



# **HIMALAYAN UNIVERSITY, ARUNACHAL PRADESH**

## **DIPLOMA IN PARAMEDICAL** **(MEDICAL LAB TECHNOLOGY)**

### **1<sup>st</sup> YEAR**

#### **1<sup>st</sup> Semester**

S. NO.	SUB. CODE	SUBJECT NAME	MARKS			
			INTERNAL	THEORY	TOTAL	PASS
1	101	General English	30	70	100	40
2	102	Computer Fundamentals	30	70	100	40
3	103	Human Anatomy	30	70	100	40
4	104	Human Physiology	30	70	100	40
5	105	Practical	30	70	100	40

#### **2<sup>nd</sup> Semester**

S. NO.	SUB. CODE	SUBJECT NAME	MARKS			
			INTERNAL	THEORY	TOTAL	PASS
1	201	General Pathology	30	70	100	40
2	202	General Microbiology	30	70	100	40
3	203	General Biochemistry	30	70	100	40
4	204	General Pharmacology	30	70	100	40
5	205	Practical	30	70	100	40

### **2<sup>nd</sup> YEAR**

#### **3<sup>rd</sup> Semester**

S. NO.	SUB. CODE	SUBJECT NAME	MARKS			
			INTERNAL	THEORY	TOTAL	PASS
1	301	Hematology	30	70	100	40
2	302	Blood Banking	30	70	100	40
3	303	Immunology and Serology	30	70	100	40
4	304	Elementary Histopathology	30	70	100	40
5	305	Practical	30	70	100	40

## **4<sup>th</sup> Semester**

S. NO.	SUB. CODE	SUBJECT NAME	MARKS			
			INTERNAL	THEORY	TOTAL	PASS
1	401	Clinical Biochemistry	30	70	100	40
2	402	Urine Analysis	30	70	100	40
3	403	Bacteriology	30	70	100	40
4	404	Parasitology	30	70	100	40
5	405	Practical	30	70	100	40

Himalayan University

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### 1<sup>st</sup> YEAR

#### 1<sup>st</sup> Semester

#### **General English (101)**

##### **1) English, Communication Skill and Public Relations:**

**2) Writing Skills:** Basics of English grammar How to write good and correct English .what is a Sentence? Types of Sentences - simple, compound, complex.

**3) Listening Skills:** What is listening? Types of Listening Purpose of Listening, Obstacles of listening

**4) Reading Skills:** Purposes of reading Types of reading - skimming, scanning, extensive reading, intensive reading, Loud and silent reading

**5) Rapport Building** Interpersonal Response, Traits, Managing Difficult Communication Traits in a hospital, communication in terminal illness

**6) Effective Communication - The Ten Commandments** The process of communication & different type of communication Communication - Definitions, Meaning, nature of communication, Purpose of communication

**7) FORMAL LETTERS:** Formal Style of Communication, Formal and Informal Letters, Essentials of a Formal Letter, Mechanics of Writing a Formal Letter, Drafting the Letter, Some Basic Equipment, The Format, Letters of Request, Letters of Complaint, Replying to Letters of Complaint, Letters about Jobs, Applications, Accepting an Offer, Declining an Offer, Letters to Government and Other Organisations, Letters of Complaint, Letters Giving Instructions, Letters of Request,

**8) WRITING REPORTS:** Different Stages in Writing a Report, Types of Report, Reporting Case History: Informal Reports, Reporting Case History: Formal Reports, Referral Letters, Referral Letters, Reply to Referral Letter

**CLINICAL CASE STUDY:** Significance of case study method some features, How is clinical case study prepared, Analyzing the case, Documentation and presentation, Conclusions

**IMPROVING STUDY SKILLS:** How do People Learn, Reading with a Purpose, What are Study Skills, Locating Information, Study Strategies for Better Comprehension: SQ3R, Variations of the SQ3R Approach

**WRITING SUMMARIES-I :** The technique of summarizing, Let us sum up, Key words

**FORMAL CONVERSATION:** FACE-TO-FACE: Making Enquiries and Giving Information at Public Offices, Making Enquiries at Hotels and Other Places, Making Enquiries : Taking a Medical History, Giving Advice to Patients. and their Relatives, Arguing with and Persuading People, Describing a Process

