HIMALAYAN UNIVERSITY, ARUNACHAL PRADESH

BACHELOR OF SCIENCE

MEDICAL LABORATORY TECHNOLOGY

1ST YEAR

1st 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

2nd 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

2ND YEAR

3rd 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

4th Semester

S. NO.	SUB. CODE	SUBJECT NAME	MARKS			
			INTERNAL	THEORY	TOTAL	PASS
1	401	Clinical Chemistry and 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

3RD YEAR

5th Semester

S. NO.	SUB. CODE	SUBJECT NAME	MARKS			
			INTERNAL	THEORY	TOTAL	PASS
1	501	Microbial Molecular Genetics	30	70	100	40
3	502	Applied Immunology	30	70	100	40
3	503	Microbial Molecular Genetics (P)	30	70	100	40

6th Semester

S. NO.	SUB. CODE	SUBJECT NAME	MARKS			
			INTERNAL	THEORY	TOTAL	PASS
1	601	Virology	30	70	100	40
2	602	Mycology	30	70	100	40
4	603	Research Methodology	30	70	100	40
3	604	Project Work	30	70	100	40

HIMALAYAN UNIVERSITY, ARUNACHAL PRADESH

BACHELOR OF SCIENCE

MEDICAL LABORATORY TECHNOLOGY

1ST YEAR

1st 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

F**ORMAL 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 Advise 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)

Human anatomy: Introduction, subdivisions of anatomy, anatomical nomenculature-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 an 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.

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

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 Equpiments.

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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2nd 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

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.

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.

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, Abbrievations 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
11. Bleeding Time and Clotting Time.

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3rd 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, Arneth 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 Recticulocyte 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 lvy method
1. Bleeding Time – Duke and lvy 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 electrophorosis demonstration.
6. ANAEMIA: Defination, courses, 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.
1. 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.

Blood Banking (302)

a. ABO system, antigens sub-groups of A, Bombay O. Antibodies of ABO systems. Nature of antibodies. Anti A.B. Anti H.

b. ABO testing -slide and tube test. Reverse grouping. Discrepancies between cell and serum results, sources of error. Rouleux formation and methods of checking this.

c. Rh system. Nomenclature, Du system and its significance, nature of Rh antibodies. Clinical significance phenotype and genotype.

d. Rh grouping test. Slide or Rapid Tube Test. False positive and false negative results.
e. Cross matching of Blood. Principles, Reasons for X match. Saline albumin, Coombs, Enzymes in testing.

f. 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.

g. 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.

h. 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.

i. 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.

j. Coombs Test – Direct and Indirect. Principle, explanation of procedure and sources of error. Control, interpretation and clinical application. Different types of coombs sera.

k. Transfusion reactions. Handling of Transfusion Reactions in Blood bank.

l. Demonstration of Coombs Tests – Direct and Indirect

m. 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.

n. Other blood group systems. Kell Duffy, Mns and its importance. H.L.A. system, Enzymes in Blood Banking. Use of LISS.

o. Antibody Titrations, reasons and methodology.

p. Blood Component Therapy.

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:

6. a/ Precipitation
b/ Ring test (original C Reactive Protein)

c/ Gel – Immune diffusion. Single and double immuno-diffusion.

7. Radial Immuno diffusion, counter immuno-electrophoresis Agglutination test. Direct agglutination, Titration, Prozone reaction fibrile agglutinins.

8. Slide agglutination and tube agglutination Widal tests, complement fixation test – principle Immunoflourescence test.

Principle and interpretation of various, immunological tests done by the Laboratory.

9. Pregnancy test, (including the historical background and Bioassays). A S O, CRP, RP, ANF and autoimmune disorder, Widal VDRL (Kahn, was erman's test TPI, RPCF, FLA, ABS).

10. EIA and RIA – Principle; Viral Hepatitis and the markers.

11. Syphilitic Serology – Kahn, VDRL, RPR.

12. 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) pregtel ASL and CRPA.

13. Complement fixation tests and Casserman Reaction

14. Immune Flurescence tests
Fluorescent labeled antibody techniques.

F.T.A. for syphilis.

ANA or ANF tests for L.E.

