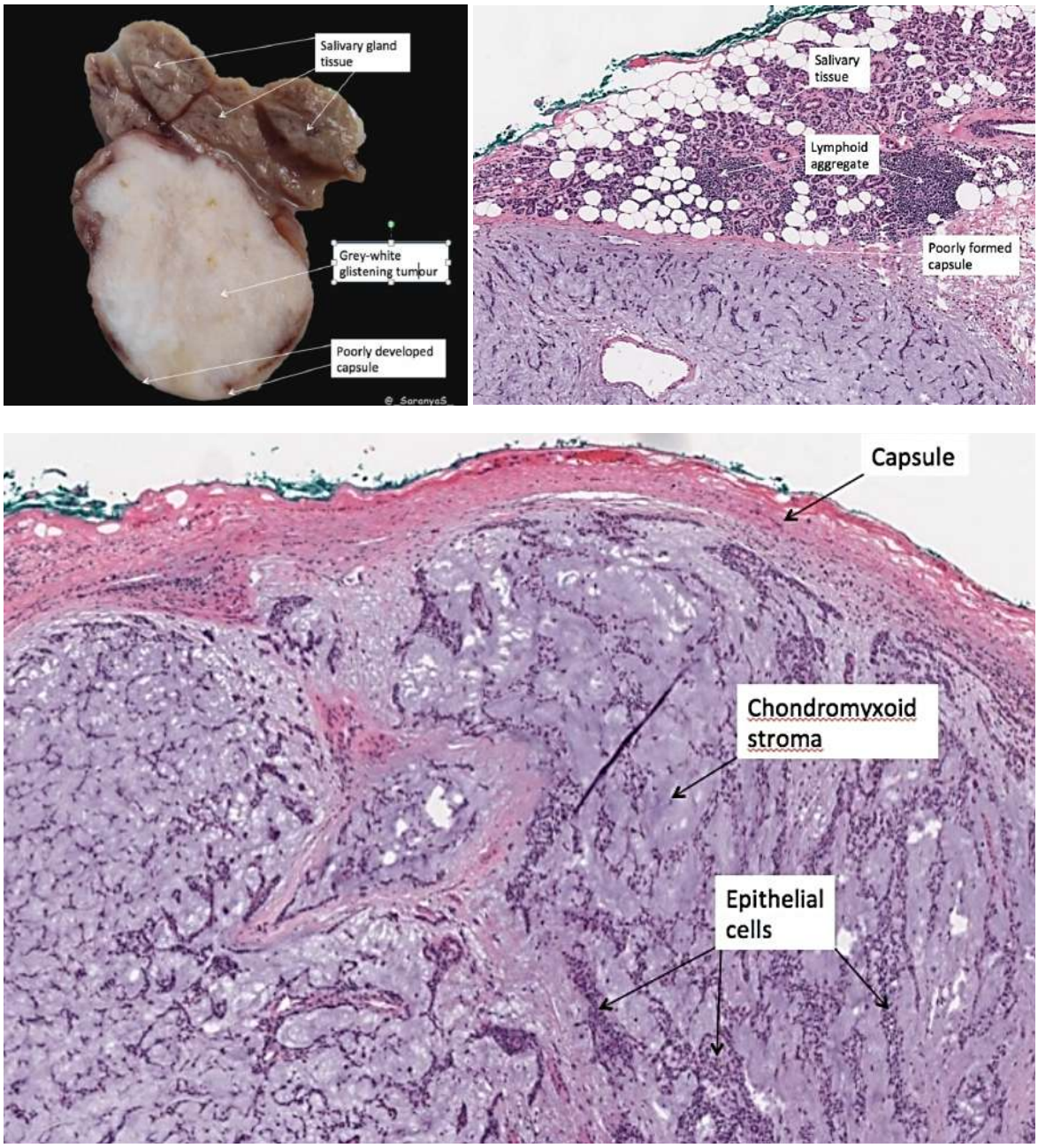
Behavior and complications

- Recurrence if inadequately excised
- Higher recurrence after enucleation
- Malignant transformation risk increases with long-standing lesions
- Can transform into carcinoma ex pleomorphic adenoma

Treatment: Complete surgical excision with margin

References:

- Robbins and Cotran pathologic basis of disease
- Shafer's textbook of oral pathology
- Neville et al. oral and maxillofacial pathology



Pleomorphic Adenoma Macroscopic and Microscopic images (H&E stain)

Student Task:

Instructor's signature:_____ **Dated: _____/_____/_____**

Practical # 24

SQUAMOUS CELL CARCINOMA

Introduction:

Squamous cell carcinoma is a malignant epithelial tumor arising from stratified squamous epithelium. It is the most common malignancy of the oral cavity and head and neck region.

General characteristics:

- Malignant tumor of squamous epithelial origin
- Locally invasive with potential for metastasis
- Commonly associated with tobacco, alcohol, betel quid use, and HPV infection
- Shows variable differentiation with keratin production

Common sites in oral cavity:

- Tongue (ventral surface)
- Floor of mouth
- Buccal mucosa
- Gingiva
- Lower lip

Morphology:

Gross features:

- Ulcerative or exophytic growth
- Irregular, indurated margins
- Non-healing ulcer
- May show leukoplakia or erythroplakia in surrounding mucosa

Microscopic features:

- Malignant squamous epithelial cells invading underlying connective tissue
- Loss of normal epithelial architecture
- Islands, nests, and cords of tumor cells in stroma
- Cellular pleomorphism and hyperchromatism
- Increased nuclear-cytoplasmic ratio
- Abnormal and frequent mitotic figures
- Individual cell keratinization
- Keratin pearl formation (concentric layers of keratinized cells) in well-differentiated scc

Histological Grade:

- Well-differentiated – prominent keratin pearls
- Moderately differentiated – reduced keratinization
- Poorly differentiated – minimal or absent keratinization
- Undifferentiated

Point of identification:

- Invasion of malignant squamous cells into connective tissue
- Presence of keratin pearls
- Cellular pleomorphism and hyperchromatic nuclei
- Abnormal mitoses
- Loss of basement membrane continuity

Biological behavior:

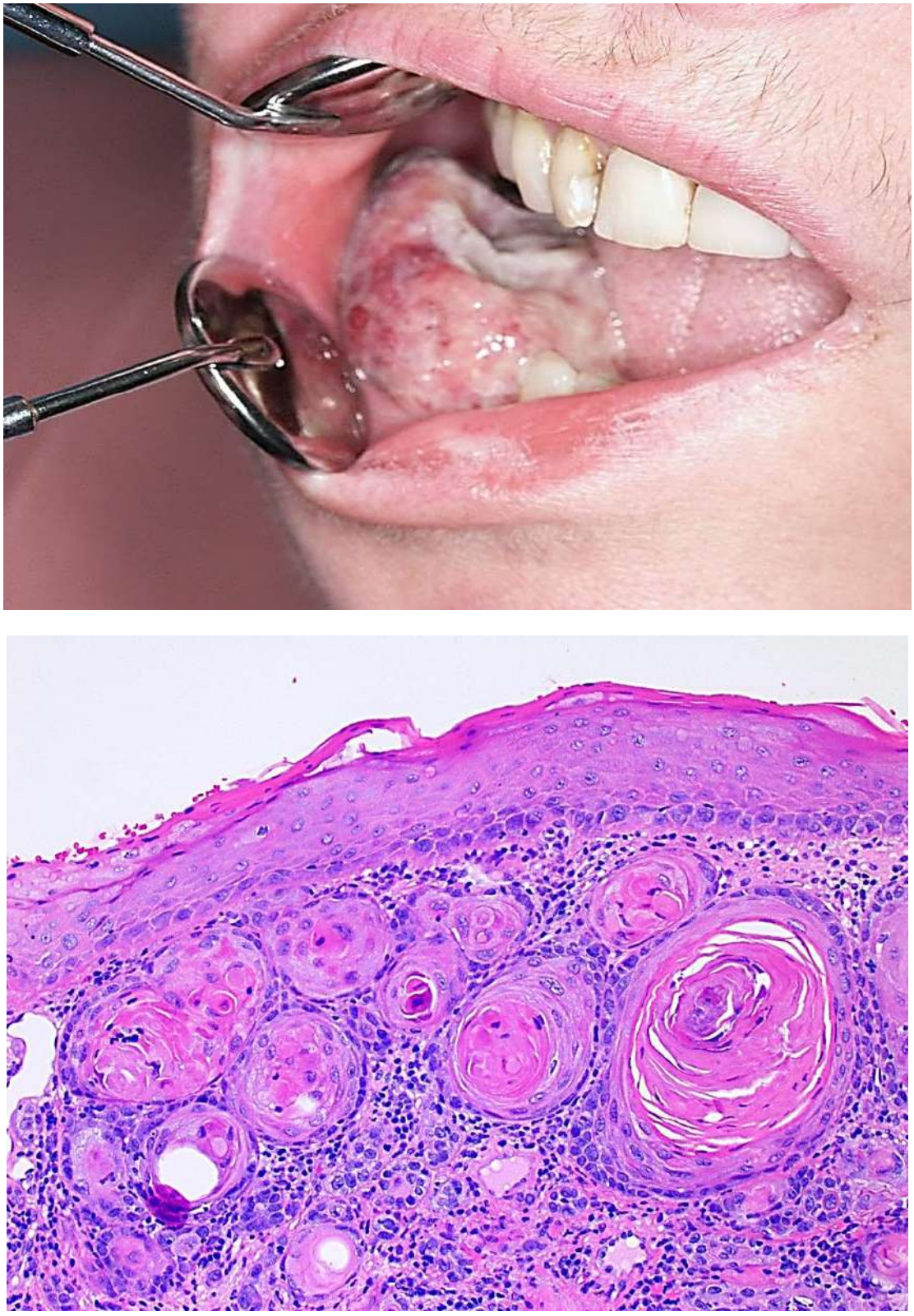
- Locally aggressive
- Spreads to cervical lymph nodes
- Distant metastasis to lungs, liver, bone in advanced cases

Prognostic factors:

- Stage at diagnosis
- Lymph node involvement
- Hpv-positive tumors have better prognosis

References:

1. Robbins and cotran pathologic basis of disease
2. Shafer's textbook of oral pathology
3. Neville et al. Oral and maxillofacial pathology



Gross and H&E Photomicrograph of Oral SCC

Student Task:

Instructor's signature:_____ **Dated: _____/_____/_____**

Practical # 25

BASAL CELL CARCINOMA

Introduction:

Basal cell carcinoma is a malignant epithelial tumor arising from the basal cells of the epidermis or follicular epithelium. It is the most common malignant tumor in humans. Although malignant, it shows slow growth, marked local invasiveness, and very rare metastasis.

