


KANNUR UNIVERSITY

(Abstract)

M.Sc. Medical Micro Biology/ M.Sc. Medical Bio Chemistry/ M.Sc. Medical Laboratory Technology Programmes under Choice Based Credit Semester System in the University Department- Revised Scheme, Syllabus & Model Question Papers Implemented with effect from 2015 admission- Orders issued.

ACADEMIC 'C' SECTION

U.O. No. Acad/C4/ 9343/2015

Civil Station P.O, Dated, 15-12-2015

- Read:
1. U.O No. Acad/C3/2049/2009 dated 11.10.2010.
 2. U.O No. Acad/C3/2049/2009 dated 05.04.2011.
 3. Meeting of the Syndicate Sub-Committee held on 16.01.2015.
 4. Meeting of the Curriculum Committee held on 10.04.2015.
 5. U.O No. Acad/C4/14536/2014 dated 29.05.2015.
 6. Meeting of the Department Council held on 15.06.2015.
 7. Letter from the Director, School of Health Sciences, Thalassery Campus, Palayad.
 8. Meeting of the Curriculum Committee held on 03.09.2015.

ORDER

1. The Regulations for Post Graduate Programmes under Choice Based Credit Semester System were implemented in the Schools/Departments of the University with effect from 2010 admission as per the paper read (1) above and certain modifications were effected to the same vide paper read (2).
2. The meeting of the Syndicate Sub-Committee recommended to revise the Scheme and Syllabus of all the Post Graduate Programmes in the University Schools/Departments under Choice Based Credit Semester System (CCSS) with effect from 2015 admission vide paper read (3) above.
3. As per the paper read (4) above, the meeting of the Curriculum Committee recommended certain modifications/ additions to the Regulations for Post Graduate Programmes under Choice Based Credit Semester System and the Regulations were modified in the University w.e.f. 2015 admission vide paper read (5).
4. The Department Council vide paper read (6) above has approved the Scheme, Syllabus & Model Question Papers for **M.Sc. Medical Micro Biology/ M.Sc. Medical Bio Chemistry/ M.Sc. Medical Laboratory Technology Programmes under Choice Based Credit Semester System(CCSS)** for implementation with effect from 2015 admission.
5. The Director, School of Health Sciences vide paper read (7) above, has forwarded the Scheme, Syllabus & Model Question Papers for **M.Sc. Medical Micro Biology/ M.Sc. Medical Bio Chemistry/ M.Sc. Medical Laboratory Technology Programmes** in line with the revised Regulations for Choice Based Credit Semester System for implementation with effect from 2015 admission.

P.T.O.

6. The meeting of the Curriculum Committee held on 03.09.2015 approved the Scheme; Syllabus & Model Question Papers for M.Sc. Medical Micro Biology/ M.Sc. Medical Bio Chemistry / M.Sc. Medical Laboratory Technology under Choice Based Credit Semester System in the Department vide paper read (8) above.

7. The Vice Chancellor after considering the matter in detail, and in exercise of the powers of the Academic Council conferred under section 11(1) of KU Act 1996, and all other enabling provisions read together with, has accorded sanction to implement the Scheme, Syllabus & Model Question Papers for M.Sc. Medical Micro Biology/ M.Sc. Medical Bio Chemistry/ M.Sc. Medical Laboratory Technology Programme under Choice Based Credit Semester System, offered in the University Department w.e.f 2015 admission, subject to report to the Academic Council.

8. Orders are, therefore, issued accordingly.

9. The revised Scheme, Syllabus and Model Question Papers of M.Sc. Medical Micro Biology/ M.Sc. Medical Bio Chemistry/ M.Sc. Medical Laboratory Technology Programme effective from 2015 admission are appended.

Sd/-
JOINT REGISTRAR (ACADEMIC)
FOR REGISTRAR

To

The Director, School of Health Sciences
Thalassery Campus, Palayad

Copy To:

1. The Examination Branch (through PA to CE)
2. PS to VC/PA to PVC/PA to R/PA to CE/PA to FO
3. JR/AR I Academic
4. The Computer Programmer (for uploading in the website)
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Forwarded/By Order


SECTION OFFICER

Bj



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KANNUR UNIVERSITY



SCHOOL OF HEALTH SCIENCES

DEPARTMENT OF MEDICAL BIOCHEMISTRY

REGULATION AND SYLLABUS FOR

M.Sc. MEDICAL BIOCHEMISTRY PROGRAMME

UNDER CHOICE BASED CREDIT AND SEMESTER SYSTEM

(Applicable from 2015 Admission onwards)

ELIGIBILITY FOR ADMISSION

Candidates seeking admission to M.Sc. programme (Three yrs.) in Medical Biochemistry should have passed Bachelors degree in any of the biological science subjects like Microbiology, Biochemistry, Zoology, Botany, Biotechnology, etc. or Chemistry with Biology as one of the subjects of study at degree /pre degree/higher secondary level securing not less than 60% marks or equivalent GPA in terms of marks secured in aggregate excluding languages/ common courses and open courses.

Candidates who have passed Bachelors degree (Four yrs.) in B.Sc. Medical Biochemistry will be considered for direct admission to Two yr. M.Sc programme in Medical Biochemistry.