**INFORMAL CONVERSATIONS:** FACE-TO-FACE: Greetings: Enquiries about one's Health, Everyday Situations, Social Life, Other Informal Situations

**TELEPHONE CONVERSATIONS:** Face-to-Face and Telephone Conversation Compared, Formal Conversation, Emergency Calls, Business Calls, Informal Conversation

**INTERVIEWS:** Preparation for an Interview, Unfolding the Personality: Specimen Interviews

**CASE PRESENTATION:** How is a Case Presentation Prepared, Data Collection and Compilation of Material, Audiovisual Aids, Choice and Method of Use, How to Make the Case Presentation, Conclusion.

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## **Computer Fundamentals (102)**

**Introduction to Computer:** Meaning or Definition of Computer, Evolution of computer, Features of Computer, Main Operation of the Computer, Main Elements of Computer System, Bits, Bytes and Words, Device in Computer, Various Input & output Device.

**Applications of Computer:** Advantages and limitations of computers.

**Memory:** Overview of storage devices. Main memory, storage evaluation criteria, random access memory, read only memory, secondary storage devices.

**Generation of Computers and their Classification** Generation of Computers, Classification of Computers

**Operating System** Meaning of Operating System, Function of Operating System, Language Translators

**Database** Meaning Of Database, Data Processing System, Function of Data Processing, Objectives of Database, Type of Database, Functions of Database Management System (DBMS), Advantages & Disadvantages of DBMS, Various Database Structures or database models

**Windows** Graphical User Interface, Windows, Features of Windows, Control Button of windows, Various Icons on Desktop

**Microsoft Word (INTRODUCTION)**

**Microsoft Excel (INTRODUCTION)**

**Microsoft PowerPoint (INTRODUCTION)**

**Internet** – Features, Different type of network, Internet,

**Patient Management** Medical Establishments using Computer, One or More Computer, Network, Software, Training, Service Operators of System Computerization in Hospitals and Nursing Homes, Features of a Hospital Software Packages, Password Protection ,Various Application of Different Medical ,Software and Support

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## **Human Anatomy (103)**

**Introduction, Subdivisions of anatomy, anatomical Nomenclature-in terms of position ,location and fundamental planes**

**Introduction to bones of human body of:**

**Bone:** definition, composition, functions, classification and features of a long bone.

**Cartilage:** definition, components and classification.

**Joints:** definition of joints, classification and function

**Upper limb:** clavicle, scapula, humerus, radius, ulna, carpus, metacarpus & phalanges,

**Lower limb:** hipbone, femur, tibia, fibula, tarsus. Metatarsus & phalanges, Skull: name the bone of the skull and sutures between them, Thorax: ribs and their articulation,

**Vertebral column:** cervical, thoracic, lumbar, sacral and coccygeal

**Surface markings of the body:** Nine regions of the abdomen, Four quadrants of the hip

**Introduction to vital organs:**

**Respiratory organ** Nasopharynx, Oropharynx, Larynx, Trachea, Bronchi, Lungs (and their lobular segments), Thoracic, Pleura and pleural cavity

**Circulatory organ** Anatomical position of the heart, Pericardium of the heart, Chambers of the heart, Great vessels of the heart, Valves of the heart

**Digestive organs** Tongue, Teeth, Oral cavity, Pharynx, Esophagus, stomach

**Reproductive organs** Male and female gonads: testes, epididymis, ovary, fallopian tube, uterus, vagina, Introduction to male genital organs, Introduction to female genital organs

**Liver and spleen** Introduction, Anatomical position, Gall bladder

**Excretory organs** Cortex and medulla of kidney, Ureter, Urinary bladder, Urethra (male and female), nephrons.

**Nervous System** :Basic anatomy of nervous system, Central nervous system, Peripheral nervous system, Autonomic nervous system.

**Muscles** Introduction, origin and insertion, function.

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## **Human Physiology (104)**

**Cell:** Definition ,Structure and functions the cytoplasmic organelles , Reproduction: meiosis, mitosis

**The important Physio - Chemical Laws Applied to physiology** Diffusion , Osmosis, Bonding, Filtration, Dialysis, Surface tension, Adsorption, Colloid

**Fundamentals of different organ system:**

**Cardiovascular System:** Systole, Diastole, Blood circulation, Conduction system of Heart ,ECG. Cardiac Output, Cardiac Stroke.