General characteristics:

- Malignant tumor of basal epithelial origin
- Locally aggressive with tissue destruction
- Metastasis is exceptionally rare
- Strongly related to chronic ultraviolet radiation exposure
- Commonly occurs on sun-exposed skin of head and neck
- May be associated with genetic syndromes such as gorlin syndrome

Common sites:

- Face (nose, eyelids, nasolabial folds)
- Scalp
- Neck
- Other sun-exposed areas

Morphology:

Gross features

- Small nodular, pearly lesion
- May show central ulceration with rolled borders (rodent ulcer)
- Surface may appear smooth, shiny, or pigmented
- Neglected lesions may cause extensive local tissue destruction

Microscopic features (H&E slide)

- Tumor composed of nests, islands, or cords of basaloid cells
- Basaloid cells have hyperchromatic nuclei and scant cytoplasm
- Peripheral palisading of nuclei at the edges of tumor nests
- Mitotic figures may be present but pleomorphism is usually mild
- Tumor cells resemble basal layer of epidermis
- Absence of keratin pearl formation (helps differentiate from squamous cell carcinoma)

Point of identification:

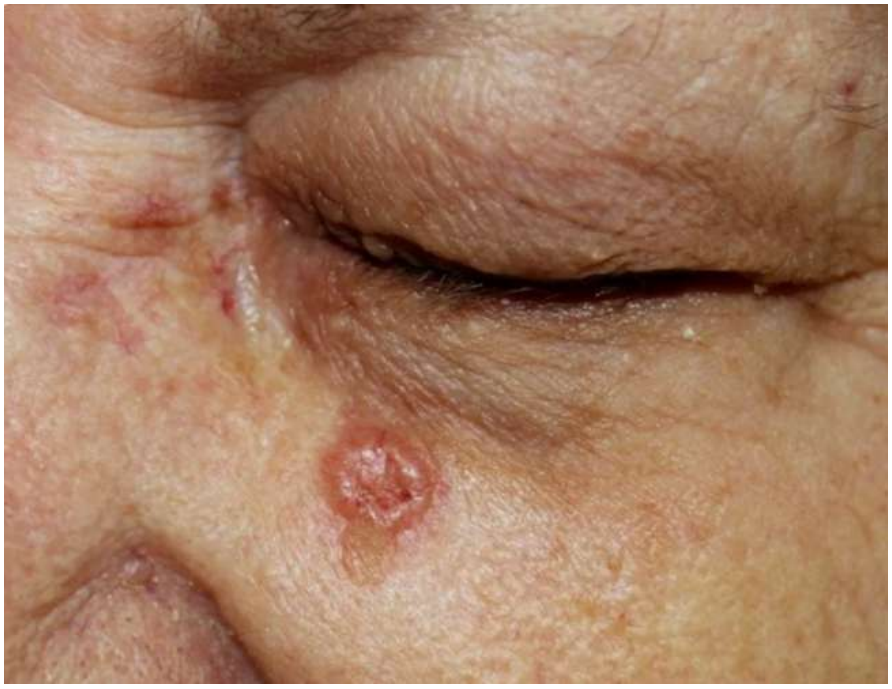
- Nests of basaloid cells
- Peripheral nuclear palisading
- Retraction clefts between tumor and stroma
- Fibromyxoid stromal background
- Absence of keratin pearls

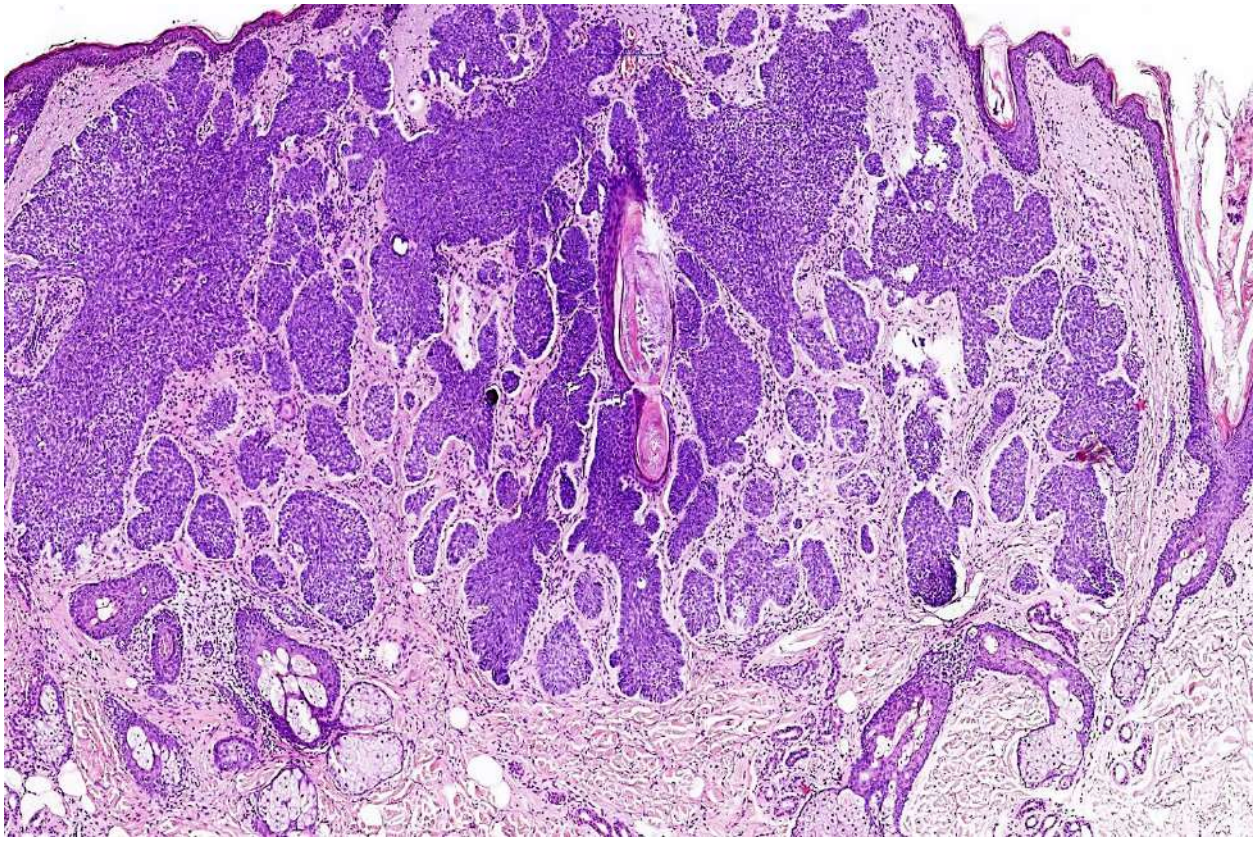
Behavior and Prognosis:

- Slow growing but locally destructive
- Recurrence possible if incompletely excised
- Excellent prognosis with proper treatment

References

1. Robbins and cotran pathologic basis of disease
2. Shafer's textbook of oral pathology
3. Neville et al. Oral and maxillofacial pathology





Clinical and H&E photomicrograph of BCC

Student Task:

Instructor's signature:_____ **Dated: _____/_____/_____**

Practical # 26

LIPID PROFILE

Introduction:

Lipids are hydrophobic organic compounds essential for energy storage, cell membrane structure, and hormone synthesis. In blood, lipids circulate as lipoproteins. Abnormal lipid levels play a major role in atherosclerosis and cardiovascular disease.

Main lipids assessed in blood:

- Total cholesterol (TC)
- Triglycerides (TG)
- High-density lipoprotein cholesterol (HDL-C)
- Low-density lipoprotein cholesterol (LDL-C)

Sample collection:

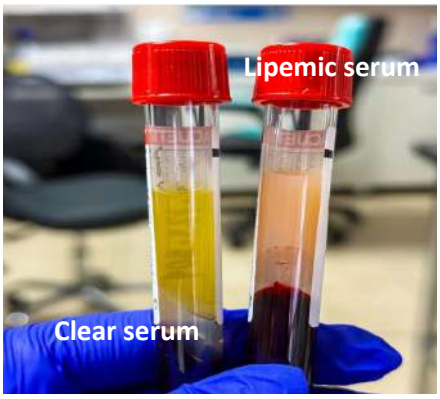
- Sample type: Venous blood
- Option 1: Serum (Most Common for Lipid Panels)
    - Vacutainer: Plain Red-Top (no additive) or SST (Gold/Tiger Top with gel and clot activator).
    - Process: Allow blood to clot (around 30 mins), then centrifuge to separate serum.
- Option 2: Plasma (For Faster Turnaround)
    - Vacutainer: Light Green Top (Lithium Heparin with gel separator).
    - Process: Centrifuge immediately to obtain plasma (no clotting needed).

Patient Preparation and Precautions

- Fasting required: 8–12 hours
- Patient should avoid fatty meals and alcohol before test
- Only water allowed during fasting
- Avoid vigorous exercise before sample collection

Why fasting is required

- Post-meal chylomicrons increase triglycerides
- Non-fasting sample may appear lipemic
- Fasting ensures true baseline lipid levels



Normal serum appearance

- Clear and transparent
- Pale yellow
- No turbidity

Lipemic serum

- Appears milky, cloudy, or creamy after centrifugation
- Due to high triglyceride levels (chylomicrons/vldl)
- Commonly seen after fatty meals or in hypertriglyceridemia

Common causes of lipemic serum

- Non-fasting sample
- Uncontrolled diabetes mellitus
- Alcohol abuse
- Familial hyperlipidemia
- Pancreatitis

Machine: Chemistry Analyzer

Parameters Assessed in Lipid Profile and Reference Values (Fasting)

- Total cholesterol: 125–200 mg/dl
- Triglycerides: 40–150 mg/dl
- HDL-C: 40–59 mg/dl
- LDL-C: 50–129 mg/dl

Interpretation:

- **Total Cholesterol:** Desirable <200 mg/dL Target
- **Triglycerides:** Desirable <150 mg/dL Target
- **HDL-C (Good Cholesterol):** Higher HDL (>=60 mg/dL) is considered protective
    - <40 mg/dL (men) or <50 mg/dL (women) are risk factors
- **LDL-C (Bad Cholesterol):** <100 mg/dL is optimal
    - <70 mg/dL for very high-risk individuals (like those with diabetes or heart disease)

Uses of lipid profile

- Assessment of cardiovascular risk
- Diagnosis of hyperlipidemia
- Monitoring therapy (statins, lifestyle changes)
- Evaluation of metabolic disorders

Risk

- High total cholesterol / LDL-C: Increased risk of atherosclerosis and coronary artery disease
- Low HDL-C: Increased cardiovascular risk
- High Triglycerides: Risk of Pancreatitis and Metabolic syndrome

References

- Robbins and cotran pathologic basis of disease
- Harper's illustrated biochemistry
- Teitz fundamentals of clinical chemistry

Parameter	Value Range mg/dl	Risk Category	Interpretation
Total Cholesterol	<200	Desirable	Total cholesterol is within normal limits; low risk of atherosclerosis.
	200–239	Borderline High	Mildly increased cholesterol; moderate cardiovascular risk.
	≥240	High Risk	Markedly increased cholesterol indicating high risk of coronary artery disease.
Triglycerides	<150	Normal	Triglyceride level is normal; no immediate metabolic risk.
	150–199	Borderline High	Mild elevation suggesting early dyslipidemia.
	200–499	High	Significantly elevated; increased risk of cardiovascular disease.
	≥500	Very High	Very high triglycerides with risk of acute pancreatitis.
HDL-C	≥60	Protective	High HDL provides protective effect against heart disease.
	<40 (men)	Risk	Low HDL increases risk of atherosclerosis.
	<50 (women)	Risk	Low HDL is a cardiovascular risk factor.
LDL-C	<100	Optimal	LDL is optimal; low risk of plaque formation.
	100–129	Near Optimal	Acceptable LDL level; mild risk.
	130–159	Borderline High	Moderately raised LDL; increased cardiovascular risk.
	160–189	High	High LDL indicating high risk of coronary artery disease.
	≥190	Very High Risk	Very high LDL with severe risk of atherosclerosis.
LDL-C (Very High-Risk Patients)	<70	Target	Target LDL level in diabetes and established heart disease.