DURATION OF THE PROGRAMME

Course of study will extend over a period of three years for graduates who have undergone Three year B.Sc. programme. The first year course (2 semesters) will be introductory course in basic medical sciences viz. Human Anatomy, Human Physiology and Biochemistry. The candidates gaining admission to Two yrs. programme will be directly admitted to second year (Part II) of the M.Sc. degree course exempting them from undergoing the first year (2semesters) course.

The minimum duration for completion of a two year PG Programme is four Semesters. The maximum period for completion is eight (8) Semesters. The minimum duration for completion of a three year PG Programme is six (6) Semesters. The maximum period for completion is twelve (12) Semesters. Even if a candidate earns the required number of credits in less than 4/6 Semesters, he/she has to necessarily study for four Semesters of the two year PG Programme and for six (6) Semesters for a three year PG Programme.

MODE OF SELECTION

As per the Regulations prescribed by the University from time to time

COURSE STRUCTURE

M.Sc. MEDICAL BIOCHEMISTRY (FACULTY OF MODERN MEDICINE)
SEMESTER WISE DISTRIBUTION OF COURSES, CONTACT HOURS, MARKS AND
CREDITS
(EFFECTIVE FROM 2015 ADMISSION)

Part I Semester I

Sl. No.	Course Code	Title of the Course	Contact Hours/Week			Marks			Credits
			L	T/S	P	ESE	CE	Total	
1	SHS C 101	Fundamentals of Human Anatomy I	4	2	-	60	40	100	4
2	SHS C 102	Fundamentals of Human Physiology I	4	2	-	60	40	100	4
3	SHS C 103	Basic Biochemistry I	4	2	-	60	40	100	4
4	SHS P 104	Fundamentals of Human Anatomy I Practicals & Viva-voce	-	-	6	60	40	100	3
5	SHS P 105	Fundamentals of Human Physiology I Practicals & Viva-voce	-	-	6	60	40	100	3
6	SHS P 106	Basic Biochemistry I Practicals & Viva-voce	-	-	6	60	40	100	3
Total			12	6	18	360	240	600	21

Part I Semester II

Sl.No.	Course Code	Title of the Course	Contact Hours/Week			Marks			Credits
			L	T/S	P	ESE	CE	Total	
1	SHS C 107	Fundamentals of Human Anatomy II	4	2	-	60	40	100	4
2	SHS C 108	Fundamentals of Human Physiology II	4	2	-	60	40	100	4
3	SHS C 109	Basic Biochemistry II	4	2	-	60	40	100	4
4	SHS P 110	Fundamentals of Human Anatomy II Practicals & Viva-voce	-	-	6	60	40	100	3
5	SHS P 111	Fundamentals of Human Physiology II Practicals & Viva-voce	-	-	6	60	40	100	3
6	SHS P 112	Basic Biochemistry II Practicals & Viva-voce	-	-	6	60	40	100	3
Total			12	6	18	360	240	600	21

Part II Semester I

Sl. No.	Course Code	Title of the Course	Contact Hours/Week			Marks			Credits
			L	T/S	P	ESE	CE	Total	
1	MBC C 113	General Microbiology	4	1	-	60	40	100	4
2	MBC C 114	Clinical Haematology	4	1	-	60	40	100	4
3	MBC C 115	Biomedical Instrumentation & Research Methodology	4	1	-	60	40	100	4
4	MBC P 116	General Microbiology- Practicals & Viva-voce	-	-	6	60	40	100	3
5	MBC P 117	Clinical Haematology Practicals & Viva-voce	-	-	6	60	40	100	3
6	MBC P 118	Biomedical Instrumentation & Research Methodology – Practicals & Viva-voce	-	-	6	60	40	100	3
7	MBC E 119	Elective 1*	3	1	-	60	40	100	3
Total			15	4	18	420	280	700	24

Part II Semester II

Sl. No.	Course Code	Title of the Course	Contact Hours/Week			Marks			Credits
			L	T/S	P	ESE	CE	Total	
1	MBC C 120	Endocrinology & Reproductive Biology	4	1	-	60	40	100	4
2	MBC C 121	Enzymology	4	1	-	60	40	100	4
3	MBC C 122	Immunology	4	1	-	60	40	100	4
4	MBC P 123	Endocrinology & Reproductive Biology Practicals & Viva-voce	-	-	6	60	40	100	3
5	MBC P 124	Enzymology Practicals & Viva-voce	-	-	6	60	40	100	3
6	MBC P 125	Immunology Practicals & Viva-voce	-	-	6	60	40	100	3
7	MBC E 126	Elective 2*	3	1	-	60	40	100	3
Total			15	4	18	420	280	700	24

Part II Semester III

Sl. No.	Course Code	Title of the Course	Contact Hours/Week			Marks			Credits
			L	T/S	P	ESE	CE	Total	
1	MBC C127	Metabolism & Inherited Metabolic disorders	4	1	-	60	40	100	4
2	MBC C128	Molecular Biology & Medical Genetics	4	1	-	60	40	100	4
3	MBC P129	Metabolism & Inherited Metabolic disorders Practicals & Viva-voce	-	-	6	60	40	100	3
4	MBC P130	Molecular Biology & Medical Genetics Practicals & Viva-voce	-	-	6	60	40	100	3
5	MBC E131	Elective 3*	3	1	-	60	40	100	3
6	MBC E132	Elective 4*	3	1	-	60	40	100	3
7	MBC C 133	Internship	-	6	-	60	40	100	3
Total			14	10	12	420	280	700	23