**Respiratory System:** Functions of Respiratory Tract, Mechanism of Breathing and Respiration, Muscles of Respiration. Common Respiratory Disorders.

**Digestive System:** Digestion of food in mouth, stomach & small intestines. Absorption of food, function of liver.

**Excretory System:** Structure & function of kidney and urinary bladder. Mechanism of urine formation. disorders of kidney.

**Reproduction system:** Male and Female Reproductive organs. Mensuration cycle.

**Endocrine system:** Functions of various endocrine glands and hormones secreted by them

**Lymphatic system:** Lymph vessels, lymph nodes and lymphoid organs, their structure & functions.

**Blood** Definition, Composition, Function

**Formation of different types of blood cells** Erythrocytes, Leucocytes, Thrombocytes

**Mechanism of Blood clotting**

**Cerebrospinal fluid** Formation, Composition, Function

**Special senses** Hearing, Taste, Smell, Touch, Sight

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**Practical (105)**

1. Study and care of Microscope.
2. Collection of blood samples.
3. Separation of plasma from blood.
4. Demonstration of Vacutainers and its use.
5. Preparation and Examination of blood smear.
6. Histology of Skeletal Muscle.
7. Histology of smooth muscle.
8. Histology of bone.
9. Histology of hyaline cartilage
10. Histology of elastic cartilage
11. Histology of Epithelial tissues: Columnar Epithelium, Squamous Epithelium, Cuboidal Epithelium.
12. Study of Lab Equipments.
13. Study of lab specimens

English: Job application, Resume writing .Interviews, Group discussions, Essay writing, Formal and informal communication.

Computers: Presentations, using excel sheet, Identification of computer devices,

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**2<sup>nd</sup> Semester**

**General Pathology (201)**

Introduction, Cell Injury ,Cell Death and Cellular Adaptation, Inflammation and types of Inflammation, Infections and types of Infections, Wound Healing and Neoplasia.

**Pathology of Human Body**

Introduction, Atherosclerosis and Other Vascular Diseases.

Morphological Responses of the Cardiovascular System and Ischemic Heart Diseases.

Pathology of Bacterial Pneumonia and Abscess, Tuberculosis.

Kidney and Urinary Tract Diseases.

Chronic Obstructive Pulmonary Diseases,

Pathology of the Esophagus and Stomach,

Pathology of the Small and Large Intestines

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## **General Microbiology (202)**

### **CLASSIFICATION OF MICROORGANISMS.**

**BACTERIOLOGY** Introduction, Structure, Classification & Metabolism of Bacteria  
.Bacterial growth curve, Basis of Antimicrobial Action- .Antibiotics.

Infections by staphylococcus and streptococcus, Infections by Mycobacterium.  
Tuberculosis, Infections by E.Coli, Infections by Salmonella. typhi.

**VIROLOGY** Introduction, Structure, Classification and multiplication of viruses, Viral  
genetics and pathogenesis of Virus, HIV virus, Hepatitis virus, Influenza virus, Herpes Virus  
.Antiviral drugs

**MYCOLOGY** General concepts of mycology, Classification of Fungus, Structure of Fungi  
and disease mechanisms, Diagnosis of Fungal Infections, Treatment of Fungal Infection.

**STERILIZATION AND DISINFECTION. STAINING TECHNIQUES.**

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## **General Biochemistry (203)**

**Chemical Bonding** Valency, Electrovalent Bonding (Ionic Bonding), Covalent Bonding  
**Molecular Weight of Compounds**

**Solutions** Definition and Importance of Solutions, Types of Solutions, Diffusion, Osmosis  
and Dialysis

**Electrolytes** Acids, Bases and Salts, Ionization, Physiological Importance of Electrolytes,

**Cell:** Eukaryotic Cell, its Structure and function, cell organelles structure and functions.  
Biological membrane and transport .Passive and Active Transport.



**Carbohydrates:** classification, glycolysis and its energetic, TCA cycle and its energetics, fate of pyruvate, Regulation of blood glucose by Insulin and Glucagon. Normal Blood Glucose levels.