Student Task:

Parameter	Reference Range (mg/dl)	Desirable / Target Value	Patient Value	Risk Category	Interpretation
Total Cholesterol	125–200	<200			
Triglycerides	40–150	<150			
HDL-C	40–59	≥60 protective			
LDL-C	50–129	<100 optimal			

Instructor's signature:_____ **Dated: _____/_____/_____**

END OF PRACTICAL LOGBOOK

KHYBER MEDICAL UNIVERSITY

PREPARED BY:

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FCPS Histopathology, CHR& CHPE

Associate Professor and Consultant Histopathologist

Rehman College of Dentistry/
Rehman Medical Institute

Logbook for Junior Operative Dentistry

2nd Year BDS

STANDARD OPERATING PROCEDURES (SOPS) FOR JUNIOR OPERATIVE DENTISTRY

INTRODUCTION:

This logbook is designed for 2nd year BDS Students to document their progress in learning and practice of basic Operative Dentistry Procedures. It aligns with the objectives of the modular system to enhance preclinical skills and prepare students for clinical practice. The curriculum for junior operative dentistry is divided into two modules for effective learning and skill development.

OBJECTIVES

- Develop manual dexterity and understanding of basic operative procedures.
- Familiarize students with dental instruments, materials, and techniques.
- Provide hands-on cavity preparation, restoration, and finishing practice in a pre-clinical environment.
- Instill principles of infection control.

PRE-CLINICAL REQUIREMENTS

UNIFORM AND PERSONAL PROTECTIVE EQUIPMENT (PPE):

- White Clean lab coat.
- Protective eyewear or face shield.
- Disposable gloves and masks.
- Shoes (sleepers not allowed).

MATERIALS AND INSTRUMENTS:

Students must carry the following for all sessions:

- Basic instruments: Mouth mirror, probe, tweezers, and instrument tray.

- Restorative instruments: Excavators, amalgam carriers, pluggers, carvers, and burnishers.
- Rotary instruments: High-speed handpiece with appropriate burs.
- Materials: Amalgam, composite, glass ionomer cement, and cavity liners.
- Typodonts with mounted teeth.

GENERAL GUIDELINES

ATTENDANCE:

- 75% Mandatory for all pre-clinical sessions.

PREPARATION:

- Review theoretical knowledge relevant to the procedure before the session.
- Assemble all required instruments and materials before starting.

INFECTION CONTROL:

- Practice standard infection control protocols.
- Dispose of waste materials in designated bins.

GENERAL INSTRUCTIONS FOR LOGBOOK USE:

- Students must record all activities in the logbook on the same day they are performed.
- Supervisors must verify each task with their signature and provide feedback where necessary.
- The logbook should be submitted for review at the end of the module.
- The completion of tasks in this logbook is mandatory for module completion.

INSTRUCTIONS FOR WORKING POSITIONS:

During the operative procedure, each student will be examined for wether

- He/she sits with the spine in an upright position, with the back well supported, the feet firmly placed on the ground, the thighs parallel to the floor, and the shoulders relaxed.
- While working on the lower jaw, the phantom head’s occlusal plane is at 45 degrees to the floor.

- While working on the upper jaw, the student's neck should not be unnecessarily bent.
- The student should hold the dental mirror in a non-working hand and reflect the light.

STUDENT INFORMATION

Name:

_____

Roll Number:

_____

Session:

_____

Module Start Date: _____

Modules End Date: _____

TOPICS:

Infection Control: Infection Control Protocols

Isolation Techniques: Rubber Dam, Cotton Roll

Class I Amalgam: Cavity preparation involving all pits and fissures on,

- occlusal surfaces of premolars and molars
- occlusal two-thirds of facial and lingual surfaces of molars

Class II Amalgam: Cavity preparation involving the proximal surfaces of posterior teeth

Class I Composite: Cavity preparation involving all pits and fissures of posterior teeth.

Class II Composite: Cavity preparation involving the proximal surfaces of posterior teeth.

GENERAL LEARNING OBJECTIVES:

At the end of these modules, the students will be able to:

- Understand and implement infection control protocols.
- Recognize the importance of cross-infection control in dental practice.
- Properly use isolation methods for operative procedures.
- Understand the principles of cavity preparation for amalgam restoration.
- Understand the principles of cavity preparation for composite restoration.
- Perform standardized Class I, and Class II cavity preparations for amalgam and composite on preclinical models.
- Apply knowledge of cavity design and retention principles.
- Develop proper instrumentation and handling techniques for amalgam and composite restorations.

MODULE 1: FUNDAMENTALS OF OPERATIVE DENTISTRY

TOPICS COVERED:

1. Infection Control Protocols
2. Isolation Techniques
3. Class I Cavity Preparation for amalgam (Pits and Fissures on Occlusal Surface of Premolars and Molars)

LEARNING OBJECTIVES FOR MODULE 1:

At the end of this modules, the students will be able to:

- Understand and implement infection control protocols.
- Explain the importance of hand hygiene in preventing cross-contamination and infection transmission.
- Identify the different types of PPE, including gloves, masks, gowns, and protective eyewear, and their specific uses.
- Describe the principles and methods of sterilization, including autoclaving, dry heat sterilization, and chemical sterilization.
- Differentiate between sterilization and disinfection and their roles in infection control.
- Recognize the importance of cross-infection control in dental practice.
- Classify the different types of biomedical waste generated in a dental clinic (e.g., sharps, general waste, and infectious waste).
- Properly use isolation methods for operative procedures.
- Explain the importance of rubber dam application in ensuring infection control and improving visibility.
- Demonstrate the correct placement and removal of a rubber dam in clinical settings.
- Discuss the Advantages and Disadvantages associated of rubber dam.
- Demonstrate the correct placement and replacement of cotton rolls to ensure patient comfort and effectiveness.

- Understand the principles of cavity preparation for amalgam restoration.
- Define the concept of outline form in cavity preparation.
- Demonstrate how to establish the correct outline form for a Class I cavity based on the extent of caries.
- Identify the factors influencing the outline form, including anatomical considerations and caries spread.
- Define Resistance form.
- Explain the purpose of resistance form in cavity preparation to withstand masticatory forces.
- Demonstrate how to create flat pulpal and gingival floors for enhanced resistance.
- Define retention form and its role in preventing dislodgement of the restoration.
- Describe the use of liners and bases to protect the pulp from thermal, chemical, and mechanical insults.
- Describe the step-by-step procedure for placing and condensing amalgam into a Class I cavity.
- Demonstrate carving techniques to restore the anatomical contours and occlusal function.
- Demonstrate proper techniques for applying pulp-protective materials.
- Perform class I cavity preparation with precision.

STEPS IN INFECTION CONTROL

Date	Task	Details of step Followed	Student's Self Evaluation Poor (P) Average (A), Good (G)			Instructor Evaluation Poor(P), Average (A), Good (G)			Signature
	Hand hygiene before and after procedures								
	Proper use of Personal Protective Equipment (PPE)								
	Sterilization of Instruments								
	Disinfection of work Surface								
	Waste Disposal following protocol								

CHECKLIST:

- ☐ Hand hygiene is performed using proper technique.
- ☐ PPE is used correctly (mask, gloves, goggles, and gown).
- ☐ Instruments were sterilized using an autoclave.
- ☐ All surfaces were disinfected before and after the procedure.
- ☐ Biomedical waste is segregated and disposed of appropriately.

ISOLATION METHODS

Date	Task	Details of step Followed	Student's Self Evaluation Poor (P) Average (A), Good (G)			Instructor Evaluation Poor(P), Average (A), Good (G)			Signature
	Application of Rubber Dam								
	Use of Cotton Rolls for Moisture Control								
	High Volume suction used								

CHECKLIST:

- ☐ Rubber dam is applied with proper clamp selection.
- ☐ Cotton rolls are placed without compromising visibility.
- ☐ High-volume suction is used effectively for moisture control.

CLASS I CAVITY PREPARATION MANDIBULAR 1ST MOLAR

Date	Task	Details of step Followed	Student's Self Evaluation Poor (P) Average (A), Good (G)			Instructor Evaluation Poor(P), Average (A), Good (G)			Signature
	Outline Form	Removal Of Carious Lesion							
		Remove Unsupported Enamel							
	Resistance Form	Horizontal Floor							
		Rounded Line Angles							
		Depth (1.5-2mm)							
		Width (1-1.5mm)							
		Butt Joint/Cavo-Surface Angle							
	Retention Form	Parallel Walls/Occlusal Convergence							
		Occlusal Dove Tail							
	Protection of Pulp	Mixing And Manipulation							
		Location/ Placement							
	Restoration	Mixing And Manipulation							
		Condensation							

		Pre-Carve Burnishing							
		Carving (Under/Overfilled)							
		Post-Carve Burnishing							
		Occlusal Adjustment							

CHECKLIST:

- ☐ Proper outline form achieved.
- ☐ Adequate resistance
- ☐ Adequate retention
- ☐ Adequate lining/Base
- ☐ Smooth cavity margins and walls

DIAGRAM:

CLASS I CAVITY PREPARATION MAXILLARY 1ST MOLAR

Date	Task	Details of step Followed	Student's Self Evaluation Poor (P) Average (A), Good (G)			Instructor Evaluation Poor(P), Average (A), Good (G)			Signature
	Outline Form	Removal Of Carious Lesion							
		Remove Unsupported Enamel							
	Resistance Form	Horizontal Floor							
		Rounded Line Angles							
		Depth (1.5-2mm)							
		Width (1-1.5mm)							
		Butt Joint/Cavo-Surface Angle							
	Retention Form	Parallel Walls/Occlusal Convergence							
		Occlusal Dove Tail							
	Protection of Pulp	Mixing And Manipulation							
		Location/ Placement							
	Restoration	Mixing And Manipulation							
		Condensation							

