Choice Based Credit System (CBCS)

NOWGONG COLLEGE
(AUTONOMOUS)

SYLLABUS

DEPARTMENT OF B. Voc. COURSES

Learning Outcomes-based Curriculum Framework (LOCF)
of
Undergraduate Programme

BACHELOR OF VOCATION IN MEDICAL LABORATORY TECHNOLOGY

(Effective from Academic Year 2020-21)

Syllabus Approved in Academic Council
Nowgong College (Autonomous)

Syllabus for B. Voc.in MEDICAL AND LABORATORY TECHNOLOGY

Course and Credit Structure

Semester	Regular Core Course 12 × 6 = 72	Ability Enhancement Course 2 × 4 = 8	Skill Enhancement Course 4 × 4 = 16	Discipline Specific Elective Course 6× 6 = 36
1st	Course:1 MELT-RCC-1016 Course:2 MELT-RCC-1026 Course:3 MELT-RCC-1036	Communicative English/Communicative MIL ENGL-AEC-1014 ASSA-AEC-1014 HIND-AEC-1014 BENG-AEC-1014		
2nd	Course:1 MELT-RCC-2016 Course:2 MELT-RCC-2026 Course:3 MELT-RCC-2036	ENST-AEC-2014		
3rd	Course:1 MELT-RCC-3016 Course:2 MELT-RCC-3026 Course:3 MELT-RCC-3036		XXXX-SEC-3014	
4th	Course:1 MELT-RCC-4016 Course:2 MELT-RCC-4026 Course:3 MELT-RCC-4036		XXXX-SEC-4014	
5th			XXXX-SEC-5014	Course:1 MELT-RDS-5016 Course:2 MELT-RDS-5026 Course:3 MELT-RDS-5036
6th			XXXX-SEC-6014	Course:1 MELT-RDS-6016 Course:2 MELT-RDS-6026 Course:3 MELT-RDS-6036

SEMESTER-I

PAPER CODE: MELT-RCC-1016

BASIC ANATOMY AND PHYSIOLOGY

PAPER CREDIT: 06 (4T+2P)

T: Theory P: Practical

Total no. of Lectures: 60+30(L+P) Total Marks: 100 (T60+IA20+P20)

L: Lecture, T: Tutorial, P: Practical T: Theory, IA: Internal Assessment, P: Practical

OBJECTIVES:

Tolearn about basic human anatomy and physiology

LEARNING OUTCOME:

Students will learn about basic human anatomy and physiology

CONTENTS

THEORY

UNIT 1 Human Anatomy and Physiology, Definitions and divisions-anatomy and physiology, Different anatomical and physiological terms, Positions and planes, Organization of human body.

UNIT 2 The Cell, Cell: Types, Structures, Functions. Cell Divisions. Cancer. Tissue: Definition, Classification and Functions.

UNIT 3 Musculoskeletal System, Muscle: Definition, classification, structure and functions, cartilage. Muscle contraction. Skeleton: Bones-Functions, types, structure (Macroscopy and microscopy). BMD. Ossification. Axial and appendicular skeleton. Joints. Common disorders and diseases of bone, joints and muscles.

UNIT 4 Respiratory system, Introduction, Parts: Structures and functions. Respiration, cycle of breathing. Lung volumes and capacities, spirometry. Brief description of common diseases of respiratory system

UNIT 5 Digestive system, Overview, Parts: structures and functions. Accessory organs of digestion: Structures and functions. Absorption of nutrients. Metabolism. Common diseases of pancreas, stomach and liver.

UNIT 6 Cardiovascular system, Overview of CVS. Blood vessels and it's types. Anatomy and physiology of heart. Conducting system of the heart. Cardiac cycle, cardiac output. Blood pressure, pulse. Different types of blood circulation. Common disorders and diseases of CVS.

UNIT 7 Nervous system, Introduction and classification of nervous system. Structure and function of neurons. Meninges, ventricles and cerebrospinal fluid (CSF). Structured and functions of Brain and its parts. Peripheral and autonomic nervous system. Common disorders and diseases of brain.

UNIT 8 Urinary system, Overview. Anatomy and physiology of the kidney. Nephron. Composition and formation of urine. Water and electrolyte balance. Urinary bladder. Micturition. Diseases of kidney.

UNIT 9 Endocrine system, Anatomy and physiology of different glands, Common diseases and disorders of glands.

UNIT 10 Reproductive system, Brief anatomy and physiology: male and female reproductive system. Testes and ovary. Menopause and infertility.

UNIT 11 Immune System, Overview, Definition, types, structure and role of different immunity.

PRACTICAL

1. To study the simple compound and binocular microscope
2. To study the human skeleton through model
3. To study the respiratory system through model
4. To study of permanent slides
5. To study the heart and brain through model
6. To study the histology of cartilages
8. To study digestive system through model

SUGGESTED READINGS:

1) Waugh and Grant. *Ross and Wilson Anatomy and Physiology In Health And Illness,* 13th Edition. Elsemier.

2) Sembulingam and Sambulingam. *Essentials of Medical Physiology*, 7th Edition.Jaypee.

SEMESTER-I

PAPER CODE: MELT-RCC-1026

BIOCHEMISTRY-I

PAPER CREDIT: 06 (4T+2P)

T: Theory P: Practical

Total no. of Lectures: 60+30(L+P) Total Marks: 100 (T60+IA20+P20)

L: Lecture, T: Tutorial, P: Practical T: Theory, IA: Internal Assessment, P: Practical

OBJECTIVES:

To learn about laboratory apparatus, preparation of solutions, laboratory maintenance, etc.

LEARNING OUTCOME:

Students will learn about laboratory apparatus, preparation of solutions, laboratory maintenance etc.

CONTENTS

THEORY

UNIT 1 Laboratory Maintenance, Beakers, measuring cylinders, conical flask, pipettes, burettes etc. Types of glasses. Cleaning of glasswares and plasticwares

UNIT 2 Laboratory apparatus maintenance, Sphygmomanometer, digital balance, micropipette,haemoglobinometer, haemocytometer,Ph meter, magnetic stirrer with hot plate, glucometer etc. Use, care and maintenance of different laboratory instruments-Autoanalyser, colorimeter, spectrophotometer, centrifuge, refrigerator, incubator, autoclave, hot air oven etc.

UNIT 3 Preparation of solutions, Molar, normal and percentage. Stock solution, dilution and serial dilution. Preparation of standard solutions of different hygroscopic and deliquescent compounds.