Part II Semester IV

Sl. No	Course Code	Title of the Course	Contact Hours/Week			Marks			Credits
			L	T/S	P	ESE	CE	Total	
1	MBC C134	Clinical Biochemistry	4	2	-	60	40	100	4
2	MBC C135	Nutritional & Dietetics	4	2	-	60	40	100	4
3	MBC P136	Clinical Biochemistry Practicals & Viva-voce	-	-	6	60	40	100	3
4	MBC P137	Nutritional & Dietetics Practicals & Viva-voce	-	-	6	60	40	100	3
5	MBC C138	Research Project & Viva Voce	-	12	-	120	80	200	10
Total			8	16	12	360	240	600	24

ELECTIVES

1. CLINICAL EMBRYOLOGY
2. ENVIRONMENTAL TOXICOLOGY
3. GENERAL AND CLINICAL PATHOLOGY
4. ETHICS, PATENCY AND IPR
5. PREVENTIVE MEDICINE AND PUBLIC HEALTH

SCHEME OF EVALUATION

Evaluation shall be done on the basis of continuous evaluation and end semester examination. The proportion of the distribution of marks among ESE and CE shall be 60:40.

Distribution of marks for Theory ,Practicals & Viva voce (Core & Elective)

	End Semester Examination	Continuous Evaluation	Total
Theory	60	40	100
Practicals*	30	20	100
Viva-voce*	50	-	
Grand Total	140	60	200

*Practicals and viva-voce component is only for Core paper

Continuous evaluation of the course shall be based on periodic written tests, seminars, assignments and attendance in respect of theory courses and based on tests, lab skill and attendance in respect of practical courses. The percentage of marks assigned to various components for continuous evaluation is as follows.

Weightage to the components of internal marks

Theory

- | | | |
|----------------|---|-----|
| 1. Test papers | - | 40% |
| 2. Seminars | - | 20% |
| 3. Assignment | - | 20% |
| 4. Attendance | - | 20% |

Practicals

- | | | |
|---------------|---|-----|
| 1. Tests | - | 50% |
| 2. Lab skills | - | 30% |
| 3. Attendance | - | 20% |

Test papers

At least three class tests will be conducted during a semester. Best of the marks obtained in the two tests will be counted.

Seminar

Each student shall deliver one seminar as an internal component of each course

Assignments

Each student shall be required to do at least 2 assignments for each course.

ATTENDANCE

The minimum attendance required for each course shall be 75% of the total number of classes conducted for that semester. Those who secure the minimum attendance in a semester alone will be allowed to register for the End Semester Examination. Condonation of attendance to a maximum of 10 days in a Semester subject to a maximum of two spells within a Programme will be granted by the Vice-Chancellor. Benefit of Condonation of attendance will be granted to the students on health grounds, for participating in University Union activities, meetings of the

University Bodies and participation in extracurricular activities on production of genuine supporting documents with the recommendation of the Head of the Department concerned. A student who is not eligible for condonation shall repeat the course along with the subsequent batch.

CONDUCT OF END SEMESTER EXAMINATION

Pattern of Double valuation will be followed for Choice based Credit Semester System

The Head of the Department will have to submit to the Controller of Examinations, the details of the Core and Elective of each semester along with the syllabus, Model Question Papers and Panel of Experts for setting the questions, immediately after starting of each semester. The Controller of Examinations in turn shall set, print and supply one set of question paper in sealed cover to the Head of the Dept./ Course Director within a maximum of 60 days.

Viva voce examination of II semester will cover all the papers both theory and practicals of I and II semesters. Viva Voce examination at the end of IV semester will cover all the papers, both theory and practical of III and IV semester.

PATTERN OF QUESTIONS

For the end semester examination each question paper shall consists of three sections:

Section A, B and C carrying a total of 60 marks

Section A consists of two essay type questions, each carrying 10 marks.

Section B consists of five short note questions, each carrying 5 marks.

Section C consists of five brief note questions, each carrying 3 marks.

PROJECT WORK

Written account of the project shall be submitted by the students with in prescribed time before registering for IV semester (part II) examination.

The evaluation of the project will be on the following basis.

Project content	-	60marks
Presentation	-	30marks
Defence/Viva voce	-	30marks
Continuous evaluation	-	80 marks
Total	-	200 marks

Students scoring less than 50% (100 out of 200) marks in project evaluation shall be required to re submit and re appear for project evaluation.

Students failing to secure pass in any paper (Theory& practicals) shall reappear for that paper/those papers in subsequent semester examination. Students who fail to secure pass in Part I (preliminary- I years examination) shall not be permitted to register for Part II final semester (semester IV) examination. Students will be permitted to appear for project evaluation only after appearing for all the examinations in part I &II.

GRADING

1. An alphabetical grading system shall be adopted for the assessment of a student's performance in a Course. The grade is based on a 6 point scale. The following table gives the range of marks %, grade points and alphabetical grade.