15. Auto Immunity auto immune disease LE cell ,ANA or ANF

16. Hypogammaglobulinemia

17. Hypergammaglobulinemia, Cryoglobulinemia

18. Organ transplantation

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. Dacalcification

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, homing 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. Decalfication 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.

Practical (305)

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4th Semester

Clinical Chemistry and 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/ Na^+

b/ K^+

c/ Cl

d/ 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 Revies 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/ T_3 T_4 TSH

b/ CPK

c/ VMA

d/ Cortisols

e/ Estrogen &Progesterone

f/ Hormones

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

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 Sulfosalyclic 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.

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

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, Pneumoccus, bacitracin test, optochin and Bile solubility tests.
8. Neisseria
9. Enterobacteriacae 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.

Parasitology (404)

1. Protozon classification and general morphology.
2. E.Coli, E. Histolytica and other Rhizopoda
3. Flagelattes 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. Platyheliminths – 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 medinesis.
14. Methods of Examination of Stool for Parasities and for Protozoa.

Practical (405)

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5th Semester

Microbial Molecular Genetics (501)

UNIT-I The study of Microbial genetics, Inheritance of characteristics and variability, Phenotype & genotype.

UNIT-II Genotypic changes, Mutation (Types), Its Occurance, Repairing..

UNIT-III Bacterial Recombination, Introduction: Conjugation, Advantages, Properties.

UNIT-IV Introduction of generalized and specialized transduction, Transformation.

UNIT-V The Regulation and expression of gene Activity, properties

UNIT-VI Control of Microbes and Antibiotics. Physical methods of control: Moist heat-principle and application of pasteurization, Tantalization and autoclaving

UNIT-VII Microbial Physiology :Properties, nomenclatures, classification, mechanism of action, factors affecting enzyme activity, enzyme inhibitors, regulation

UNIT-VIII Microbial Genetics Nucleic acids: DNA and RNA-composition, structure, replication in prokaryotes and eukaryotes, models of replication.

UNIT-IX Microbial interactions Rhizoplane, rhizosphere, mycorhizza, symbiotic and non-symbiotic, interactions

UNIT-X Types of Microbiology :Agricultural Microbiology, Environmental Microbiology, Food and Dairy Microbiology, Industrial Microbiology, Medical Microbiology.

UNIT-XI Nucleic Acids Structure, physical and chemical properties of DNA and RNA, extra chromosomal DNA- profile, function and evolution DNA replication, damage and repair, spontaneous and induced Mutation, reversion of mutation

UNIT-XII Transposition Structure of transposes, replicative and non-replicative transposition, transposon mutagenesis, Genetic- recombination, Molecular models and mechanism, Gene conversion.

Applied Immunology (502)

UNIT-I: Basic concepts Introduction of Immunology and its application Antigen, Antibody, Immune complex

UNIT-II: Autoimmunity Introduction of Autoimmunity, Laboratory test for detection of Antigen and Antibodies, Autoimmune disorders

UNIT-III: ELISA and RIA Introduction of ELISA technique and its application, Introduction of RIA - Principle and its Application

UNIT-IV Serological techniques Basic and advanced Serological techniques and its application

UNIT-V Serological tests Serological tests : Widal, VDRL Resewaller, Brucella agglutination and Cold agglutination.

UNIT-VI Electrophoresis and Chromatography Principle, Technique and application, I. Thin layer chromatography (TLC), II. Polyacrylamide Gel Electrophoresis (PAGE), SDS – PAGE, III. Agrose Gel Electrophoresis

UNIT-VII Antigens and antibodies Types of antigens, antigen city, factors influencing antigenicity and types of immunoglobulins

UNIT-VIII Structure of Immunology Structure of Immunoglobulin's, production of polyclonal and monoclonal antibodies

UNIT-IX: Major histocompatibility complex: Generation of humoral and cellular immune responses and Effector mechanisms; antigen processing and presentation

UNIT-X: Antigen antibody interactions and its applications

UNIT-XI Immunological memory, Complement system; action of cytotoxic T lymphocytes; Natural killer cells, ADCC.

UNIT-XII Immunology in health and disease ,Autoimmunity, immunodeficiency's hypersensitivity; concept of immunotherapy

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Microbial Molecular Genetics (P) (503)

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6th Semester

Virology (601)

UNIT-I :General morphology and ultra structure of Viruses, Introduction, Capsids- Helical Symmetry, icosahedral symmetry and complex symmetry, Envelope: Glycoprotein and matrix protein

UNIT-II: Viral genome Introduction: their types and structure.