UNIT 4 Basic laboratory hazards and safety procedures, Basic laboratory hazards and safety procedures. First aid of cut, injury, burns etc.

UNIT 5 Phlebotomy technician, Duties and responsibilities of phlebotomy technician

UNIT 6 Digestion,metabolism and absorption., Introduction to digestion,metabolism and absorption.

UNIT 7 Water, electrolyte and acid-base balance, Water, electrolyte and acid-base balance

UNIT 8 Nutrition, Basics about Nutrition

PRACTICAL

1. To study the cleaning and maintenance of laboratory glass wares
2. To study of some of commonly used laboratory instruments
3. To prepare different normal solutions
4. To prepare different molar solutions
5. To detect uric acid in the supplied samples
6. To detect urea in the supplied samples
7. Estimation of blood sugar
8. To detect monosaccharide (glucose)in the supplied samples
9. To detect disaccharide (sucrose) in the supplied samples

SUGGESTED READINGS:

1) Satyanaranan and Chakrapani. *Biochemistry*, 5th Edition.Elsevier.
2) Vasudevan and Das. *Practical Textbook of Biochemistry for Medical Students*, 2nd Edition.Jaypee.
3) Albert L. Lehninger, David L. Nelson, and Michael M. Cox, ***Lehninzer Principles of Biochemistry***, 8th Edition, MacMillan Learning Pvt. Ltd., 2021

SEMESTER-I

PAPER CODE: MELT-RCC-1036

CLINICAL PATHOLOGY

PAPER CREDIT: 06 (4T+2P)

T: Theory P: Practical

Total no. of Lectures: 60+30(L+P) Total Marks: 100 (T60+IA20+P20)

L: Lecture, T: Tutorial, P: Practical T: Theory, IA: Internal Assessment, P: Practical

OBJECTIVES:

To learn about hematology, pharmacology etc.

LEARNING OUTCOME:

Students will learn about hematology, pharmacology etc.

CONTENTS

THEORY

UNIT 1 Blood, Introduction, properties, composition and functions. Morphology and functions of RBC, WBC and platelets. Erythropoiesis. Anaemia: Definition and classification. Haemostasis. Common disorders and diseases of blood.

UNIT 2 Hematology, Introduction, Hematopoiesis. Techniques and precautions of capillary, venous and arterial blood collection. Different equipment used for blood sample collection. Coloured coded vacutainers. Interpretation of test request form. Storage of blood sample.

UNIT 3 Immuno-hematology, Introduction. History of blood groups. Blood group systems-ABO. Landsteiner's law. Determination of ABO group. Matching and crossmatching. Transfusion reactions. Complications of mismatched blood transfusion. Rh factor. Importance of knowing blood group.

UNIT 4 Chemical pathology, Normal and abnormal constituents of urine. Indications for urinalysis. Collection and preservation of urine samples. Physical, chemical and microscopic examination of urine. Collection and appearance of sputum: Gram staining, bacteriological culture of sputum.

UNIT 5 Introduction to Pharmacology, Definitions and different branches of pharmacology. Routes of drug administration
-Absorption, distribution, metabolism and excretion of drugs (ADME). General mechanisms of

drug action. Analgesics, antipyretics, anti-inflammatory, antiallergic, haematinics, drug acting on gastric ulcers, antidiarrhoeal etc.

UNIT 6 Personnel hygiene, Concept of health. Procedures of hand hygiene. Personal protective equipment (PPE)

PRACTICAL

1. To study the collection of capillary, venous and arterial blood samples
2. To study the estimation of haemoglobin by different methods
3. To study the Hematocrit(PCV)
4. To study the Bleeding time
5. To study the Clotting time
6. To study the Erythrocyte sedimentation rate (ESR)
7. To determine the Blood grouping by different methods
8. To study the Rh typing by different methods

SUGGESTED READINGS:

1) Kawthalkar. *Essentials of Clinical Pathology*, 2nd Edition.Jaypee.
2) Maheswari. *Clinical Pathology Hematology and Blood Banking*, 3rd Edition. Jaypee.

SEMESTER-II

PAPER CODE: MELT-RCC-2016

MICROBIOLOGY-I

PAPER CREDIT: 06 (4T+2P)

T: Theory P: Practical

Total no. of Lectures: 60+30(L+P) Total Marks: 100 (T60+IA20+P20)

L: Lecture, T: Tutorial, P: Practical T: Theory, IA: Internal Assessment, P: Practical

OBJECTIVES:

To learn about sterilization, disinfection, parasitology etc.

LEARNING OUTCOME:

Students will learn about sterilization, disinfection, parasitology etc.

CONTENTS

THEORY

UNIT 1 Introduction to Microbiology, The history and scope of microbiology, characterization, classification of Micro-organisms. Morphology of bacteria: Size, shape, structure of bacteria. Gram's characteristics of bacteria. Gram's staining. Acid fast staining.

UNIT 2 Growth and Nutrition, Nutrition requirements of bacteria. Growth and multiplications of bacteria. Different types of culture media. Use of culture media in diagnostic bacteriology. Methods of bacterial culture: Streak culture, lawn culture, stroke culture, stab culture, pour-plate culture, shake culture and liquid culture.

UNIT 3 Sterilization and Disinfection
Definition. Methods of sterilization and disinfection. Frequently used terms. Anti-septic and disinfectants. Principles and use of equipments of sterilization namely Hot air Oven, Autoclave. Pasteurization.

UNIT 4 Systematic Bacteriology
Morphology, cultivation, disease caused, pathogenicity laboratory diagnosis including specimen collection of the following bacteria: Streptococci, E. Coli, Clostridium and Mycobacterium.

UNIT 5 Parasitology

Morphology, life cycle and laboratory diagnosis of *E. histolytica, B. coli, Plasmodium vivax, Plasmodium falciparum*.

UNIT 6 Virology, General properties of virus, diseased caused, lab diagnosis and presentation of following viruses: Hepatitis, HIV, rabies and poliomyelitis.

PRACTICAL

1. To study sterilization equipments: hot air oven, autoclave, bacterial filters.
2. Demonstrations of commonly used culture media, nutrient broth, nutrient agar, blood agar, chocolate agar, MacConkey medium, L J media, Robertson cooked meat media,
3. To study the grams stain
4. To study the acid fast staining
5. Demonstration of common serological tests – WIDAL, VDRL, ELISA.