Range of Marks%	Grade Points	Alphabetical Grade
90-100	9	A+
80-89	8	A
70-79	7	B+
60-69	6	B
50-59	5	C
BELOW 50	0	F

2. A minimum of grade point 5 (Grade C) is needed for successful completion of a course.
3. Performance of a student at the end of each semester is indicated by the Grade Point Average (GPA) and is calculated by taking the weighted average of grade points of the courses successfully completed. Following formula is used for the calculation. The average will be rounded off to two decimal places.

$$\text{GPA} = \frac{\text{Sum of (grade points in an average multiplied by its credit)}}{\text{Sum of credits of courses.}}$$

4. At the end of the programme, the overall performance of a student is indicated by the Cumulative Grade Point Average (CGPA) and is calculated using the same formula given above.

5. Empirical formula for calculating the percentage of marks will be $CGPA \times 10 + 5$.
6. Based on the CGPA overall letter grade of the student shall be in the following way.

CGPA	Overall Letter Grade
8.5 and above	A+
7.5 and above but less than 8.5	A
6.5 and above but less than 7.5	B+
5.5 and above but less than 6.5	B
4.5 and above but less than 5.5	C

7. Conversion of Grades into Classification

Overall Letter Grade	Classification
A+ and A	First class with Distinction
B+ and B	First Class
C	Second Class

8. A student who has failed in a course can reappear for the End Semester Examination of the same course along with the new batch without taking re-admission or choose another Course in the subsequent Semesters of the same Programme to acquire the minimum credits needed for the completion of the Programme.
9. Appearance for Continuous Evaluation (CE) and End Semester (ESE) are compulsory and no Grade shall be awarded to a candidate if he/she is absent for CE/ESE or both.
10. A student who fails to complete the Programme /Semester can repeat the full Programme/Semester once, if the Department Council Permits to do so.
11. There shall not be provision for improvement of CE and ESE.
12. No student shall be allowed to take more than eight/twelve consecutive Semesters for completing a four /six Semester Programme from the date of enrollment.
13. Ranking will be confined to only those students who qualify all the examinations in first attempt. Only marks of the Part II examinations will be considered for classification and ranking.
14. No Candidate shall be permitted to work outside the institution while studying the course

GRIEVANCE REDRESSAL MECHANISM

Committees will be constituted at the Department and University levels to look into the written complaints regarding Continuous Evaluation (CE). Department Level Committee (DLC) will consist of the Department Council and student nominee of the Department Students' Union from the concerned Faculty.

University Level Committee (ULC) will consist of the Pro – Vice- Chancellor (Chairman & Convenor), the convenor of the Curriculam Committee(Vice- Chairman), the Head of the Department concerned and a nominee of the students' Union. Department Level Committee will be presided over by the HOD and University Level Committee by the Pro- Vice Chancellor. Department Level Committee will have initial jurisdiction over complaints against Continuous Evaluation and University Level Committee will hear appeals against Department level decisions. Complaints will have to be submitted to the Department concerned within two weeks of publication of results of Continuous Evaluation (CE) and disposed of within two weeks of receipt of complaint. Appeals to University Level Committee should be made within one month of the decisions taken by Department level Committee and disposed of within two months of the receipt of the complaint.

Complaints unsolved by the University level Grievance Committee shall be placed before the Vice Chancellor.

M.Sc. MEDICAL BIOCHEMISTRY

PART I – SHS C 101 – FUNDAMENTALS OF HUMAN ANATOMY I

THEORY

Unit I

General Anatomy

Nomenclature and Terminologies in Anatomy

Cell- membrane, cytosol , organelle and inclusion bodies.

Tissues-

Epithelial tissue and glandular epithelia

Connective tissue

Muscular tissue

Nervous tissue

Blood vessels

Lymphoid tissue

Joints-Classification

Genetics and Embryology

Cell division, genome, DNA, Chromosomal anomalies, Chromosomal analysis

Gametogenesis- oogenesis,spermatogenesis,spermatogonia,menstrual cycle

Placenta-functions

Unit 2

Gross Anatomy

Classification of Bones

Upper limb-Osteology of upper limb bones

Important muscles of upper limb.-Pectoralis major, Trapezeius, deltoid, biceps brachi, triceps brachi, supinator, pronator teres, name muscles of thenar and hypothenar eminence.

Joints- shoulder, elbow, wrist. Clinical aspects

Blood vessels-Cephalic vein, median cubital vein, axillary artery, brachial artery, radial artery and Clinical aspects

Nerves- Bracheal plexus-axillary, median ,ulnar, radial nerves and clinical importance

Unit 3

Lower limb- osteology of lower limb bones

Important muscles- gluteus maximus, quadriceps femoris, hamstring muscles, soleus and clinical importance

Joints-hip, knee, ankle and Clinical aspects

Nerves- Sacral plexus-Femoral and sciatic nerves and its Clinical aspects

Blood vessels- great saphenous vein, Femoral artery, dorsalis pedis

Unit 4

Thorax –osteology of ribs, thoracic vertebrae

Muscles- intercostal muscles

Pleura, lungs

Mediastinum- pericardium,heart, aorta, superior venacava, inferior venacava, azygos vein.