**Lipids:** Classification and importance of lipids, Types of Fatty acids, Triacylglycerols ,importance of TAG ,Phospholipids classification and function, prostaglandins and steroids. Digestion and Transportation of Lipids.

**Amino acids, Proteins and Enzymes:** Classification of amino acids, Importance of amino acids, Classification of Proteins, structure and functions of proteins .Classification of enzymes, Properties of Enzyme, Factors affecting Enzyme action ,Diagnostic Significance of Enzymes.

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### **General Pharmacology (204)**

Introduction, Basic concepts of drugs, Factors affecting drug response. Routes of administration of drugs, Effects of Drugs on the body, Prevention of adverse effects to drugs .Drugs and laws, Paramedics Responsibility in Drug Administration, Terminology, drug store, Ethical and Legal Aspects. Antibiotics, Antifungals, Antivirals, Time of Administration, Abbreviations and Symbols used. Antiseptics and Disinfectants,

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### **Practical (205)**

1. Blood collection.
2. TLC
3. DLC
4. Microscopic Urine analysis.
5. Microscopic Stool Examination.
6. Staining techniques: Grams staining, Acid Fast Staining, Negative Staining, Simple Staining.
7. Laboratory instruments: Principle and working of Centrifuge, Incubator, colorimeter.
8. Blood grouping.
9. Type of Stains and their Action: Acidic Stains and Basic Stains.
10. Types of media for Bacterial Culture: Nutrient Agar , Nutrient Broth, Macconkey Agar Bleeding Time and Clotting Time.

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### **3<sup>rd</sup> Semester**

### **Hematology (301)**

1. HAEMATOLOGY: Introduction, haematology: Definition, Importance, Important Equipment and Chemicals, various tests performed, Laboratory organization.

2. RED BLOOD CELLS: Normal morphology count, isolation from whole blood and count and morphology of physicochemical parameters and the diseased state, Red cell anomalies and their relevance wrt to normal and diseased state.

E.S.R. Principles - Normal levels, interpretation, Various Methods - Demonstration.

Hemoglobin – formation, fate and functions; Normal ranges, physiological and pathological variations

Various principals for methods in Hemoglobinometry; Standardisation.

Interpretation of TLC & DLC. Leukocytosis, Physiological and Pathological, Arneht and setilling counts, Leukopenia, eosinophilia, lymphocytosis,

3. FORMATION OF BLOOD: Origin, formation and fate of Blood cells, Theories of Blood cell formation. Bone Marrow sites.

Maturation of Blood cells - myeloid series.

Maturation of Blood cells - lymphocyte and monocytic series and megakaryocytic series.

Maturation of Erythrocytic series - Normoblastic and megaloblastic maturation.

Principle, interpretations and demonstrations of Reticulocyte count - various methods

Interpretations and Demonstration

L.E. Principle – various methods. ANF Test. Demonstration

PMNS smear, Filarial preparation, Eosinophil count principle, interpretation and source of error.

4. COAGULATION STUDIES: Theory of Blood coagulation. Factors involved. Extrinsic and Intrinsic Pathway. Cascade Theory.

Various sample tests – Duke and Ivy method

1. Bleeding Time – Duke and Ivy method
2. Coagulation Time – Lee White Capillary and Slidy Method
3. Prothrombin Time – 1 stage and 2 stag
4. Clot Retraction
5. Platlet Count
6. Thrombin Time
7. Partial Thromboplastin Time
8. F.D.P.

5. HEMOGLOBINS – structure in detail, formations, fate, abnormal Hemoglobins, methods of study – Sickle Test, Hb electrophoresis demonstration.

6. ANAEMIA: Definition, causes, Types of Anemia, their Classification, Physiochemical Parameters, Characteristic features, etiology of Aplastic Anemia, haemolytic anemia, megaloblastic anemia, clinical features and Diagnosis

7. R.B.C., MORPHOLOGY, normal and abnormal - hypochromia, anisocytosis, polychromasia, Cabot Rings, Basophilic, Stippling, Reticulocyte.

The Hematocrit - macro and micro methods; Hematocrit ratio to Hb, Erythrocyte indices, Interpretation.