SUGGESTED READINGS:

1) Wiley, Sherwood, Woolverton. Prescott,Harley, and Klein's Microbiology, 7th Edition. McGraw Hill.
2) Tortora, Funke, Case. Microbiology, 9th Edition. Pearson.
3) PelczarJr, Chan, Krieg. Microbiology, 5th Edition, McGraw Hill.

SEMESTER-II

PAPER CODE: MELT-RCC-2026

BIOCHEMISTRY-II

PAPER CREDIT: 06 (4T+2P)

T: Theory P: Practical

Total no. of Lectures: 60+30(L+P) Total Marks: 100 (T60+IA20+P20)

L: Lecture, T: Tutorial, P: Practical T: Theory, IA: Internal Assessment, P: Practical

OBJECTIVES:

To learn about lipids, vitamins, enzymes etc.

LEARNING OUTCOME:

Students will learn about lipids, vitamins, enzymes etc.

CONTENTS

THEORY

UNIT 1 Basic Sensitization to Biochemistry and Clinical Biochemistry
Introduction to inorganic chemistry
Introduction to organic chemistry
Introduction to physical chemistry
Introduction to analytical chemistry

UNIT 2 Blood chemistry, Urine chemistry, Blood chemistry, Urine chemistry

UNIT 3 Carbohydrates, Classification, Isomerism, Monosaccharaides, Important chemical reaction of monosaccharaides, Oligosaccharides, Polysaccharides, Glycoprotein, Mucopolysaccharides, Qualitative test for identification of carbohydrates.

UNIT 4 Introduction to metabolism, Catabolism and anabolism, Types of metabolic reactions, Metabolism of carbohydrate and disorders of carbohydrate metabolism.

UNIT 5 Lipids, Classification, Simple lipids, Compound lipids, Glycolipids, Lipoproteins, Derived Lipids, Saturated fatty acids, Unsaturated fatty acid, Plasma Proteins, Lipoproteins, Essential fatty acid, Steroids, Important tests.

UNIT 6 Vitamins, Definition, classification, Sources, functions, deficiency, requirements.

UNIT 7 Biophysics, Surface tension, osmolarity and viscosity.

UNIT 8 Enzymes, Introduction, activation energy, classification, activity, specificity kinetics V max, km, Michaelis Menten equation.

UNIT 9 Most probable number method, Urea, uric acid, creatinine of these importance.

PRACTICAL

1. To study the estimation of blood sugar
2. To study the quantitative test for urine glucose and GTT.
3. To study the qualitative screening test for normal and abnormal urine sample.
4. To study the biochemical Tests for Urine Test for sugar
5. To study the test for proteins Test for Ketones
6. To study the test for bile pigments and urobillinogen
7. To study the test for bile salts
8. To study the estimation of non protein nitrogenous compounds of blood: blood urea, creatinine, creatinine clearance test (CCT).

SUGGESTED READINGS:

1) Satyanaranan and Chakrapani. *Biochemistry*, 5th Edition.Elsevier.
2) Vasudevan and Das. *Practical Textbook of Biochemistry for Medical Students*, 2nd Edition.Jaypee.
3) Albert L. Lehninger, David L. Nelson, and Michael M. Cox, ***Lehninzer Principles of Biochemistry***, 8th Edition, MacMillan Learning Pvt. Ltd., 2021

SEMESTER-II

PAPER CODE: MELT-RCC-2036

CLINICAL PATHOLOGY

PAPER CREDIT: 06 (4T+2P)

T: Theory P: Practical

Total no. of Lectures: 60+30(L+P) Total Marks: 100 (T60+IA20+P20)

L: Lecture, T: Tutorial, P: Practical T: Theory, IA: Internal Assessment, P: Practical

OBJECTIVES:

To learn about blood coagulation, bio medical waste management etc.

LEARNING OUTCOME:

Students will learn about blood coagulation, bio medical waste management etc.

CONTENTS

THEORY

UNIT 1 Haematology:
Haemopoiesis, stem cell, formed elements and their functions. Haematopoiesis in details (erythropoiesis, granulopoiesis, monocyte macrophage series,thrombopoiesis). Absolute eosinophil count. Reticulocyte count. Preparation of staining of blood film for morphology of red cells and differential cell counts.

UNIT 2 Haemostasis and Coagulation:

a) Normal haemostasis, mechanism of blood coagulation and normal fibrinolytic system.
b) Investigation of haemostatic mechanism – BT, CT, Whole blood coagulation time test, PT,APTT.
c) Assay of clottingfactors.
d) Test for fibrinolytic activity – Euglobin, clot lysis test and FDP.
e) Platelet functiontest.

UNIT 3 Special haematological tests:

a) Sickling test
b) Osmotic fragility test
c) Investigation of G6PDdeficiency.
d) Plasma haptoglobin and demonstration of hemosiderinin urine.
e) Test for autoimmune haemolytic anaemia. Measurement of abnormal Hb pigments.

UNIT 4. Bone marrow biopsy study:

a) Needle aspiration and surgical biopsy techniques.
b) Preparation of smear and staining

UNIT 5 Histopathology: Introduction to histopathology, Different branches of histopathology.

UNIT 6 Cytology and Cytopathology: Introduction, Definition of cytology, Cells & tissues, Normal tissues. Classification of cytology- Exfoliative and interventional cytology, Role of Cytology.

UNIT 7 Bio Medical Waste Management, To gain understanding of importance of proper and safe disposal of bio-medical waste &treatment.

- To gain understanding of categories of bio medical waste.
- To learn about disposal of bio-medical waste colour coding, types of containers, transportation of waste, etc.
- To gain broad understanding of standards for bio-medical waste disposal
- To gain broad understanding of means of biomedical waste treatment.

PRACTICAL

1. To study the red blood cell count.
2. To study the total white blood cell count
3. To study the Platelet count.
4. To study the Blood smear preparation (PBF) and staining and Differential leucocyte count (DLC)
5. To study the calculation of red cell indices (MCV, MCH & MCHC)
6. To study the determination of BT, CT, Whole blood clotting time, Clot retraction.
7. To study the determination of PT and APTT

SUGGESTED READINGS:

1) Kawthalkar. *Essentials of Clinical Pathology*, 2nd Edition.Jaypee.
2) Maheswari. *Clinical Pathology Hematology and Blood Banking*, 3rd Edition. Jaypee.