Nerve-intercostal nerve

PRACTICALS - SHS P 104 - FUNDAMENTALS OF HUMAN ANATOMY I

Micro Anatomy practicals

1. Simple compound microscope
2. Epithelium- classification
3. Connective tissue –collagen, elastic and reticular fibres and cells
4. Cartilage- hyaline, elastic, fibrous
5. Bone- compact bone T.S and L.S
6. Muscular tissue- skeletal, smooth and cardiac
7. Nervous tissue- neuron, c.s of peripheral nerve, spinal and motor ganglia.
8. Vascular tissue- medium sized artery , large artery, large vein.
9. Lymphoid tissue- lymph node, spleen, tonsil, thymus.
10. Gross Anatomy- Demonstration of dissection and prosection of human body including osteology relevant to the topics dealt in Lecture classes. Surface Anatomy. Discussions with the help of maps and models.

PART I – SHS C 102 – FUNDAMENTALS OF HUMAN PHYSIOLOGY I

THEORY

Unit I

Introduction to Human Physiology

Unit II

Circulatory System

Composition and functions of blood and plasma

RBCs – Structure – functions, properties

PCV, E.S.R, Osmotic fragility, Normal Count, Variations

Regulations of haemopoiesis – Life span – Deficiency disorders.

WBC – Morphology – Normal values – Classification of WBCs – functions

Life span – disorders of WBC functions.

Platelets – Structure – Normal values – properties and functions– Abnormalities

Blood volume – Normal value – Abnormalities

Tissue fluid: Formation – Starling Hypothesis-Lymph formations, Circulation, functions, oedema

Blood groups: Discovery – Landsteiner's law –

ABO system – method of determination – Inheritance.

Rh. system – Blood group incompatibility disorders

Other blood group systems.

Unit III

Cardiovascular system:

Functional Anatomy of heart and blood vessels –

Properties of Cardiac muscle

Conducting system of heart – Origin and spread of Cardiac impulse – Cardiac Cycle –

Pressure changes, heart sound..etc

Cardiac output – Definition – normal value – method of measurement – Heart rate and its regulation.

Blood pressure – normal values and variations.

Regulation of blood pressure – measurement of B.P

Normal ECG

Unit IV

Respiratory system

Introduction – Functional anatomy of respiratory tract

Mechanism of respiration-movements,muscles,pressures,resistance,compliance

Lung volumes and capacities-Spirometry

Transport of gases-oxygen and carbondioxide

Regulation of respiration-Nervous and Chemical

– centers controlling respiration – Chemical control of respiration – chemical stimuli –

Chemo receptors – Peripheral and Central mechanisms

Hypoxia – clinical features – therapeutic procedures

Unit V

Nerve-Muscle Physiology

Nerve cells-structure, properties and function

Synapse-properties and functions

Skeletal muscle – Contractile proteins – properties of skeletal muscle.

Cardiac muscle – mechanism of contraction

Smooth muscle – Properties and mechanism of contraction – Neuromuscular function.

Unit VI

Nervous system

Receptors, classification-Sensations; Touch, Pain and Temperature

Reflexes-reflex arc, properties of reflexes, mono and polysynaptic reflexes,

Stretch reflex, Withdrawal reflex

Spinal cord-Sensory and Motor tracts

Cerebral cortex-characterestic areas and functions

EEG: Methods of recording – clinical use.

PRACTICALS - SHS P 105 – FUNDAMENTALS OF HUMAN PHYSIOLOGY I

1. Study of Microscope
2. Determination of total Erythrocyte (RBC) count, Determination of total Leucocyte (WBC) count : [TLC]. Estimation of Haemoglobin (Sahli's method). Preparation of peripheral blood smear and determination of differential Leucocyte count : [DLC]
3. Determination of Bleeding time [BT], Clotting time [CT], ESR and PCV
4. Determination of Blood groups [A,B,O and Rh system]

PART I – SHS C 103 - BASIC BIOCHEMISTRY I

THEORY

Unit I

Cell and Biological Membranes

Structure and functions of eukaryotic cells and organelles, molecular organization of cells, lipid bilayers, micelles and liposomes, lipid mobility, fluidity and asymmetry, membrane proteins, membrane structure and assembly, Fluid-Mosaic model, membrane transport, endocytosis and exocytosis, Gibbs Donnan membrane phenomenon, membrane potentials and action potential, single channel conductance.

Unit II

Lymph, tissue fluids and physical aspects

Blood cells, properties and functions. Blood volume and its regulation. Colloids, Diffusion, Partition, Law of Mass action, Surface tension, Adsorption, Viscosity, Osmotic pressure, Donnan membrane equilibrium and their applications.

Unit III

Carbohydrates

Definition, structure, properties and biological importance of monosaccharides, disaccharides and polysaccharides like glucose, fructose, mannose, ribose, xylose, galactose, lactose, maltose, sucrose, starch, glycogen, dextrans, and cellulose, deoxy sugars, amino sugars, uronic acids, heteropolysaccharides and glycosamino-glycans and proteoglycans, cell membrane, cell surface and serum glycoproteins, glycosylated proteins, carbohydrates of blood group antigens, sialic acid etc. Role of carbohydrates in cell recognition, and cell to cell interactions and communications, lectins.