		Pre-Carve Burnishing							
		Carving (Under/Overfilled)							
		Post-Carve Burnishing							
		Occlusal Adjustment							

CHECKLIST:

- ☐ Proper outline form achieved.
- ☐ Adequate resistance
- ☐ Adequate retention
- ☐ Adequate lining/Base
- ☐ Smooth cavity margins and walls

DIAGRAM:

CLASS I CAVITY PREPARATION MANDIBULAR 1ST PREMOLAR

Date	Task	Details of step Followed	Student's Self Evaluation Poor (P) Average (A), Good (G)			Instructor Evaluation Poor(P), Average (A), Good (G)			Signature
	Outline Form	Removal Of Carious Lesion							
		Remove Unsupported Enamel							
	Resistance Form	Horizontal Floor							
		Rounded Line Angles							
		Depth (1.5-2mm)							
		Width (1-1.5mm)							
		Butt Joint/Cavo-Surface Angle							
	Retention Form	Parallel Walls/Occlusal Convergence							
		Occlusal Dove Tail							
	Protection of Pulp	Mixing And Manipulation							
		Location/ Placement							
	Restoration	Mixing And Manipulation							

		Condensation							
		Pre-Carve Burnishing							
		Carving (Under/Overfilled)							
		Post-Carve Burnishing							
		Occlusal Adjustment							

CHECKLIST:

- ☐ Proper outline form achieved.
- ☐ Adequate resistance
- ☐ Adequate retention
- ☐ Adequate lining/Base
- ☐ Smooth cavity margins and walls

DIAGRAM:

CLASS I CAVITY PREPARATION MAXILLARY 1ST PREMOLAR

Date	Task	Details of step Followed	Student's Self Evaluation Poor (P) Average (A), Good (G)			Instructor Evaluation Poor(P), Average (A), Good (G)			Signature
	Outline Form	Removal Of Carious Lesion							
		Remove Unsupported Enamel							
	Resistance Form	Horizontal Floor							
		Rounded Line Angles							
		Depth (1.5-2mm)							
		Width (1-1.5mm)							
		Butt Joint/Cavo-Surface Angle							
	Retention Form	Parallel Walls/Occlusal Convergence							
		Occlusal Dove Tail							
	Protection of Pulp	Mixing And Manipulation							
		Location/ Placement							
	Restoration	Mixing And Manipulation							
		Condensation							

		Pre-Carve Burnishing							
		Carving (Under/Overfilled)							
		Post-Carve Burnishing							
		Occlusal Adjustment							

CHECKLIST:

- ☐ Proper outline form achieved.
- ☐ Adequate resistance
- ☐ Adequate retention
- ☐ Adequate lining/Base
- ☐ Smooth cavity margins and walls

DIAGRAM:

MODULE 2: ADVANCED OPERATIVE DENTISTRY

TOPICS COVERED:

Class I: Cavity preparation for composite restoration

Class II: Cavity Preparation for amalgam restoration (Proximal Surface of Posterior Teeth)

Class II: Cavity Preparation for composite restoration (Proximal Surface of Posterior Teeth)

LEARNING OBJECTIVES FOR MODULE 2

By the end of this module, students will be able to:

- Understand the principles of cavity preparation for composite restoration.
- Perform class I cavity preparation for composite restoration with precision.
- Demonstrate the preparation of a conservative cavity outline that preserves maximum tooth structure.
- Demonstrate proper etching, priming, and bonding protocols for optimal retention
- Describe the incremental layering technique to prevent polymerization shrinkage and ensure proper curing.
- Demonstrate the placement and shaping of composite material to restore anatomical contours.
- Explain the importance of proper light-curing techniques for optimal restoration strength.
- Discuss finishing and polishing procedures to achieve a smooth surface and enhance aesthetics.
- Perform class II cavity preparation for composite restoration with precision.
- Demonstrate proper adhesive techniques, including etching, priming, and bonding, to ensure micromechanical retention.
- Explain the role of beveling enamel margins to improve bonding and aesthetic outcomes

- Describe the incremental layering technique to minimize polymerization shrinkage and ensure optimal curing.
- Demonstrate the placement and shaping of composite material to restore anatomical contours and occlusal function.
- Explain the importance of proper light-curing techniques to achieve adequate polymerization.
- Perform class II cavity preparation for amalgam restoration with precision.
- Identify anatomical landmarks to preserve during cavity preparation, such as marginal ridges
- Demonstrate how to create flat pulpal and gingival floors to withstand occlusal forces.
- Describe the importance of beveling and rounding internal angles to reduce stress concentration.
- Demonstrate techniques for creating retention grooves and undercuts to enhance amalgam stability
- Demonstrate correct placement of the matrix band and wedge to achieve tight proximal contact and minimize overhangs.
- Describe the components of a matrix band system, including the matrix band, retainer, and wedges.
- Identify different types of matrix bands and their clinical applications.
- Demonstrate the correct assembly of a Tofflemire matrix retainer with a matrix band.
- Practice the placement of a matrix band and retainer on typodont teeth for Class II cavities.
- Simulate the removal of the matrix band system without damaging the restoration or surrounding tissues.
- Describe the procedure for placing and condensing amalgam in a Class II cavity.
- Explain the importance of checking and adjusting occlusion after restoration placement.
- Discuss the finishing and polishing steps to ensure a smooth surface and enhance longevity.

CLASS I CAVITY PREPARATION FOR COMPOSITE RESTORATION MANDIBULAR 1ST MOLAR

Date	Task	Details of step Followed	Student's Self Evaluation Poor (P) Average (A), Good (G)			Instructor Evaluation Poor(P), Average (A), Good (G)			Signature
	Outline Form	Removal Of Carious Lesion							
		Remove Unsupported Enamel							
	Resistance Form	Horizontal Floor							
		Rounded Line Angles							
		Depth (1.5-2mm)							
		Width (1-1.5mm)							
		Butt Joint/Cavo-Surface Angle							
	Retention Form	Parallel Walls/Occlusal Convergence							
		Occlusal Dove Tail							
	Protection of Pulp	Mixing And Manipulation							
		Location/ Placement							

	Restoration	Etching for 15-20 seconds							
		Wash for 15 seconds							
		Air dry							
		Bonding Applicator							
		Curing for 10 seconds							
		Increment Composite placement							
		Finishing and polishing							

CHECKLIST:

- ☐ Proper outline form achieved.
- ☐ Adequate resistance
- ☐ Adequate retention
- ☐ Adequate lining/Base
- ☐ Smooth cavity margins and walls

DIAGRAM:

CLASS II CAVITY PREPARATION FOR COMPOSITE RESTORATION MANDIBULAR 1ST MOLAR

Date	Task	Details of step Followed	Student's Self Evaluation Poor (P) Average (A), Good (G)			Instructor Evaluation Poor(P), Average (A), Good (G)			Signature
	Outline Form	Removal Of Carious Lesion							
		Remove Unsupported Enamel							
	Resistance Form	Horizontal Floor							
		Rounded Line Angles							
		Depth (1.5-2mm)							
		Width (1-1.5mm)							
		Butt Joint/Cavo-Surface Angle							
	Retention Form	Parallel Walls/Occlusal Convergence							
		Occlusal Dove Tail							
	Protection of Pulp	Mixing And Manipulation							
		Location/ Placement							

	Matrix Band and Wedge Placement practice	Matrix band placement							
		Wedge placement							
	Restoration	Etching for 15-20 seconds							
		Wash for 15 seconds							
		Air dry							
		Bonding Applicator							
		Curing for 10 seconds							
		Increment Composite placement							
		Finishing and polishing							

CHECKLIST:

- ☐ Proper outline form achieved.
- ☐ Adequate resistance.
- ☐ Adequate retention.
- ☐ Adequate lining/Base.
- ☐ Smooth cavity margins and walls.
- ☐ Correct use of matrix system.

DIAGRAM:

CLASS II CAVITY PREPARATION MANDIBULAR 1ST MOLAR

Date	Task	Details of step Followed	Student's Self Evaluation Poor (P) Average (A), Good (G)			Instructor Evaluation Poor(P), Average (A), Good (G)			Signature
	Outline Form	Removal Of Carious Lesion							
		Remove Unsupported Enamel							
	Resistance Form	Horizontal Floor							
		Rounded Line Angles							
		Depth (1.5-2mm)							
		Width (1-1.5mm)							
		Butt Joint/Cavo-Surface Angle							
	Retention Form	Parallel Walls/Occlusal Convergence							
		Occlusal Dove Tail							
	Protection of Pulp	Mixing And Manipulation							
		Location/ Placement							
	Restoration	Mixing And Manipulation							
		Condensation							

		Pre-Carve Burnishing							
		Carving (Under/Overfilled)							
		Post-Carve Burnishing							
		Occlusal Adjustment							
	Matrix Band and Wedge Placement practice	Matrix band placement							
		Wedge placement							

CHECKLIST:

- ☐ Proper proximal box design with adequate clearance.
- ☐ Proper outline form achieved.
- ☐ Adequate retention.
- ☐ Adequate resistance.
- ☐ Adequate lining/Base.
- ☐ Smooth cavity margins and walls.
- ☐ Correct use of matrix system.

DIAGRAM:

CLASS II CAVITY PREPARATION MAXILLARY 1ST MOLAR

Date	Task	Details of step Followed	Student's Self Evaluation Poor (P) Average (A), Good (G)			Instructor Evaluation Poor(P), Average (A), Good (G)			Signature
	Outline Form	Removal Of Carious Lesion							
		Remove Unsupported Enamel							
	Resistance Form	Horizontal Floor							
		Rounded Line Angles							
		Depth (1.5-2mm)							
		Width (1-1.5mm)							
		Butt Joint/Cavo-Surface Angle							
	Retention Form	Parallel Walls/Occlusal Convergence							
		Occlusal Dove Tail							
	Protection of Pulp	Mixing And Manipulation							
		Location/ Placement							
	Restoration	Mixing And Manipulation							
		Condensation							

		Pre-Carve Burnishing							
		Carving (Under/Overfilled)							
		Post-Carve Burnishing							
		Occlusal Adjustment							
	Matrix Band and Wedge Placement practice	Matrix band placement							
		Wedge placement							

CHECKLIST:

- ☐ Proper proximal box design with adequate clearance.
- ☐ Proper outline form achieved.
- ☐ Adequate retention.
- ☐ Adequate resistance.
- ☐ Adequate lining/Base.
- ☐ Smooth cavity margins and walls.
- ☐ Correct use of matrix system.