SEMESTER-III

PAPER CODE: MELT-RCC-3016

MICROBIOLOGY II

PAPER CREDIT: 06 (4T+2P)

T: Theory P: Practical

Total no. of Lectures: 60+30(L+P) Total Marks: 100 (T60+IA20+P20)

L: Lecture, T: Tutorial, P: Practical T: Theory, IA: Internal Assessment, P: Practical

OBJECTIVES:

To learn about medical mycology, medical bacteriology and staining techniques

LEARNING OUTCOME:

Students will learn about medical mycology, medical bacteriology and staining techniques

CONTENTS

THEORY

UNIT 1 Medical bacteriology: Morphology, colony characteristics, pathogenicity and laboratory diagnosis of: *Staphylococcus epidermis, Streptococcus pneumonia, Vibrio cholera,* Pseudomonas Species, *Corynobacterium diphtheria, Klebsiella pneumonia, Shalmonella Species,* Shigella, Meningococci, Proteus species, Spirochetes: *Treponema pallidum,* Borrelia, Leptospira. *Helicobacter pylori*.

UNIT 2 Medical mycology: Introduction to mycology, Properties of fungi, different type of mycosis. General properties, pathogenesis and laboratory diagnosis of: Superficial mycosis: *Malsezzia furfur, T. nigra, T.pidera*. Subcutaneous mycosis: Mycetoma, Rhinosporidium, Sporotrichosis. Systemic mycosis: Histoplasmosis, Blastomycosis, Coccidiodosis, Paracoccidiodosis. Opportunistic mycosis: Aspergillosis, Talaromycosis, Zygomycosis, Pneumocystis, Mycotoxins.

UNIT 3 Staining techniques: Capsular staining (negative staining), Metachromatic granule staining, Flagellar staining, Cell wall staining, Endospore staining (Schafer fulton method), Lectophenol cotton blue staining for fungi, Hanging drop technique for motility.

PRACTICAL

1. To study the Gram's staining
2. To study the Fungal staining (LPCB)
3. To study the Capsule staining
4. To study the Hanging drop preparation
5. To study the Negative staining
6. To study the WIDAL, CRP, ASO

SUGGESTED READINGS:

1) Wiley, Sherwood, Woolverton. Prescott,Harley, and Klein's Microbiology, 7th Edition. McGraw Hill.
2) Tortora, Funke, Case. Microbiology, 9th Edition. Pearson.
3) PelczarJr, Chan, Krieg. Microbiology, 5th Edition, McGraw Hill.

SEMESTER-III

PAPER CODE: MELT-RCC-3026

BIOCHEMISTRY III

PAPER CREDIT: 06 (4T+2P)

T: Theory P: Practical

Total no. of Lectures: 60+30(L+P) Total Marks: 100 (T60+IA20+P20)

L: Lecture, T: Tutorial, P: Practical T: Theory, IA: Internal Assessment, P: Practical

OBJECTIVES:

To learn about amino acids, proteins etc.

LEARNING OUTCOME:

Students will learn about amino acids, proteins etc.

CONTENTS

THEORY

UNIT 1 Acid Base Balance: Elementary knowledge of Acid Base Balance

UNIT 2 Lipids: Classification, Simple lipids, Compound lipids, Glycolipids, Lipoproteins, Derived Lipids, Saturated fatty acids, Unsaturated fatty acid, Plasma Proteins, Lipoproteins, Essential fatty acid, Steroids, Important tests.

UNIT 3 Amino acids: Common properties of amino acids, Structure of amino acids, Properties of amino acid.

UNIT 4 Proteins: Classification, Bonds relating to protein structure, Structure of protein, α helix, β Pleated sheet, Structure of protein related to biological function of protein, Denaturation of protein, Important tests of protein, Estimation of protein.

UNIT 5 Metabolism of Proteins: Transamination, Oxidant, Deamination, Synthesis of urea, Test of urea in urine, Essential and non-essential amino acids, Creatine and Creatinine, Proteinuria.

UNIT 6 Metabolism of Lipids: β Oxidation of fatty acid, Biosynthesis of lipids, Prostaglandin, Cholesterol metabolism, Atherosclerosis, Essential fatty acids

PRACTICAL

1. To determine Blood glucose
2. To determine OGTT
3. To determine Serum total protein, albumin globulin ratio
4. To determine glucose in urine
5. To determine Serum lipids, Total cholesterol, HDL, LDL

SUGGESTED READINGS:

1) Satyanaranan and Chakrapani. *Biochemistry*, 5th Edition.Elsevier.
2) Vasudevan and Das. *Practical Textbook of Biochemistry for Medical Students*, 2nd Edition.Jaypee.
3) Albert L. Lehninger, David L. Nelson, and Michael M. Cox, ***Lehninzer Principles of Biochemistry***, 8th Edition, MacMillan Learning Pvt. Ltd., 2021

SEMESTER-III

PAPER CODE: MELT-RCC-3036

PATHOLOGY III

PAPER CREDIT: 06 (4T+2P)

T: Theory P: Practical

Total no. of Lectures: 60+30(L+P) Total Marks: 100 (T60+IA20+P20)

L: Lecture, T: Tutorial, P: Practical T: Theory, IA: Internal Assessment, P: Practical

OBJECTIVES:

To learn about histopathology, anemia etc.

LEARNING OUTCOME:

Students will learn about histopathology, anemia etc.

CONTENTS

THEORY

UNIT 1 Sample collection: Understand blood and collection of blood sample in detail RBC, WBC platelets, reticulocytes

UNIT 2 Haemoglobins: Definition, Method and synthesis, Normal & abnormal, HB variants, Method of estimation, Clinical importance.

UNIT 3 Anaemia: Definition. Morphology & Etiologic classification. Microcytic Hypochromic anaemia: Causes, Types, Lab investigation, Laboratory pictures, Clinical importance. Normocytic Hypochromic anaemia and Diamorphic anaemia. As other types of anaemia in details (Iron deficiency anaemia, megaloblastic anaemia, Aplastic anaemia, pure red cell aplasia).

UNIT 4 Histopathology: Introduction to histopathology. Introduction to Cells, Tissues, Outline of methodology. Receiving of specimen in the laboratory. Various fixatives, mode of action, preparation and indication. Grossing techniques. Tissue processing for paraffin sections. Embedding or blocking. Section cutting. Mounting techniques – various mountants. Maintenance of records and filing of the slides. Use and care of microscopes. Staining of tissues – H&E stain.