Unit IV

Lipids

Classification of lipids, definition structure, properties and biological significance of fatty acids, triacyl glycerols, phospholipids, glycolipids, plasma lipids and lipoproteins, and cell membrane lipids, structure, biological significance and properties of cholesterol, bile acids, vit. D and steroid hormones. structure, properties and biological significance of poly

unsaturated fatty acids and eicosanoids-prostaglandins, prostacyclins, thromboxanes, leukotrienes and lipoxins, action of non-steroidal anti-inflammatory drugs.

Unit V

Proteins

Definition, structure, properties and classification of amino acids, Structure, properties, classification, and functions of proteins . primary structure, Ramachandran plot and secondary structures- α - helix and β -sheet β turns and bends random coils, hairpin loops and other non repetitive structures, structure of insulin, myoglobin, hemoglobin and hemoglobin derivatives, myosin and actin, structure of silk fibroin, α -keratin and collagen triple helical structures, supersecondary structures (motifs), tertiary and quaternary structures of proteins, forces that stabilize protein structure, denaturation, coagulation and precipitation of proteins, separatory techniques of proteins, methods to determine the molecular weight of proteins.

Unit VI

Enzymes

Definition and general properties of enzymes, IUB classification and nomenclature, enzyme specificity, active site and enzyme-substrate complex, factors governing the rate of enzyme catalyzed reactions, chemical kinetics-zero order, first order and second order reactions and activation energy, enzyme inhibitions, catalytic mechanisms of enzymes - acid - base, metal ion, covalent and electro static catalysis, enzyme regulation, covalent modifications, zymogen activation, induction and repression, coenzymes, cofactors and prosthetic groups, isoenzymes, abzymes, ribozymes. units of enzyme activity.

Unit VII

Nucleic Acids

Structure and properties of purine and pyrimidine bases, definition, structure, properties and functions of nucleosides, nucleotides and nucleic acids. structure and functions of DNA , denaturation and renaturation of DNA, polymorphic forms of DNA - A, B, C, D and Z DNA, nucleoproteins, structure, properties and functions of RNA - mRNA, rRNA, and tRNA.

Unit VIII

Porphyrins

Classification, structure and properties of hemes and cytochromes.

Unit IX

Acids, Bases, Buffers

Physical and chemical properties of water - ionization of water, acids and bases - definition, ionization and dissociation constants, pH, buffers and buffering capacity, blood buffers and other biological buffers, Henderson - Hasselbalch equation, indicators and pH papers, principle, instrumentation and applications of pH meters and ion selective electrodes.

Unit X

General Methodology

Preparation of cleaning solution for glassware cleaning and care of laboratory glasswares and instruments, calibration of pipettes and other volumetric apparatuses. Storage and handling of dangerous chemicals and reagents. Anticoagulants, preservation and preparation of anticoagulant bottles for blood collection for different parameters. Introduction to clinical laboratory procedures, organization of a clinical laboratory, the lay out and design, laboratory accidents and precautions, first aid in laboratory accidents, capillary and venous blood collection.

Unit XI

Basic Laboratory principles and procedures

Water specifications- distilled, double distilled and demineralized water, general and clinical laboratory supplies, volumetric equipments and their calibration, Beer-Lambert's laws of light absorption, general principles, instrumentation and applications of colorimetry.

PRACTICALS SHS P 106 BASIC BIOCHEMISTRY I

Learn the technique of drawing blood from the vein of humans. Reactions of carbohydrates, proteins and non protein nitrogenous substances, identification of unknown substances of physiological importance, reactions of oils, steroids (Lieberman-Burchard reaction), salivary amylase action on starch. Verification of Beer Lamberts Law

PART I – SHS C 107– FUNDAMENTALS OF HUMAN ANATOMY II

THEORY

Unit I

Abdomen pelvis & perineum

Osteology- lumbar vertebrae

Muscles of anterior abdominal wall

Peritoneum- greater omentum, lesser omentum, mesentery.

Oesophagus, stomach, small intestine, large intestine .

Liver, extrabiliary apparatus, pancreas, spleen, supra renal gland

Portal vein, portosystemic anastomosis, thoracic duct.

Pelvic organs- urinary bladder , uterus, fallopian tube, ovary, rectum

Prostate, ejaculatory duct.

Perineum- anal canal, scrotum, testes, male urethra.

Unit II

Head and Neck

Briefly mention the osteology of skull, cervical vertebrae.

Thyroid gland, parathyroid

Tongue, pharynx, larynx, trachea

Brain- its parts and spinal cord, cerebellum, ventricle of brain

Pituitary gland.

Blood vessels- subclavian artery, vertebral artery, circle of willis

Cranial nerves and spinal nerves

Eye ball

Ear

PRACTICALS - SHS P 110 - FUNDAMENTALS OF HUMAN ANATOMY II

1. Oesophagus, stomach, duodenum, jejunum, ileum, large intestine, liver, gall bladder, pancreas

2 . Uterus, ovary, c.s of vas deferens, testes, epididymis, spermatozoa
Kidney , ureter, urinary bladder

3 . Pituitary gland, thyroid gland, parathyroid, suprarenal gland.