Demonstration of Microhematocrit, Iron Metabolism myelofibrosis Polycythemia, Leukemias – acute and chronic, Purpura and Hemorrhagic disease, Hemophilia

8. BONE MARROW ASPIRATION. Staining and differential Staining and reporting.

Demonstration of Bone Marrow pictures.

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### **Blood Banking (302)**

1. ABO System, antigens sub-groups of A, Bombay O. Antibodies of ABO systems. Nature of antibodies. Anti A.B. Anti H.
2. ABO testing -slide and tube test. Reverse grouping. Discrepancies between cell and serum results, sources of error. Rouleux formation and methods of checking this.
3. Rh system. Nomenclature, Du system and its significance, nature of Rh antibodies. Clinical significance phenotype and genotype.
4. Rh grouping test. Slide or Rapid Tube Test. False positive and false negative results.
5. Cross matching of Blood. Principles, Reasons for X match. Saline albumin, Coombs, Enzymes in testing.
6. Labelling of tubes, Methodology, legal implications, Incompatible Crossmatch. Auto antibodies, plasma expanders, multiple myeloma etc. affecting a X-match. Difficulties in X- matching, and methods of investigations.
7. Anticogulants for blood preservation, ACD, CPD, CPD A-1. Heparin advantages and Disadvantages. Shelf life of blood Changes taking place in blood on storage, Na, K etc.
8. Reception of donors, indirect questioning of eliciting medical history. Types of donors, Rejection of donors in certain diseases and history of diseases. Physical examination of donor and test done on donor's blood for safe transfusion of blood. Technique and importance of sterile technique in drawing blood.

9. Various donor reactions and their remedies. Facts of blood donations, precautions and care to be taken during and after blood donation. Need of giving refreshments to the donor. Emergency kit.
10. Coombs Test – Direct and Indirect. Principle, explanation of procedure and sources of error. Control, interpretation and clinical application. Different types of coombs sera.
11. Transfusion reactions. Handling of Transfusion Reactions in Blood bank.
12. Demonstration of Coombs Tests – Direct and Indirect
13. Hemolytic disease of the new born due to anti – D or ABO. Mechanism of the disease. Blood for exchange and tests done on cord blood.
14. Other blood group systems. Kell Duffy, Mns and its importance. H.L.A. system, Enzymes in Blood Banking. Use of LISS.
15. Antibody Titrations, reasons and methodology.
16. Blood Component Therapy.

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### **Immunology and Serology (303)**

1. Definition of Immunity and the immune System, body immune responses. Basic definitions
2. Basic aspects of the immune response.
  - a/ Humoral response
  - b/ Cellular response
3. Antigens and haptens. Types of antigen. Types of immunization Heterophile antigens, Alloantigens.
4. Basic Structure, biological properties of immunoglobulins, complement system.
5. Methods of detection and measurement of antibody and antigen:
  - a/ Precipitation
  - b/ Ring test (original C Reactive Protein)
  - c/ Gel – Immune diffusion. Single and double immuno-diffusion.
6. Radial Immuno diffusion, counter immuno-electrophoresis Agglutination test. Direct agglutination, Titration, Prozone reaction fibrile agglutinins.

7. Slide agglutination and tube agglutination Widal tests, complement fixation test – principle Immunofluorescence test.  
Principle and interpretation of various, immunological tests done by the Laboratory.
8. Pregnancy test, (including the historical background and Bioassays). ASO, CRP, RF, ANF and autoimmune disorder, Widal VDRL (Kahn, Wasserman's test TPI, RCF, FLA, ABS).
9. EIA and RIA – Principle; Viral Hepatitis and the markers.
10. Syphilitic Serology – Kahn, VDRL, RPR.
11. Indirect of passive agglutination
  - a/ using RBC as carriers (Coated RBC) Pregnancy tests HBs Ag.
  - b/ Latex coated particles fixation, Bentonite, Rheumatoid factor; Pregnancy latest (Gravindex) pregel ASL and CRPA.
12. Complement fixation tests and Casserman Reaction
13. Immune Fluorescence tests  
Fluorescent labeled antibody techniques.  
F.T.A. for syphilis.  
ANA or ANF tests for L.E.
14. Auto Immunity autoimmune disease LE cell ,ANA or ANF
15. Hypogammaglobulinemia
16. Hypergammaglobulinemia, Cryoglobulinemia
17. Organ transplantation

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### **Elementary Histopathology (304)**

1. Introduction to Histopathology sources and types of Histopathological specimens received, records, labeling and general rules when receiving a specimen.
2. Fixation, properties of fixing fluids, Classification of fixatives, simple fixatives and compound fixatives.