UNIT 5 Analytical Laboratory Testing Process: To gain broad understanding of chemicals/reagents useful in sample analysis. To gain broad understanding of maintaining record of inventory, test results,etc. Able to inspect the availability of medical supplies or diagnostic kits.

PRACTICAL

1. Total WBC count
2. Total Reticulocyte count
3. To study Absolute eosinophil count
4. To Study Peripheral blood smear, Preparation of thin blood film , staining and study RBC morphology.
5. To study Osmotic fragility test
6. To study Test for Sickle cell anemia
7. To study the Examination of different types of body fluids (CSF, Semen, Pleural fluid etc)
8. To study the Physical, Chemical and Cell count
9. To study the Histopathology of

    - Labeling of specimen, Filling of forms
    - Receiving, entering and labeling and register
    - Grossing
    - Tissue Processing
    - Blocking and embedding
    - Section cutting
    - H&E staining

SUGGESTED READINGS:

1) Kawthalkar. *Essentials of Clinical Pathology*, 2nd Edition.Jaypee.
2) Maheswari. *Clinical Pathology Hematology and Blood Banking*, 3rd Edition. Jaypee.

SEMESTER-IV

PAPER CODE: MELT-RCC-4016

MICROBIOLOGY- III

PAPER CREDIT: 06 (4T+2P)

T: Theory P: Practical

Total no. of Lectures: 60+30(L+P) Total Marks: 100 (T60+IA20+P20)

L: Lecture, T: Tutorial, P: Practical T: Theory, IA: Internal Assessment, P: Practical

OBJECTIVES:

To learn about various parasites and its types and the disease caused and various virus its transmission lab diagnosis etc. further the students will be able to identify different blood and stool parasites.

LEARNING OUTCOME:

Students will learn about various parasites and its types and the disease caused and various virus its transmission lab diagnosis etc. further the students will be able to identify different blood and stool parasites.

CONTENTS

THEORY

UNIT 1 Introduction to Parasitology, Classification, terminology in parasitology, Basic classification of Protozoa and Helminthes (Basically medical importance).

UNIT 2: Morphology, Life-Cycle, Pathogenicity and Laboratory diagnosis of:

- Protozoa
- *Entamoeba histolytica*,
- *Balantidium coli*,
- Giardia,
- Toxoplasma,
- Malaria,
- Leishmania

UNIT 3 Morphology, Life-Cycle, Pathogenicity and Laboratory diagnosis of helminthes and nematodes.

Nematodes-

- Ascaris,
- Hookworm,
- Strongyloides,
- Trichuris,
- Trichinella,
- Dracunculus,
- Filarial.

UNIT 4 Classification and general properties of viruses.

UNIT 5 Morphology, pathogenicity and laboratory diagnosis of human viruses.

- Hepatitis viruses,
- HIV,
- Rabies virus,
- Dangue virus,
- Herpes virus,
- Adenoviruses,
- Influenza virus,
- H1N1virus,
- Poliovirus.

PRACTICAL:

1. Saline preparation, Iodine Preparation of stool,
2. Saline concentration techniques for faecal parasite,
3. Zinc sulphate floatation techniques,
4. Preparation and staining of thick blood smear for malaria parasite,
5. Serological examination: HbsAg, Tri Dot etc.

SUGGESTED READINGS

1) Wiley, Sherwood, Woolverton. Prescott,Harley, and Klein's Microbiology, 7th Edition. Mc Graw Hill.
2) Tortora, Funke, Case. Microbiology, 9th Edition. Pearson.
3) PelczarJr, Chan, Krieg. Microbiology, 5th Edition, Mc Graw Hill.
4) Prescott and Dunn., Industrial Microbiology, 4th edition, CBS Publishers & Distributors, Delhi.
5) Rose: Industrial Microbiology.
6)Probisher, Hinsdill et al: Fundamentals of Microbiology, 9th ed. Japan

SEMESTER-IV

PAPER CODE: MELT-RCC-4026

BIOCHEMISTRY-IV

PAPER CREDIT: 06 (4T+2P)

T: Theory P: Practical

Total no. of Lectures: 60+30(L+P) Total Marks: 100 (T60+IA20+P20)

L: Lecture, T: Tutorial, P: Practical T: Theory, IA: Internal Assessment, P: Practical

OBJECTIVES:

To learn about hormone and its mechanism, different enzymes and elevated levels in various disease conditions, further the students will know about the functions of liver, kidney, heart, thyroid and tests to evaluate these organs.

LEARNING OUTCOME:

Students will learn about hormone and its mechanism, different enzymes and elevated levels in various disease conditions, further the students will know about the functions of liver, kidney, heart, thyroid and tests to evaluate these organs.

CONTENTS

THEORY

UNIT 1 HORMONES: General characteristics of hormone, Mechanism of action of hormone, Hypothalamic and pituitary hormones, Steroid hormones, Thyroid hormones, Pancreatic hormones.

UNIT 2 CLINICAL ENZYMOLOGY: General information on enzymes, Iso-enzymes, Lactate dehydrogenase, creatine kinase, aspartate amino amylase, isocitrate dehydrogenase., Enzymes as therapeutic agents, Enzymes used for diagnosis, Immobilized enzyme.

UNIT 3 ORGAN FUNCTION TEST

1. Liver function tests:

Role of Liver in metabolism, Tests for Liver Function, Serum bilirubin, Classification of jaundice, Bile acids and bile salts, Tests based on metabolic capacity of liver, Tests based on synthetic function

2. Renal function tests:

Functions of kidney, formation of urine, Urea clearance tests, Endogenous creatine clearance tests, Tests for renal blood flow, Test based on tubular function, Water dilution tests.

3. Gastric function tests:

Test for determining gastric function, Examination of resting contents, Fractional gastric analysis, and Histamine stimulation tests.