Cerebrum, cerebellum, c.s spinal cord

4 . Gross Anatomy- Demonstration of dissection and prosection of human body including osteology relevant to the topics dealt in Lecture classes. Surface Anatomy. Discussions with the help of maps and models.

PART I – SHS C 108 – FUNDAMENTALS OF HUMAN PHYSIOLOGY II

THEORY

Unit I

Renal System

Introduction-Functional anatomy of renal system

Urine formation-structure of Nephron, Counter current system

Diuresis

General anatomy of urinary bladder, muscles and sphincters

Micturition-reflex control-voluntary control and higher control

Abnormalities of micturition

Unit II

Gastro-Intestinal System

Functional Anatomy of gastrointestinal tract

Physiological basis of mechanism of secretion – regulation

Salivary secretion – Composition of saliva and functions

Regulation of Salivary secretion

Gastric Secretion – Composition and functions of gastric juice – Mechanism and regulation of HCl secretion, Regulation of gastric secretion.

Pancreatic Secretion: Composition, mechanism of secretion and actions. Regulation of pancreatic secretion – Pancreatic function tests.

Liver: Functions of Liver – Composition of bile – Functions of bile – regulation of bile secretion gall bladder functions – regulation of gall bladder functions.

Movements of GIT – Peristaltic movements - Gastric movements – types and regulation

Small intestines – different parts – movements of small intestine – types of movements and their functions.

Large intestine and its function – Different parts Secretion of large intestine and its regulation-defecation

Unit III

Reproductive System

Introduction: Sex organs – genetic basis of sex. Sex chromatin – role of sex hormones in sexual differentiation in foetal life

Abberations of sexual development

Gonadotropins, prolactin,

Reproduction in female, menstrual cycle, ovarian

Cycle, ovulation, ovarian hormones, uterine cycle, cervical cycle, vaginal cycle, regulation of menstrual cycle

Fertilisation, Physiological basis of Pregnancy, function of placenta, placental hormones, pregnancy tests, Physiological basis of contraceptive methods.

Reproduction in male: Spermatogenesis and its regulation – Testosterone – functions and regulation, erection, ejaculation of semen – composition of semen.

Unit IV

Endocrine system

Hormones and its mechanisms of action

Secretion, regulation and functions of Pituitary, Thyroid and Parathyroid glands

Endocrine functions of Pancreas

Adrenal cortex and Adrenal medulla

PRACTICALS - SHS P 111 – FUNDAMENTALS OF HUMAN PHYSIOLOGY II

1. Determination of Platelet count,
2. Determination of Reticulocyte count
3. Determination of Absolute eosinophil count
4. Examination of Reflexes.
5. Measurement of Blood Pressure.
6. Tests for HCG in urine.
7. Demonstration of ECG, EEG
8. Clinical examination of Nervous System, including Cranial Nerves.
9. Clinical examination of Cardiovascular System.
10. Clinical examination of Respiratory system

PART I – SHS C 109 - BASIC BIOCHEMISTRY II

THEORY

Unit I

Bioenergetics

Laws of thermodynamics, basic concepts of free energy change, coupling of endergonic and exergonic reactions, activation energy of reactions, enzymes and coenzymes involved in oxidation and reduction, redox potentials, respiratory chain-components, organization and functioning of electron transport chain and its role in energy capture, mechanism of oxidative phosphorylation, mitochondrial transport and shuttle systems, inhibitors of respiratory chain, high energy compounds, generation, effects and disposal of reactive oxygen species, antioxidants

Unit II

Digestion and Absorption of food components

Carbohydrates, lipids, proteins and nucleic acids

Unit III

Metabolism of carbohydrates

Glycogenesis, glycogenolysis, glycolysis, TCA cycle, HMP shunt and uronic acid pathways, gluconeogenesis and their regulations. metabolism of galactose, fructose, metabolism of glucose in tissues like RBC, skeletal muscles (type I, II & III), cardiac muscles, adipose tissue, lens etc. Diabetes mellitus and related disorders, Glucose tolerance test – Procedure and interpretation.

Unit IV

Metabolism of lipids

fatty acid oxidation, synthesis, elongation and desaturation of fatty acids, Ketone bodies formation and utilization, Metabolism of cholesterol, triacyl glycerols, phospholipids, lipoproteins, eicosanoids and glycolipids. role of adipose tissue in the metabolism. Disorders related to lipids

Unit V

Metabolism of proteins and aminoacids

Intracellular breakdown of proteins and cathepsins, Body amino acid pool, inter organ transport of amino acids, Nitrogen balance . Deamination,decarboxylation,transamination and transdeamination. Formation and Disposal of ammonia, Urea cycle , hyper ammonemias. Glycogenic and Ketogenic aminoacids. Metabolism of individual amino acids – glycine, methionine, cysteine, valine, leucine, isoleucine, phenyl alanine, tyrosine, tryptophan etc.formation and biological significance of specialized products from amino acids.