3. Decalcification
4. Processing – Dehydration, Principle. Various clearing agents, advantages and disadvantages of each.
5. Processing Count, Clearing, Principle. Various clearing agents, advantages and disadvantages of each.
6. Impregnation with paraffin. Type of paraffin. Advantages and Disadvantages.
7. Embedding and Blocking.
8. Impregnation; embedding and blocking with various water soluble masses.
9. Various equipments and methods used in History for processing, Histokinette etc.
10. Microtomes and Knives, Care
11. Hones, strops, honing and stropping, methodology and checking the results attaching blocks to carriers.
12. Cutting and sectioning knife angle. Errors in sectioning and their remedies.
13. Separating and identifying sections.
14. Decalcification of Stains, types of stains, mordents and differentiations.
15. Separating and identifying sections.
16. H & E staining methods and principles involved in staining.
17. Papanicolaou staining.

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**Practical (305)**

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**4<sup>th</sup> Semester**

**Clinical Biochemistry (401)**

1. Principles in brief of the various methodologies.
2. One or two common methods in detail – principle, brief procedure, Reagent ingredients and functions sources of errors and precautions and standardization.

### 3. Brief Metabolism and Clinical Interpretation.

4. One Lecture – care and precautions, in general, to be used in Biochemical testing.

5. Urea Methods:

a/ Diacetyl Monoxime

b/ Bertholets

6. Bilirubin:

a) Malloy and Evelyn method.

b) Jendrassik and Grof method.

7. Neonatal jaundice and Direct Spectrophotometric method of Bilirubin Estimation- Advantages and Disadvantages.

8. Creatinine

9. Enzymes – general considerations, units of measurement, Factors effecting and types of assays.

10. Amylase caraways method

11. Protein free filtrates

12. Creatinine estimation – Jaffe's reaction

13. Calcium

14. CSF. Physical, chemical and cytological examination, methods and procedures used and clinical interpretation..

15. Revision of the Basic concepts in Biochemistry, Atomic and molecular symbols and formulae; various types of solutions, Molar, Normal definitions and calculations; various types of chemicals.

16. SGOT & SGPT - Reitman & frankel method

17. Alk P'tase. BLB method

18. Acid P'tase BLB method

19. Serum proteins. Total protein by Biuret method and Albumin by BCG method

20. Review of Beer's Law and Spectrophotometry.

21. Principles of spectrophotometry and use of flame Photometer. Estimation of :

a/  $\text{Na}^+$

b/  $\text{K}^+$

c/ Cl

d/  $\text{HCO}_3$

22 Lipid metabolism and estimation

a/ Cholesterol

b/ HDL Cholesterol

c/ Triglycerides

d/ Total Lipids.

23 Fractional test meal and analysis of gastric contents. Augmented histamine test, Hallenders test.

24 Transudates and exudates; Phosporus.

25 Quality Control

26 Acid, Base, PH, Indicators, Buffers.

27 Electrolytes, Acid, Base and Water balance

28 Primary and Secondary standards.

29 Reviess of :

Carbohydrate

a/G.T.T. and metabolism, intermediary metabolism and Ketosis

b/ Urea metabolism and Kidney function test.

c/ Billirubin metabolism and liver functions test.

d/ Calcium and Phosphorus metabolism.

e/ Proteins metabolism and electrophoresis

30 Brief understanding of :

a/  $\text{T}_3$   $\text{T}_4$  TSH

b/ CPK

c/ VMA



d/ Cortisols

e/ Estrogen & Progesterone

f/ Hormones

Introduction to automation in clinical chemistry, Basic concepts, types of analysers.