4. Lipid ProfileTest
5. Thyroid function tests: T3, T4 and TSH

PRACTICAL:

1. Liver functiontests
    - Bilirubin (total & directindirect)
    - SGOT(Serum glutamic-oxaloacetic transaminase)
    - SGPT(Serum glutamic-pyruvic transaminase)
2. Renal functiontests
    - Urea
    - Creatinine
    - Uricacid
3. Lipidprofile
    - Cholesterol
    - HDL(High-density lipoprotein)
    - Triglycerides
    - LDL(Low-density lipoprotein)
4. Pancreatic functiontests
    - Amylase
    - LDH(Lactate dehydeogenase)

SUGGESTED READINGS

1) Satyanaranan and Chakrapani. *Biochemistry*, 5th Edition. Elsevier.
2) Vasudevan and Das. *Practical Textbook of Biochemistry for Medical Students*, 2nd Edition. Jaypee

3) Fundamentals of General,organic& Biological Chemistry -7e By Mcmurry David S. Ballantine Carl A. Hoeger Virginia E. Peterson McMurry
4) Organic and Biochemistry for Today by Spencer L. Seager, Michael R. Slabaugh

SEMESTER-IV

PAPER CODE: MELT-RCC-4036

PATHOLOGY-IV

PAPER CREDIT: 06 (4T+2P)

T: Theory P: Practical

Total no. of Lectures: 60+30(L+P) Total Marks: 100 (T60+IA20+P20)

L: Lecture, T: Tutorial, P: Practical T: Theory, IA: Internal Assessment, P: Practical

OBJECTIVES:

To study about blood groups, blood transfusion, different methods to identify blood groups, matching donor's blood with patient's blood, various screening procedures for donors. Further the students will be able to learn about cytotechniques.

LEARNING OUTCOME:

Students will understand about blood groups, blood transfusion, different methods to identify blood groups, matching donor's blood with patient's blood, various screening procedures for donors. Further the students will be able to learn about cytotechniques.

CONTENTS

THEORY

UNIT 1 Introduction to immunohematology, ABO Blood group and Rh system in details, Subgroups of A and B, Other blood groups and other blood group systems (Bombay group),Methodology to identify blood groups, HLA antigens and their significance.

UNIT 2:

Principle of Blood transfusion:

1. Blood donor selection
2. Methods of bleeding donors
3. Blood containers, anticoagulants and storage of blood
4. Coomb's test and its significance
5. Screening of blood for ineffective material
6. Blood components, preparation & component therapy
7. Autologous transfusion
8. Transfusion reactions.
9. Blood bank organization, standards, procedures, techniques and quality control.

UNIT 3:

Cytopathology

- Brief introduction of cytology and cytopathology,
- Elementary knowledge of specimen collection and transportation,
- Elementary knowledge of precautions to be taken for gynecological samples,
- Elementary knowledge of specimen collection, transportation and preservation of non-gynecological samples,
- Understand about fixation and fixative,
- Understand about fluid specimen,
- Describe the Papanicolaou stain

UNIT 4:

Fine needle aspiration

- Understand the purpose of fine needle aspiration,
- Describe the procedure of fine needle aspiration.

PRACTICAL:

1. Preparation of 5% and 10% red blood cell suspension,
2. ABO & Rh typing (Both slide and tube method),
3. Back typing or serum typing,
4. Cross matching (Major and Minor cross matching),
5. RhD antibody determination,
6. Cytopathology: Sample receiving labelling and entering,
7. Preparation of Exfoliative cytological smears
    a. Fixation – types and methods Wet and dry fix smear

SUGGESTED READINGS

1) Kawthalkar. *Essentials of Clinical Pathology*, 2nd Edition. Jaypee.
2) Maheswari. *Clinical Pathology Hematology and Blood Banking*, 3rd Edition. Jaypee.
3) Textbook of Pathology - 8th Edition + Pathology Quick Review by Harsh Mohan
4) Biochemistry And Clinical Pathology by RAJE V.N.
5) Robbins and Cotran Pathologic Basis of Disease, 10th Edition

SEMESTER-V

PAPER CODE: MELT-RDS-5016

MICROBIOLOGY-IV

PAPER CREDIT: 06 (4T+2P)

T: Theory P: Practical

Total no. of Lectures: 60+30(L+P) Total Marks: 100 (T60+IA20+P20)

L: Lecture, T: Tutorial, P: Practical T: Theory, IA: Internal Assessment, P: Practical

OBJECTIVES: -

To learn about body defense system and types, vaccines and immunization, infection that can be transmitted from hospital, prevention and control of hospital infection. Further the students will have idea about various serological tests.

LEARNING OUTCOME:

Students will understand about body defense system and types, vaccines and immunization, infection that can be transmitted from hospital, prevention and control of hospital infection. Further the students will have idea about various serological tests.

CONTENTS

THEORY

UNIT 1 Immunology-
Definition, types of immunity, Immune response, immunoglobulin and its types.

UNIT 2 Hypersensitivity, autoimmune diseases

UNIT 3 Vaccines, Immunization schedule.

UNIT 4 Serological tests (WIDAL, VDRL, ASO, CRP, RIA, RF & ELISA)
Rapid test for HIV and Hbs Ag

UNIT 5 Hospital infection-
Causative agents, transmission methods, prevention and control hospital

born infection.

PRACTICAL:

1. WIDAL,VDRL,ASO,CRP,RIA,RF & ELISA
2. Rapid test for HIV and Hbs Ag
3. Mountoux test

SUGGESTED READINGS

1) Wiley, Sherwood, Woolverton. Prescott,Harley, and Klein's Microbiology, 7th Edition. Mc Graw Hill.
2) Tortora, Funke, Case. Microbiology, 9th Edition. Pearson.
3) PelczarJr, Chan, Krieg. Microbiology, 5th Edition, Mc Graw Hill.
4) Prescott and Dunn., Industrial Microbiology, 4th edition, CBS Publishers & Distributors, Delhi.
5) Rose: Industrial Microbiology.
6)Probisher, Hinsdill et al: Fundamentals of Microbiology, 9th ed. Japan

SEMESTER-V

PAPER CODE: MELT-RDS-5026

BIOCHEMISTRY-V

PAPER CREDIT: 06 (4T+2P)

T: Theory P: Practical

Total no. of Lectures: 60+30(L+P) Total Marks: 100 (T60+IA20+P20)

L: Lecture, T: Tutorial, P: Practical T: Theory, IA: Internal Assessment, P: Practical

OBJECTIVES: -

To learn about water and mineral metabolism and associated diseases related to it, different inorganic ions and importance in our body, formation of kidney stone, concept of acid and base with related disease with acid base balance disturbances.

LEARNING OUTCOME:

Students will learn about water and mineral metabolism and associated diseases related to it, different inorganic ions and importance in our body, formation of kidney stone, concept of acid and base with related disease with acid base balance disturbances.