UNIT-III: Cultivation of Viruses in embryonated eggs, experimental animals and cell culture: primary and secondary cell culture, suspension cell culture and monolayer cell cultures.

UNIT-IV: Introduction of Assays of viruses, physical and chemical methods of assays (protein nucleic acid, radioactivity traces, electron microscopy), plaque method, pock counting method, end point method and infectivity of plant viruses).

UNIT-V: Serological methods :Haemagglutination inhibition, complement fixation, Immunofluroscence Assays (IFA) ,ELISA, RIA .

UNIT-VI : Recent advances in classification of plant viruses, Life cycle and other details of TMV and Mosaic virus, potato virus X General idea about cyanophages, actinophages and mycoviruses.

UNIT-VII: Bacterophages Classification, Morphology and ultra structure, One step growth curve (Latent period, eclipse Period and burst size).

UNIT-VIII :Life cycle: Lytic and Lysogenic cycles of bacteriophages .

UNIT-IX : Animal viruses; classification and nomenclature .

UNIT-X : DNA viruses ,Life cycles and other details of DNA viruses: herpes, adeno and SV40.

UNIT-XI : RNA viruses Life cycle and other details of RNA viruses: Retroviruses, oncogenic viruses and lentiviruses (HIV), picorna, ortho myxo and paramyxo.

UNIT-XII :Characteristics of the following viruses with tests :Pox virus Myxovirus ,Arbovirus ,Herpes virus ,Enterovirus ,Rabies virus ,Rota virus ,HIV virus ,Oncogenic viruses (in brief).

Mycology (602)

UNIT-I Mycology Introduction to mycology, classification of fungal infections, and fungal infections in men

UNIT-II Fungal infections Laboratory diagnosis of fungal infections-Specimens collection, transport of specimens

UNIT-III Direct microscopic, Different methods employed-direct microscopic examination, Slide culture technique, fungal culture, serology and animal inoculation.

UNIT-IV Cutaneous mycoses ,Superficial cutaneous mycoses- Malassezia infections, Taenia nigra, Piedra, Dermatophytosis

UNIT-V :Subcutaneous mycosis-Myeloma, Sporortricosis, Chromoblastomycosis, Phaeohypomycosis, Rhinosporidiosis, Lobo mycosis

UNIT-VI : Systemic mycoses-Histoplasmosis, Blastomycosis, Coccidioidomycosis, Paracoccidioidomycosis

UNIT-VII : Opportunistic mycoses Introduction- Candidiasis, cryptococcosis, Penicilliosis, Aspergillosis, Zygomycosis, Occulomycosis, Otomycosis, Mycotic poisoning.

UNIT-VIII: Types of Mushroom Poisoning and other Mycotoxins: Prognosis and Treatment, Culture isolation and identification.

UNIT-1X: Treatment options for infections in animals, humans, Isolation and culture of pathogenic fungi; Common laboratory contaminants

UNIT-X Superficial mycoses Introduction, Pityriasis Versicolor; Tinea Nigra; Piedra.

Research Methodology (603)

UNIT-I Introduction Need and importance of Research in General and with special reference to Physical Education & ports

UNIT-II Characteristics of Research and Research Worker

UNIT-III Classification of Research ,Classification in relation to Nature, Methods and Nature of data

UNIT-IV Formulation of Research Problem

UNIT-V Research problem, Location and criteria of selecting a Research problem, Limitations and Delimitations.

UNIT-VI :Reasons for surveying related literature, Allied and critical Literature

UNIT-VII : Hypothesis Introduction and Significance of Hypothesis, Types of Hypothesis

UNIT-VIII : Historical Research Meaning, Historical sources and their Evaluation

UNIT-IX :Survey Studies ,Introduction and Tools of Survey and Case Studies

UNIT-X :Philosophical Studies Introduction- Meaning, Steps in Critical Thinking, Experimental Research, Meaning and Nature of Experimental Research, Sources of Experimental Invalidity.

UNIT-XI :Experimental Designs ,Introduction, Pre, True and Quasi Experimental designs.

UNIT-XII Research Methodology, Research proposal, Research Report.

Project Work (604)

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