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### **Urine Analysis (402)**

1. Physical and Chemical examination of urine by strip - appearance colour specific gravity pH Alb. Sugar.
2. Demonstration of technique; Chemical examination of urine by other methods. Albumin Sulfosalicylic acid method; Glucose - Benedict's method.
3. Urinary sediments – Methods of obtaining sediment; Organic and Inorganic sediments: normal and abnormal sediments.
4. Principles of Albumin tests with interpretation. 24 - hour semiquantitative test for albumin; Bence Jones protein methodology.
5. Principle of tests for glucose in urine – various methods.
6. Bile pigments and urobilinogen in urine; Principle and various methods; Demonstration of Harrison's Spot Test; Metabolism of bile pigments; Interpretation.
7. Watson's semiquantitative test and tests for Porphobilinogen; Demonstration of techniques.
8. Porphyrins in urine – various tests; clinical significance; Demonstration of techniques.
9. Ketone bodies in urine – principles and interpretation; Demonstration of techniques.
10. Occult Blood in urine; principles, various methods; sources of error; Demonstration of technique.
11. Semen analysis; reasons for it and interpretation.
12. Urine calculi; reasons for formation; clinical significance; Demonstration of technique and test.
13. Semiquantitative and 24 - hours tests for urinary calcium (Sulkowitch) and chloride (Fantu's); Demonstration of technique.
14. Tests for Melanin, Indian PKU, Homogentisic acid; Demonstration of technique.

15. Renal Function Tests – principle of concentration and dilution tests P.S.P. Dye Test.

Addis Count - Various preservatives for 24 - hours samples of urine, volume of urine in 24 - hours; change in urine on standing.

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### **Bacteriology (403)**

1. Structure and Biology bacteria; respiration; reproduction, nutrition and growth.
2. Methods of sterilization with equipment used:
  - a/ Physical
  - b/ Chemical
  - c/ Irradiation, etc.
3. Basic constituents of culture media; various types of culture media; Liquid and solid media; Semisolid media – differential, selective, enriched.
4. Methods of inoculation and streaking liquid; semisolid and plates aerobic and anaerobic methods of culture.
5. Review Gram's and AFB staining methods and capsular and Albert's stain; demonstration in all of these to be taken regularly in the Ist month.
6. Gram +ve Staphylococcus. Catalase and coagulase tests.
7. Streptococci, Pneumococcus, bacitracin test, optochin and Bile solubility tests.
8. Neisseria
9. Enterobacteriaceae with classification, Code I, Code II, Metilitis full code.
10. E Coli, Klebsiella and Enterobacter.
11. Edwardsiella, alkalescens dispar group, serratia and Hafnia with Gillies code.
12. Pseudomonas, Aeromonas, Mimae polymorpha, Alcaligenes.
13. Proteus, Providence.
14. Salmonella, Citrobacter, Arizina.
15. Shigella

16. Vibrios, Hanging drop
17. Non- intestinal gram negative bacteria; Hemophilus, Brucella ,*Pasteurella*, Bordetella; Bacterioides.
18. Gram positive bacteria – (Corynebacteria; Listeria); Bacillus species
19. Spirochetes and Spirillum
20. Mycobacterium
21. Virus ,Rickettsia
22. Fungus
23. Normal flora of various areas in the body
24. Chemical disinfectants and methods of study of disinfectants.
25. Antibiotics and sensitivity.

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### **Parasitology (404)**

1. Protozon classification and general morphology.
2. E.Coli, E. Histolytica and other Rhizopoda
3. Flagellates ex. Trichomonas, Giardia intestinalis, etc.
4. Malaria Parasites, Life cycle – various stages.
5. Hemoflagellates, Trypanosomas, Leishmania.
6. Nematode classification; Trichnella spiralis; Trichuris; Trichura.
7. Round Worms and Pin Worm.
8. Hook Worms and Strongyloides
9. Platyhelminths – classification and names with general outline.
10. Tenia Saginata; T. Solium; H.Nana
11. Echinococcus Granulosus; D. Latum.
12. Tissue Nematodes; Wuchcheria Bancrofti Brugia; loa loa.

13. Onchocera; Dracunculose medinosis.

14. Methods of Examination of Stool for Parasities and for Protozoa.

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Practical (405)

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