CONTENTS

THEORY

UNIT 1 Water and mineral metabolism:
Distribution of fluids in body, water metabolism, factor influencing the distribution of body water, intake and loss of body water, dehydration, principal mineral elements, essential trace elements, calcium and phosphorus metabolism, magnesium metabolism, iron, zinc, copper metabolism

UNIT 2 Gastric Analysis: Composition of gastric juice, concepts of free and bound acids, gastric acid secretion stimulation.

Inorganic ions: Calcium metabolism, phosphate metabolism, sodium- potassium balance and trace element (Fe, Cu)

UNIT 3 Calculi: Theory of formation and analysis, Renal clearance concentration and application of Phenol sulfonaphthalein.

UNIT 4 Acid: Base balance and its disturbances.

UNIT 5 Metabolism of proteins and amino acids.

PRACTICAL:

- Serum electrolyte
    1. Bicarbonate
    2. Sodium
    3. Potassium
    4. Calcium
    5. Chlorine
- Total protein, albumin, globulin and Ratio of A:G.

SUGGESTED READINGS

1) Satyanaranan and Chakrapani. *Biochemistry*, 5th Edition. Elsevier.
2) Vasudevan and Das. *Practical Textbook of Biochemistry for Medical Students*, 2nd Edition. Jaypee

3) Fundamentals of General,organic& Biological Chemistry -7e By Mcmurry David S. Ballantine Carl A. Hoeger Virginia E. Peterson McMurry
4) Organic and Biochemistry for Today by Spencer L. Seager, Michael R. Slabaugh

SEMESTER-V

PAPER CODE: MELT-RDS-5036

PATHOLOGY-V

PAPER CREDIT: 06 (4T+2P)

T: Theory P: Practical

Total no. of Lectures: 60+30(L+P) Total Marks: 100 (T60+IA20+P20)

L: Lecture, T: Tutorial, P: Practical T: Theory, IA: Internal Assessment, P: Practical

OBJECTIVES: -

To learn about the tissue specimen, taking specimen for grossing, fix it with proper fixative, processing the tissue specimen to place the fixed tissue in the paraffin, taking tissue specimen for embedding, proper sectioning of the tissue and stain it with various staining solutions.

LEARNING OUTCOME:

Students will understand about the tissue specimen, taking specimen for grossing, fix it with proper fixative, processing the tissue specimen to place the fixed tissue in the paraffin, taking tissue specimen for embedding, proper sectioning of the tissue and stain it with various staining solutions.

CONTENTS

THEORY

UNIT 1 Introduction to Histopathology,Introduction to Cells, Tissues, Outline of methodology.

Specimen receiving, labeling and registration in the laboratory.

- Proper label with patient information and avoid cross contamination of the specimen.
- Unique specimen identification number and type of specimen.

UNIT 2 Fixatives:

- Fixative definition
- Classification, mode of action of various fixatives
- Aim of fixation
- Routinely used fixatives
- Anatomically correct dissection.
- Ratio of fixative and specimen.
- Buffered fixatives
- Preparation of various fixatives

UNIT 3 Grossing techniques

UNIT 4 Tissue processing for paraffin sections

UNIT 5 Embedding or blocking

UNIT 6 Different types of microtome and microtome knives, honing and stropping

UNIT 7 Special stains

a) Connective tissuestains-
   Van Gieson's stain, Masson's trichrome stains, Gordon's and sweets methods, RNA stain -Fuelgen stain,
b) Carbohydrates staining-PAS, Mucicarminestain

Pigments and their stains-
Endogenous pigments eg :Haem pigments,Perl's Prussian blue, Haemozoin pigments, Haematoidin pigments, Bile pigments, Tyrosine pigments, Lipid pigments.

UNIT 8 Frozen section and Cryostat section studies.

PRACTICAL:

1. Instruments used in Histopathology Laboratory
2. Labelling of specimen, Filling of forms
3. Receiving, entering and labelling and register
4. Slide demonstration of different types of cells
5. Common instruments for histopathology, cytopathology Lab.
6. Fixative preparation, Preparations of graded alcohols
7. Grossing, role of technicians
8. Tissue Processing,
9. Preparation of blocking and section cutting
10. Staining and mounting labelling
11. Decalcification
12. Special Stains
13. Preservation and museum technique

SUGGESTED READINGS

1) Kawthalkar. *Essentials of Clinical Pathology*, 2nd Edition. Jaypee.
2) Maheswari. *Clinical Pathology Hematology and Blood Banking*, 3rd Edition. Jaypee.
3) Textbook of Pathology - 8th Edition + Pathology Quick Review by Harsh Mohan
4) Biochemistry And Clinical Pathology by RAJE V.N.
5) Robbins and Cotran Pathologic Basis of Disease, 10th Edition

SEMESTER-VI

PAPER CODE: MELT-RDS-6016

MICROBIOLOGY-V

PAPER CREDIT: 06 (4T+2P)

T: Theory P: Practical

Total no. of Lectures: 60+30(L+P) Total Marks: 100 (T60+IA20+P20)

L: Lecture, T: Tutorial, P: Practical T: Theory, IA: Internal Assessment, P: Practical

OBJECTIVES: -

To learn about various medically important bacteria, basics of molecular biology and different types of microscope including electron microscope.
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LEARNING OUTCOME:

Students will learn about various medically important bacteria, basics of molecular biology and different types of microscope including electron microscope.

CONTENTS

THEORY

UNIT 1 Systemic Bacteriology- Classification, Morphology, Genotypic & Phenotypic characteristics, Pathogenesis, Disease Caused, Lab Diagnosis & Prophylaxis:

- Pneomococcus
- Listeria
- Actinomyces
- Nocardia
- Neisseria
- Enterobacteriaceae
- Proteus
- Pseudomonas
- Haemophilus
- Brucella
- Pasturella
- Bordetella
- Campylobacter
- Bacteroides
- Fusobacterium

UNIT 2 Mycobacteria**:**

- M.tuberculosis
- M.laprae
- Atypical Mycobacteria

UNIT 3 Molecular techniques in Diagnosis microbiology- PCR, DNA hybridization.