DIAGRAM:

CLASS II CAVITY PREPARATION MANDIBULAR 1ST PREMOLAR

Date	Task	Details of step Followed	Student's Self Evaluation Poor (P) Average (A), Good (G)			Instructor Evaluation Poor(P), Average (A), Good (G)			Signature
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		Remove Unsupported Enamel							
	Resistance Form	Horizontal Floor							
		Rounded Line Angles							
		Depth (1.5-2mm)							
		Width (1-1.5mm)							
		Butt Joint/Cavo-Surface Angle							
	Retention Form	Parallel Walls/Occlusal Convergence							
		Occlusal Dove Tail							
	Protection of Pulp	Mixing And Manipulation							
		Location/ Placement							
	Restoration	Mixing And Manipulation							

		Condensation							
		Pre-Carve Burnishing							
		Carving (Under/Overfilled)							
		Post-Carve Burnishing							
		Occlusal Adjustment							
	Matrix Band and Wedge Placement practice	Matrix band placement							
		Wedge placement							

CHECKLIST:

- ☐ Proper proximal box design with adequate clearance.
- ☐ Proper outline form achieved.
- ☐ Adequate retention.
- ☐ Adequate resistance.
- ☐ Adequate lining/Base.
- ☐ Smooth cavity margins and walls.
- ☐ Correct use of matrix system.

DIAGRAM:

CLASS II CAVITY PREPARATION MAXILLARY 1ST PREMOLAR

Date	Task	Details of step Followed	Student's Self Evaluation Poor (P) Average (A), Good (G)			Instructor Evaluation Poor(P), Average (A), Good (G)			Signature
	Outline Form	Removal Of Carious Lesion							
		Remove Unsupported Enamel							
	Resistance Form	Horizontal Floor							
		Rounded Line Angles							
		Depth (1.5-2mm)							
		Width (1-1.5mm)							
		Butt Joint/Cavo-Surface Angle							
	Retention Form	Parallel Walls/Occlusal Convergence							
		Occlusal Dove Tail							
	Protection of Pulp	Mixing And Manipulation							
		Location/ Placement							
	Restoration	Mixing And Manipulation							
		Condensation							

		Pre-Carve Burnishing							
		Carving (Under/Overfilled)							
		Post-Carve Burnishing							
		Occlusal Adjustment							
	Matrix Band and Wedge Placement practice	Matrix band placement							
		Wedge placement							

CHECKLIST:

- ☐ Proper proximal box design with adequate clearance.
- ☐ Proper outline form achieved.
- ☐ Adequate retention.
- ☐ Adequate resistance.
- ☐ Adequate lining/Base.
- ☐ Smooth cavity margins and walls.
- ☐ Correct use of matrix system.

DIAGRAM:

FINAL REMARKS BY MODULE COORDINATOR

Coordinator Name: _____

Signature: _____

Date: _____

Note: Submission of completed logbook is mandatory for eligibility to appear in the module assessment.

KHYBER MEDICAL UNIVERSITY

PRE-CLINICAL PROSTHODONTICS

LOGBOOK

STUDENT NAME: _____

TABLE OF CONTENTS

LEARNING OUTCOMES:

By the end of the preclinical Prosthodontics course, students will be able to:

1. Explain the importance of Prosthodontics in dental practice.
2. Identify the armamentarium used in Prosthodontics ward.
3. Complete the step-by-step fabrication of complete dentures on models, demonstrating proficiency in all related tasks.
4. Understand the standard operating procedures in the prosthodontics ward.
5. Demonstrate punctuality, appropriate dress code, and professional behavior in all ward activities
6. Engage in effective communication with peers, faculty, and staff.
7. Evaluate personal performance and progress through reflective practice and feedback.

Standard Operating Procedures (SOPs) for Prosthodontics Ward

For Preclinical Prosthodontics - Second Year BDS Students

1. General Conduct

- **Punctuality**: Students must arrive on time for all sessions.
- **Dress Code**: Wear appropriate clinical attire, including lab coats and name tags.
- **Hygiene**: Maintain high standards of personal and workspace hygiene.
- **Attendance**: Attendance is mandatory for all sessions.
- **Behavior**: Display professional and respectful behavior towards peers, faculty, and patients.

2. Safety and Infection Control

- **Hand Hygiene**: Perform hand hygiene before and after each procedure.
- **Personal Protective Equipment (PPE)**: Use gloves, masks, and eye protection as required.
- **Disinfection**: Ensure all instruments and surfaces are properly disinfected before and after use.
- **Waste Disposal**: Dispose of clinical waste in designated bins according to biohazard protocols.

3. Preclinical Activities

- **Preparation**: Ensure all materials and instruments are ready before the session.
- **Documentation**: Maintain accurate and complete records of all procedures in the logbook.
- **Supervision**: Work under the supervision of faculty or trained technicians at all times.

4. Use of Facilities

- **Practice**: Utilize models and simulators for practice as per the schedule.
- **Equipment**: Handle all equipment with care and return it to its designated place after use.
- **Laboratory Usage**: Use laboratory space responsibly and ensure it is clean before leaving.
- **Break Times**: Follow the schedule for breaks and ensure timely return to sessions.

5. Communication

- **Queries and Concerns**: Address any queries or concerns to the designated faculty member.

Junior Prosthodontics

Define Prosthodontics:

Define Preclinical Prosthodontics:

Define branches of Prosthodontics:

Teacher’s Sign:

ARMAMENTARIUM:

1. Diagnostic instruments
    - Mouth mirror
    - Probe
    - Tweezer
    - Explorer
2. Impression trays:
    - Stock trays(dentate and edentulous)
    - Perforated trays
3. Fabrication tools
    - Bowl & Spatula
    - Mixing slab
    - Pliers---- Round, Flat, Adam's plier
    - Wire cutter
    - Glass bowl for Acrylic mixing
    - Wax knife
    - Plaster knife
    - Wax carver
    - Dental flask
    - Ruler/Scale(Flexible)
    - Spirit lamp/ torch
    - Measuring scoops
    - Magnifying glass
4. Cutting/Trimming Instruments:
    - Dental lathes
    - Bench grinders
    - Acrylic trimmers
    - Carborundum discs
    - Finishing burs
    - Trimming knives
    - Acrylic burs(Flame, barrel, round, fissure)
    - Carbide burs
    - Diamond burs

- Model trimmer
- Scalpel blades

5. Miscellaneous:

- articulators
- facebow

COMPLETE DENTURE:

Define Complete Denture:

_____

_____

_____

Surfaces and parts of Complete Denture:

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_____

Fabrication steps Of Complete Denture:

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IMPRESSIONS IN COMPLETE DENTURE:

Define Dental impression:

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Principles of Impression Making:

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Classify Dental Trays:

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Define Primary Impression:

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Materials used for Primary Impression:

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Define Secondary (final) Impression:

_____

_____

Materials used for Secondary Impression:

_____

_____

CASTS IN COMPLETE DENTURES:

DEFINITION:

PARTS:

TYPES:

Denture Bearing Areas

Define:_____

_____

_____

Maxillary denture bearing areas:

A.Limiting structures:

_____

_____

1.Labial frenum:

_____

_____

2.Labial vestibule:

_____

_____

3.Buccal freni

_____

_____

4. Buccal vestibule:

_____

_____

5. Hamular notch:

_____

_____

6.Post-dam area / posterior palatal seal:

_____

_____

B.<u>Supporting structures:</u>

_____

_____

A. Primary stress bearing area:

_____

a.Hard palate:

b.Postero-lateral slopes of residual ridge:

c. Maxillary tuberosity:

B. Secondary stress bearing area:

a.Rugae:

b. Alveolar ridges:

C. RELIEF AREAS:

Incisive papilla:

Mid-palatine raphe:

Fovea palatina:

Draw and label maxillary denture bearing areas

Teacher's sign

MANDIBULAR DENTURE BEARING AREAS:

A. Limiting structures:

_____

_____

1. Labial frenum:

_____

_____

2. Labial vestibule

_____

_____

3. Buccal frenum

_____

_____

4. Buccal vestibule:

_____

_____

5. Lingual frenum:

_____

_____

6. Alveolo-lingual sulcus:

_____

_____

7. Retromolar pads:

_____

_____

8. Pterygo-mandibular raphae:

B. Primary Supporting structures:

1. Buccal shelf area:

2. Retromolar Pad

C. Secondary Supporting Structures

_____

_____

Crest of the alveolar ridges:

RELIEF AREAS:

Mylohyoid ridge:

Mental foramen:

Genial tubercles:

Torus mandibularis:

Draw and label mandibular denture bearing areas

Teacher's Sign:

FABRICATION OF CUSTOM TRAY

1.Maxillary:

2.Mandibular:

_____

_____

_____

_____

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_____

Teacher's sign:

Fabrication of Custom Tray

Date	Work done	Remarks	Teachers Sign
	Acrylic mixing		
	Acrylic manipulation		
	Custom tray Extension		
	Thickness		
	Frenal Relief		
	Finishing		
	Tray Handles		

Wax pattern for denture base plates

1. Maxillary:

2. Mandibular:

Teacher's sign

FABRICATION OF DENTURE BASES

MAXILLARY

Date	Work done	Remarks	Teacher's sign
	Wax pattern		
	Flasking		
	Dewaxing		
	Use of separating media		
	Packing		
	Curing		
	Deflasking		
	Finishing		

MANDIBULAR

Date	Work done	Remarks	Teacher's sign
	Wax pattern		
	Flasking		
	Dewaxing		
	Use of separating media		
	Packing		
	Curing		
	Deflasking		
	Finishing		

FABRICATION OF OCCLUSAL RIMS:

Define Occlusal Rims:

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_____

Materials Used:

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Rolled wax technique:

Step- by- Step:

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MAXILLARY OCCLUSAL RIMS

Date	Area of adjustment	Ideal height	Adjusted height	Remarks	Teacher's sign
	From border of flange - canine eminence region	22mm			
	From crest of alveolar ridge - anterior region	10-12 mm			
	From border of flange - posterior region	18mm			
	From crest of alveolar ridge - posterior region	5-7mm			
		Ideal width	**Adjusted width**		
	Anterior teeth region	4-6mm			
	Premolar area	6-8mm			
	Molar area	8-12mm			
	Distance from incisive papilla	8mm			

MANDIBULAROCCLUSAL RIMS

Date	Area of adjustment	Ideal height	Adjusted height	Remarks	Teacher's sign
	From border of flange - canine eminence region	18mm			
	From crest of alveolar ridge - anterior region	6-8mm			
	Flush with retro molar pad -posterior region	2/3 of its height			
	From crest of alveolar ridge - posterior region	3-6mm			
		Ideal Width	**Adjusted width**		
	Anterior teeth region	4-6mm			
	Premolar area	6-8mm			
	Molar area	8-12mm			

MAXILLO-MANDIBULAR RELATIONS

Define Maxillo-Mandibular relationship:

_____

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_____

Define orientation jaw relation:

_____

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Define vertical jaw relation:

_____

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Define horizontal/centric jaw relation:

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Teacher's Sign:

ARTICULATORS & ARTICULATION

Define Articulation:

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_____

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_____

Define an articulator:

_____

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_____

Uses of Articulators:

_____

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_____

Classify articulators on basis of adjustability:

_____

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_____

MOUNTING HINGE ARTICULATOR

Date	Work done	Remarks	Teacher's sign
	Sealing of occlusal rims		
	Mounting of cast with occlusal rims		
	finishing		

Teacher's sign:

TOOTH SET-UP

Define

_____

_____

_____

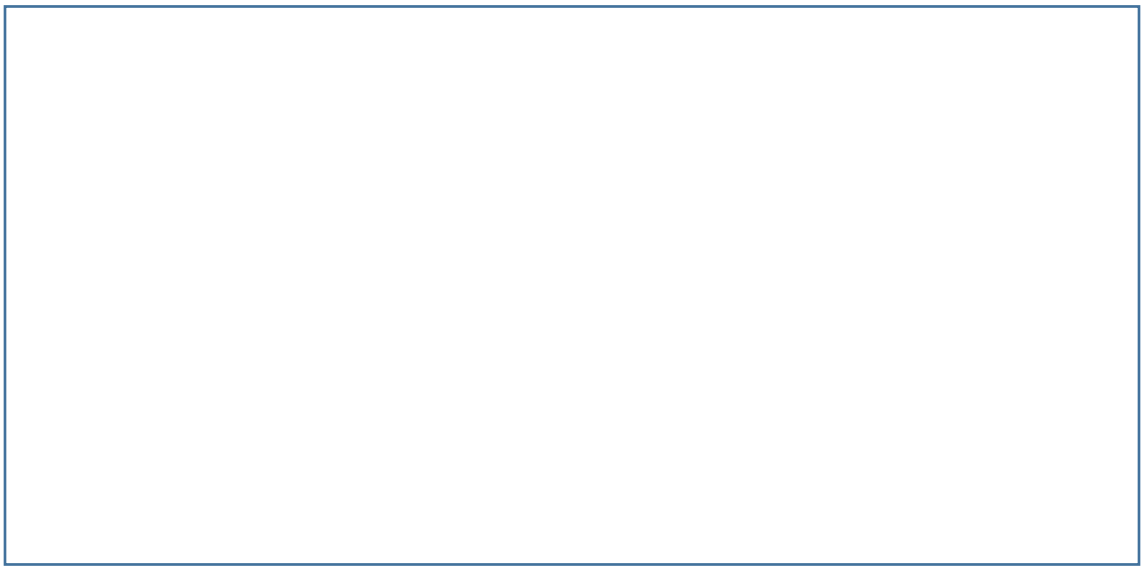
GUIDE TO TOOTH SET-UP:

TEETH	FACIAL VIEW	PROXIMAL VIEW	OCCLUSAL PLANE RELATION
MAX. CENTRAL INCISOR	Long axis slightly mesially inclined	Labially inclined by 15°	Incisal edge contacts horizontal plane
MAX. LATERAL INCISOR	Slopes more mesially compared to centrals	Labially inclined by 20°	Incisal edge 1-2mm short of occlusal plane
MAX. CANINE	Long axis VERTICAL or slightly mesially inclined. Mesial surface more visible than distal surface	Long axis VERTICAL	Canine tip in contact with occlusal plane
MAND.CENTRAL INCISOR	Long axis leans towards mesial	Labially inclined	Incisal edge 2mm above occlusal plane
MAND.LATERAL INCISOR	Long axis slopes mesially	Labial inclination less pronounced compared to centrals	Incisal edge 2mm above occlusal plane

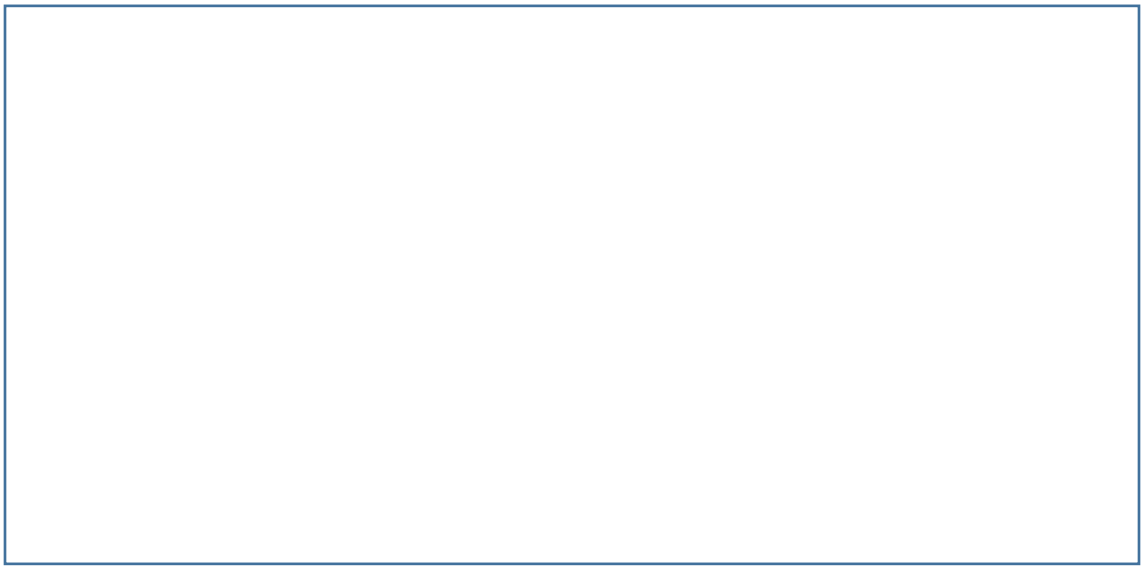
MAND. CANINE	Long axis straight or slightly mesially inclined	Long axis straight or leans very slightly to lingual	Incisal edge at a slightly higher plane than laterals
MAX.1ST PREMOLAR	Long axis straight or slightly mesially inclined	Long axis straight or leans very slightly to lingual	Buccal cusp in contact with occlusal plane Palatal cusp 1mm shorter
MAX 2ND PREMOLAR	Long axis vertical	Long axis straight or leans very slightly to lingual	Both cusps touch occlusal plane
MAX 1ST MOLAR	Long axis inclined distally	Buccal inclination	Only mesiopalatal cusp in contact with occlusal plane
MAX 2ND MOLAR	More distal inclination	Buccal inclination	None of cusps contact occlusal plane but mesiopalatal is still nearest to it
MAND.1ST PREMOLAR	Long axis vertical	Long axis vertical	Buccal cusp is above occlusal plane and lingual cusp below occlusal plane
MAND.2ND PREMOLAR	Long axis vertical	Long axis vertical	Both cusps 2mm above occlusal plane
MAND.1ST MOLAR	Long axis mesially inclined	Long axis lingually inclined	DB cusp above occlusal plane,buccal cusps higher than lingual cusps,distal cusps higher than mesials.
MAND.2ND MOLAR	More pronounced mesial inclination	More pronounced lingual inclination	All cusps higher than first molars.

Draw Teeth position as seen in frontal, lateral and incisal/ occlusal view

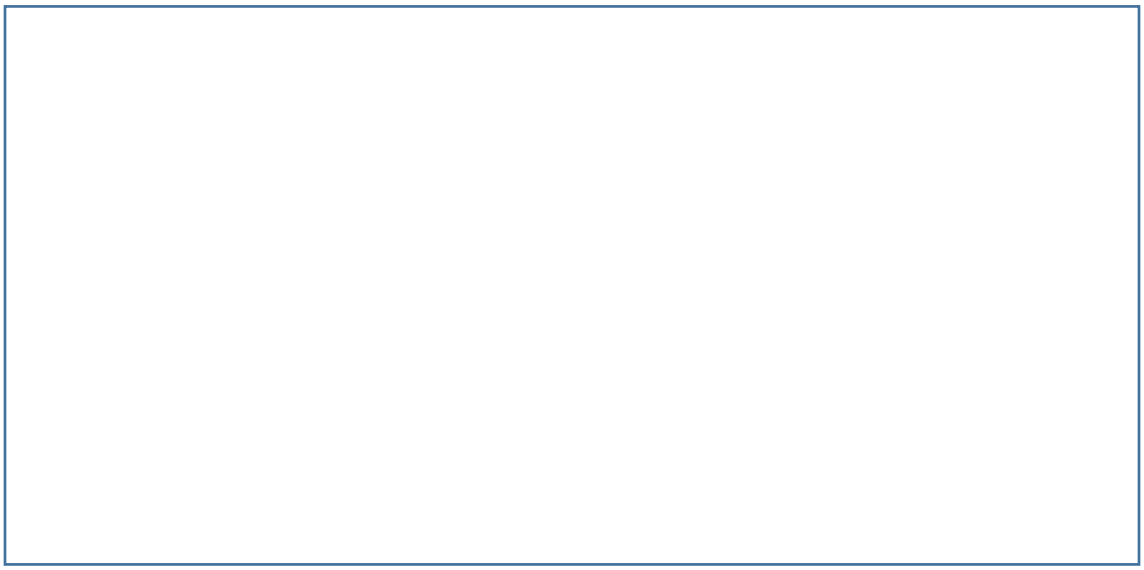
MAXILLARY CENTRAL INCISORS:



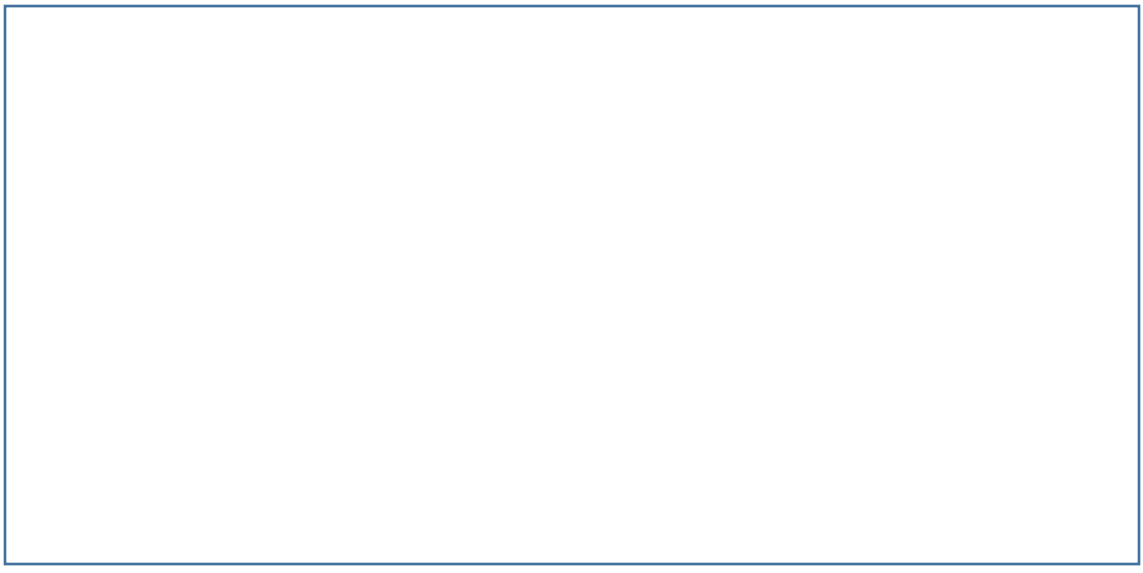
MAXILLARY LATERAL INCISORS:



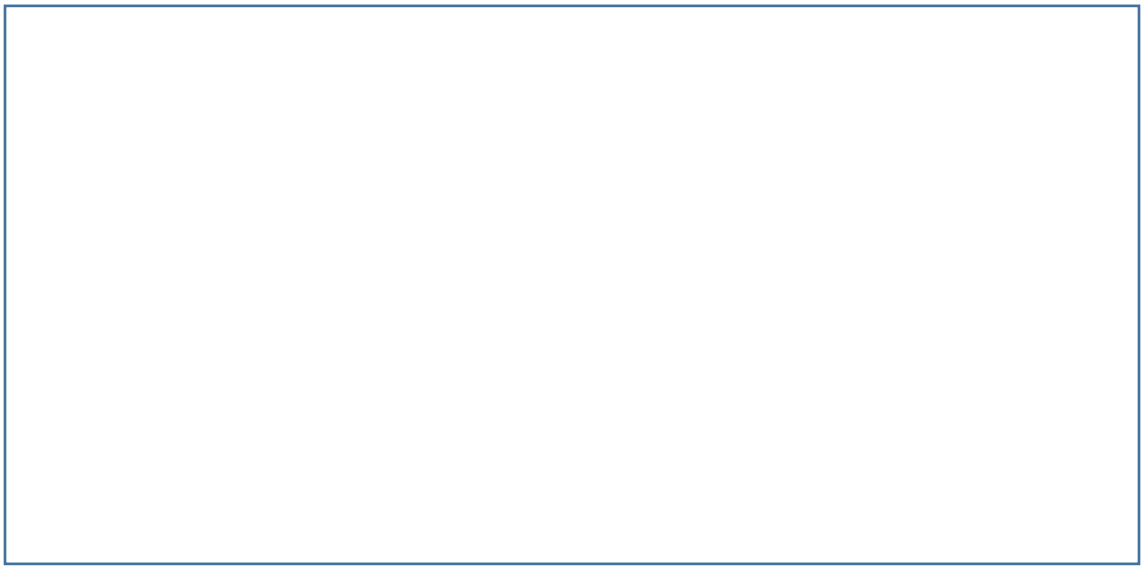
MAXILLARY CANINES:



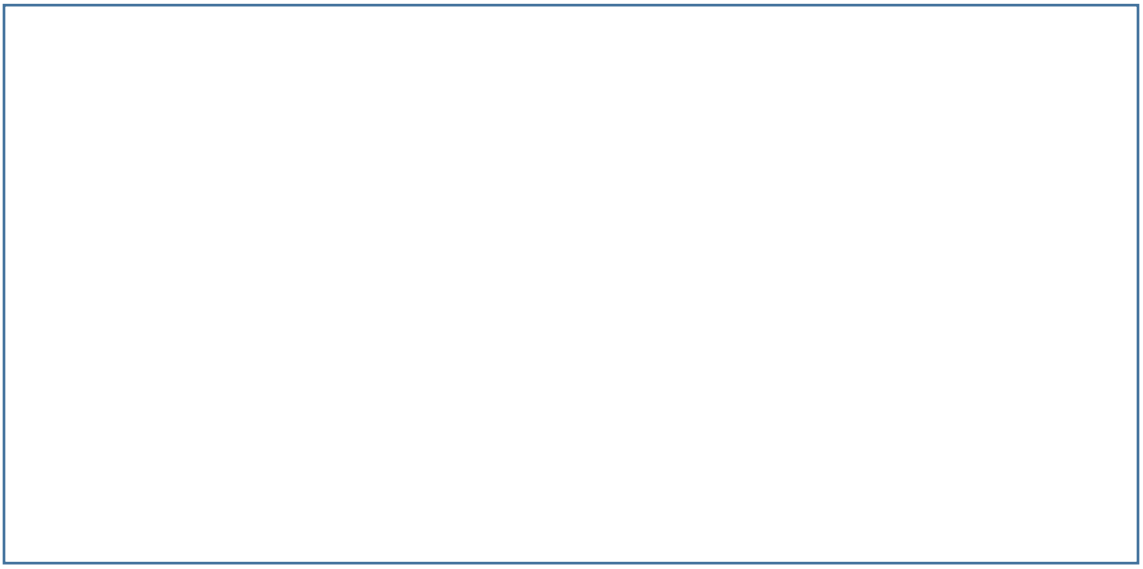
MAXILLARY FIRST PREMOLAR:



MAXILLARY SECOND PREMOLAR

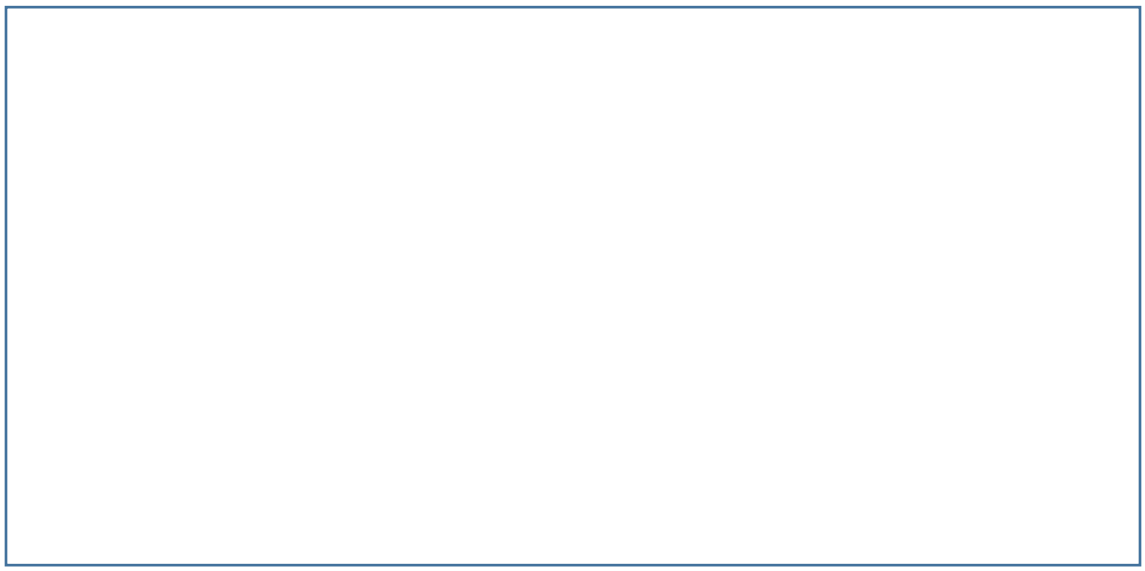


MAXILLARY FIRST MOLAR

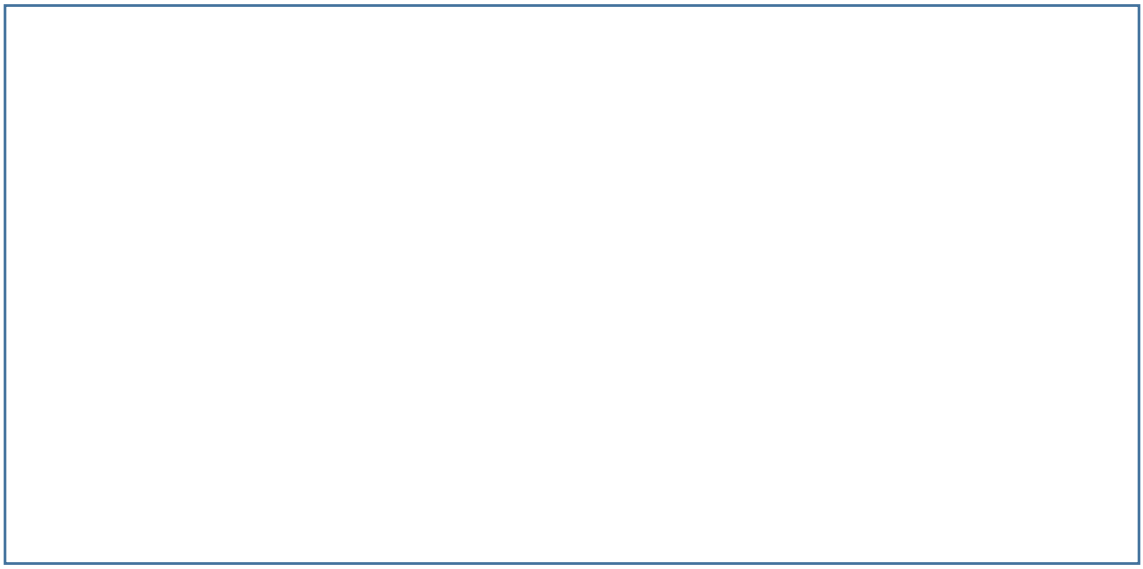


MAXILLARY SECOND MOLAR:

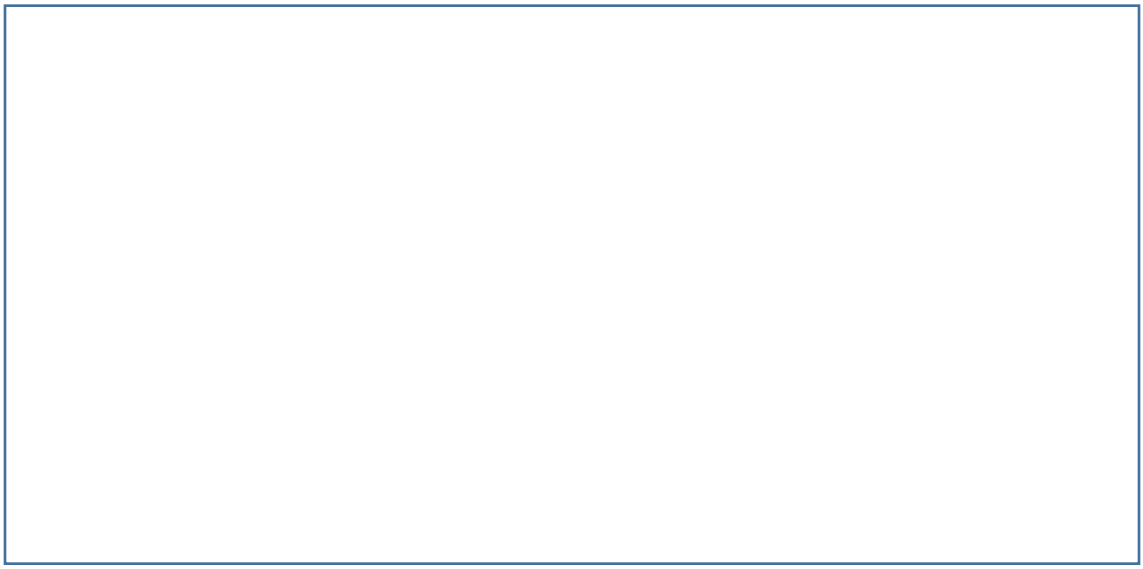
MANDIBULAR CENTRAL INCISORS:



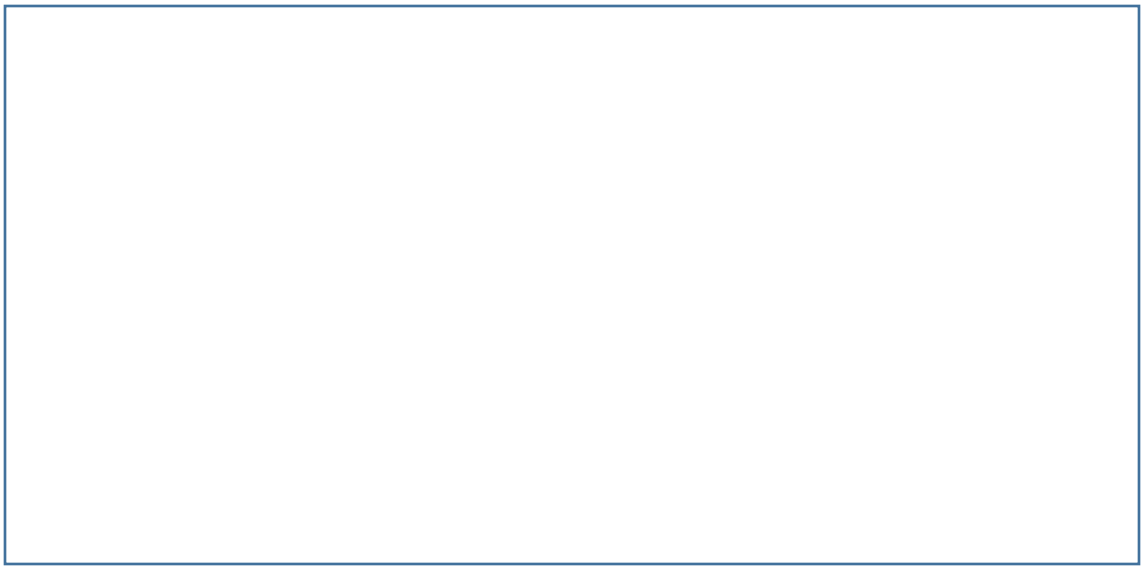
MANDIBULAR LATERAL INCISORS:



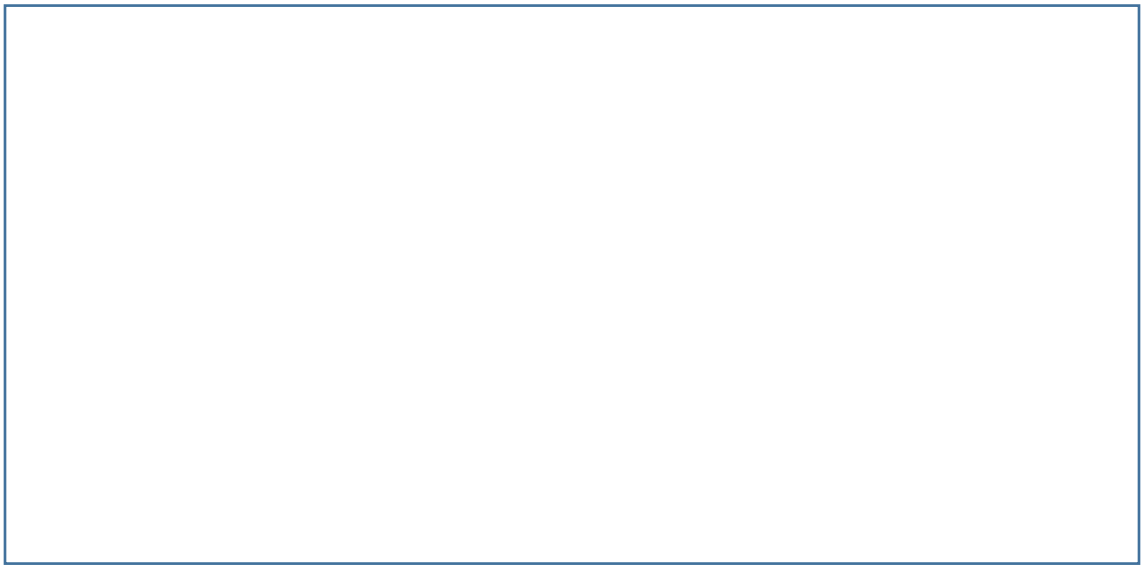
MANDIBULAR CANINES:



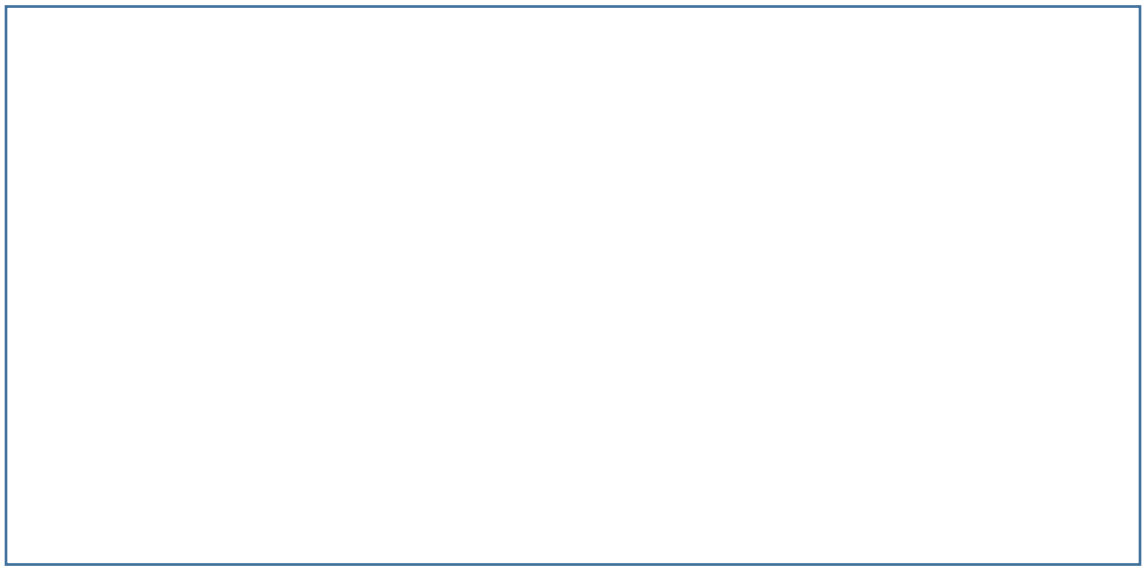
MANDIBULAR FIRST PREMOLAR:



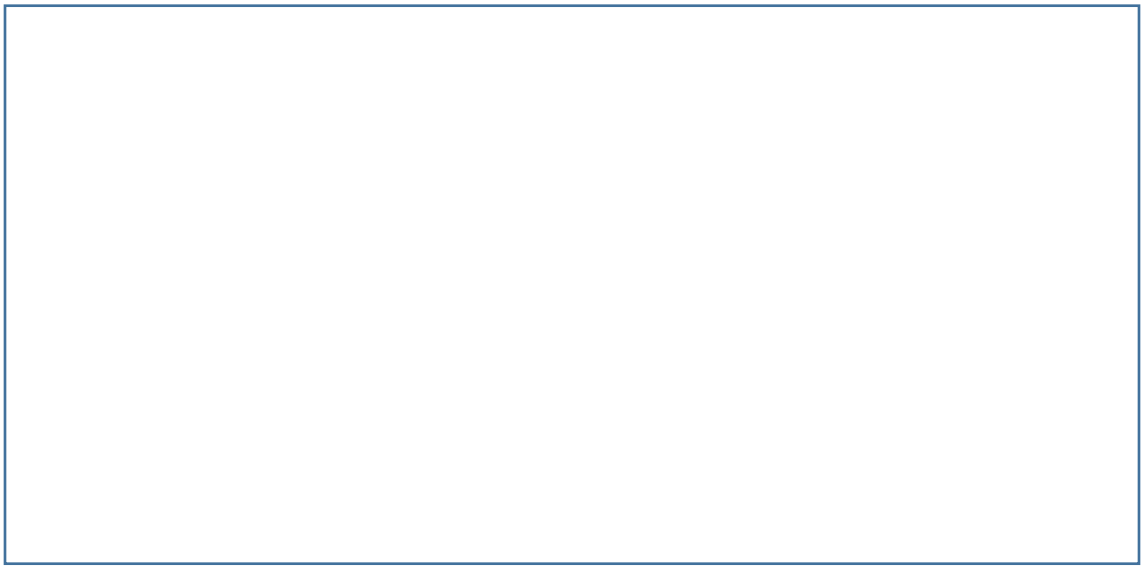
MANDIBULAR SECOND PREMOLAR:



MANDIBULAR FIRST MOLAR:



MANDIBULAR SECOND MOLAR:



GUIDE LINES FOR TEETH SETUP

Key of occlusion

1. Canine key of occlusion:

_____

_____

_____

_____

2. Molar key of occlusion:

_____

_____

_____

_____

3. Aligned occlusal groove concept

_____

_____

_____

4. Aligned buccal ridge concept

5. Overjet

6. Overbite

COMPENSATING CURVES

1. Curve of spee:

2. Wilson's curve:

3. Monson's curve:

WAX-UP

Define:_____

_____

_____

_____

_____

Date	Steps done in wax up	Remarks	Teacher's sign
	Pooling		
	Cooling		
	Festooning		
	Contouring		
	Stippling		

LABORATORY PROCESSING:

Date	Work done	Remarks	Teacher's sign
	Flasking		
	Dewaxing		
	Use of separating media		
	Packing		
	Curing		
	Deflasking		

FINAL FINISHING AND POLISHING

Date	Work done	Remarks	Teacher's sign
	Trimming / finishing		
	Sand paper finishing		
	Pumice wash		

ASSESSMENT CHART

Date	Presentation topic	Remarks	Teacher's sign

Date	Assignment topic	Remarks	Teacher's sign

Date	Dentures submitted	Remarks	Teacher's sign
	Maxillary		
	Mandibular		