UNIT 4 Microscopy:

- Bright-field Microscopy.
- Dark field Microscopy.
- Atomic Force Microscopy
- Phase contrast Microscopy.
- Fluorescence Microscopy.
- Electron Microscopy
  - Transmission Electron Microscopy
  - Scanning Electron Microscopy

PRACTICAL:

- Culture Methods
- Identification of bacterial culture

  Colony Characteristics, Morphological

  Characteristics and Motility Study
- Introduction to biochemical reactions
- Interpretation of biochemical reactions
- Antibiotic Sensitivity testing –Kirby Bauer method

SUGGESTED READINGS

1) Wiley, Sherwood, Woolverton. Prescott,Harley, and Klein's Microbiology, 7th Edition. Mc Graw Hill.
2) Tortora, Funke, Case. Microbiology, 9th Edition. Pearson.
3) PelczarJr, Chan, Krieg. Microbiology, 5th Edition, Mc Graw Hill.
4) Prescott and Dunn., Industrial Microbiology, 4th edition, CBS Publishers & Distributors, Delhi.
5) Rose: Industrial Microbiology.
6)Probisher, Hinsdill et al: Fundamentals of Microbiology, 9th ed. Japan

SEMESTER-VI

PAPER CODE: MELT-RDS-6026

BIOCHEMISTRY-VI

PAPER CREDIT: 06 (4T+2P)

T: Theory P: Practical

Total no. of Lectures: 60+30(L+P) Total Marks: 100 (T60+IA20+P20)

L: Lecture, T: Tutorial, P: Practical T: Theory, IA: Internal Assessment, P: Practical

OBJECTIVES: -

To learn about basics of DNA & RNA, replication of DNA, genetic engineering, Metabolic disorders of amino acids, elevation of enzymes in disease condition, isoenzymes, techniques used in biochemistry, further the students will understand the basics of biostatistics.

LEARNING OUTCOME:

Students will learn about basics of DNA & RNA, replication of DNA, genetic engineering, Metabolic disorders of amino acids, elevation of enzymes in disease condition, isoenzymes, techniques used in biochemistry, further the students will understand the basics of biostatistics.

CONTENTS

THEORY

UNIT 1 Over view of replication, translation, transcription and genetic engineering

UNIT 2 Metabolic disorders:

- Amino acids
- Proteins
- Inborn errors of metabolic disorders.

UNIT 3 Clinical enzymology: Introduction and clinical significance, Plasma enzyme, pancreatic enzyme, live enzyme etc. Enzyme markers used for medical diagnosis.

UNIT 4 Radio isotope techniques: Principle, definition of units, measurement of radiation standards, crystal counting, Resources and application.

UNIT 5 Immunoassay: Different method, principle and applications.

UNIT 6 Biostatistics: Population mean, Correlation Coefficient, Standard deviation, Standard error.

PRACTICAL:

1. Specimen Collection: Urine, Blood, Gastric juice.
2. Enzymes: amylase (salivary and pancreatic), Alkaline Phosphatase, Acid Phosphatase, SGOT, SGPT, LDH and CPK- DEMONSTRATION ON AUTO ANALYZER.

SUGGESTED READINGS

1) Satyanaranan and Chakrapani. *Biochemistry*, 5th Edition. Elsevier.
2) Vasudevan and Das. *Practical Textbook of Biochemistry for Medical Students*, 2nd Edition. Jaypee

4) Fundamentals of General,organic& Biological Chemistry -7e By McmurryDavid S. Ballantine Carl A. Hoeger Virginia E. Peterson McMurry

5) Organic and Biochemistry for Today by Spencer L. Seager, Michael R. Slabaugh

SEMESTER-VI

PAPER CODE: MELT-RDS-6036

PATHOLOGY-VI

PAPER CREDIT: 06 (4T+2P)

T: Theory P: Practical

Total no. of Lectures: 60+30(L+P) Total Marks: 100 (T60+IA20+P20)

L: Lecture, T: Tutorial, P: Practical T: Theory, IA: Internal Assessment, P: Practical

OBJECTIVES: -

To learn about cytopathology and various branches, different types of specimen used in cytopathology lab, different normal and abnormal cells, Fine needle aspiration cytology along with different fixation and staining.

LEARNING OUTCOME:

Students will learn about cytopathology and various branches, different types of specimen used in cytopathology lab, different normal and abnormal cells, Fine needle aspiration cytology along with different fixation and staining.

CONTENTS

THEORY

UNIT 1 Introduction: Definition of cytology, Cells & tissues, Normal tissues

Classification of cytology- Exfoliative and interventional cytology, Role of Cytology, Nuclear criteria of inflammation & malignancy.

UNIT 2 Collection of specimen from female genital tract specimen for routine screening:

- Cervical smear
- Vaginal pool smear
- Lateral vaginal smear
- Combined (fast)smear
- Triple smear
- Endocervical and endometrial smear

UNIT 3 Urinary cytology

- Collection of `urinary tract specimens
- Diagnostic utility of urinary cytology

UNIT 4 Progressive changes of the cells

i. Changes in inflammation
ii. Dyskariotic Changes
iii. Changes in malignancy

UNIT 5 Body cavity Fluids

i. Effusions
ii. Collection and processing of body cavity fluid specimens
iii. Cyto-preparation and staining
iv. Processing of clotted and bloody specimen.

UNIT 6 Fine Needle Aspiration Cytology

- Application of FNAC
- Advantages of FNAC
- General procedure of FNAC
- Limitation of FNAC
- Wet and Dry fixed smear, its difference

UNIT 7:

- Staining : R/E stain types-Methods, Maintenance, Preparation of stain, Pap's stain,
- Special stains- MGG, PAS, ZN, Mucicarmine etc.
- Mounting and labeling

UNIT 8:

Imprint cytology, Crush Smear cytology, Biopsy sediment cytology

i. Cell block preparation
ii. Cytological fixative and mailing Definition,
iii. Types/classification, Aims &object
iv. Materials for establishments of cytological lab

PRACTICAL:

- Sample receiving, labeling and entering
- Preparation of Exfoliative cytological smears,
- Fixation – types and methods, Fixatives preparations
- Preparation of smears in interventional cytology, Fixation and stains
- Staining R/E - Preparation

  stains

  Methods - MGG stain, PAP's Stain

SUGGESTED READINGS

1) Kawthalkar. *Essentials of Clinical Pathology*, 2nd Edition. Jaypee.
2) Maheswari. *Clinical Pathology Hematology and Blood Banking*, 3rd Edition. Jaypee.
3) Textbook of Pathology - 8th Edition + Pathology Quick Review by Harsh Mohan
4) Biochemistry And Clinical Pathology by RAJE V.N.
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