Unit VI

Metabolism of nucleic acids

biogenesis, degradation and regulation of purines, pyrimidines and nucleotides

Unit VII

Metabolism of porphyrins

Synthesis and degradation of hemes, integration of metabolism, regulation of mammalian fuel metabolism and their interrelationships, metabolism during starvation and diabetes.

Unit VIII

Metabolism of xenobiotics

Mechanisms of detoxication, effects of drug metabolites and biological implications of drug and xenobiotic metabolism, metabolism of alcohol.

Unit IX

Metabolism of Vitamins & Minerals

Definition, classification, chemical structure, biological functions, dietary sources, daily requirement, deficiency manifestations, toxicity and metabolism of vitamins. Sources, requirement, Physiological functions, absorption and excretion of minerals like sodium, potassium, calcium, magnesium, sulphur, iron, phosphorus, chloride, copper, zinc,

manganese selenium, cobalt, iodine, fluoride, chromium and other trace elements, water metabolism, endocrine regulation of water and mineral metabolism.

Unit X

Basics of Separation techniques

PRACTICALS SHS P 112 BASIC BIOCHEMISTRY II

Estimation of blood glucose, total cholesterol, total proteins(biuret), urea, creatinine, uricacid, Chromatographic separation for aminoacids, Analysis of normal (Organic + inorganic constituents) and abnormal constituents(Urinanalysis –Physical & Chemical) of urine

PART-II MBC C 113 - GENERAL MICROBIOLOGY

THEORY

Unit 1

Introduction

History – milestones in the development of Microbiology. Scope and application of Microbiology. Microscopes of all kinds. Definition, Taxonomy and classification of microorganisms.

Unit 2.

Prokaryotes and eukaryotes

Ultra structure of a bacterial cell. Morphology of bacteria – motility in microorganisms. Microscopic examination of bacteria and other microorganisms. Staining methods – principles and applications.

Unit 3

Growth and nutrition of microorganisms – factors influencing the growth of microorganisms - Growth curve of bacteria and its significance. Cultivation of microorganisms - Culture media – classes and applications. Isolation of microorganisms in laboratory. Procedures for the identification of microorganisms, Bacterial counting methods.

Unit 4

Sterilisation, disinfection and antisepsis. Methods, principles and applications. Anti microbial agents, major classes and mechanisms of action. Disinfectants, mechanism of action and standardization. Antibiotic sensitivity tests, MIC, MBC. Antibiotic resistance pattern.

Unit 5

Microbial metabolism.

Unit 6

Microbial infection, modes of transmission of microorganisms. Pathogenicity – factors contributing to pathogenicity – Bacterial virulence factors, toxins and enzymes. Host parasite associations, Safety measures in Microbiology laboratory.

Unit 7

Bacterial Genetics – chromosome, structure of DNA, RNA, Replication and extra chromosomal genetic material. Genetic variation and gene transfer in microorganisms.

PRACTICALS - MBC P 116 GENERAL MICROBIOLOGY

- Staining methods.
- Culture media preparation.
- Cultivation methods.
- Isolation of bacteria
- Study of colony characters of bacteria
- Antibiotic sensitivity tests.
- Determination of MIC, MBC.
- Standardizations of disinfectants.
- Familiarisation of sterilisation methods - autoclaves, hot air oven, filters, radiation devices.

PART-II MBC C 114 – CLINICAL HAEMATOLOGY

THEORY

Unit 1

Haemoglobin synthesis, Structure and Function

Hem synthesis, Globin chain synthesis, Structure and functions of hemoglobin, Oxygen transport, Carbon dioxide transport, Abnormal hemoglobin variants- pathophysiology, laboratory diagnosis and treatment,

Unit 2

Hematopoietic tissues:

Embryonic and foetal hematopoiesis, Spleen- Internal structure, function, asplenia, splenomegaly, Lymphatic tissues- Lymphopoiesis, Thymus, Lymph nodes, Bone marrow- Structure, development, functions, examinations.

Unit 3

Erythrocytes & Erythropoiesis:

Erythroid maturation, Regulation of erythrocyte production, Erythrocyte structure, metabolism, life cycle, Measurement of RBC production and destruction, RBC morphology- Normal and Abnormal

Unit 4

Hematological Disorders:

Red Blood Cell Indices and their use in the diagnosis of Anaemias- RBC indices/ corpuscular constants, individual corpuscular constants (MCV, MCH, and MCHC)

Red blood cell disorders: Polycythemias and Anaemias-causes, definition, hematological features, morbid, anatomical features, laboratory diagnosis, Heme disorders- Porphyrrias, Iron metabolism-associated disorders, disorders of iron excess, Globin chain disorders- Haemoglobinopathies, Thalassemias etc, Deoxyribonucleic acid disorders- Megaloblastic anaemias, Vitamine B12 deficiency, Folic acid deficiency, Survival disorders- Hemolytic anaemias, RBC membrane disorders- Hereditary spherocytosis, hereditary elliptocytosis, hereditary pyropoikilocytosis, paroxysmal nocturnal hemoglobinuria, Hemolysis caused by RBC metabolic disorders- G6PD deficiency, Pyruvate kinase deficiency

Leukocyte disorders: Leukopenia, leukocytosis, leukimoid reactions, cytochemical stains, Leukemia- classification, clinical features and diagnostic criteria

Myeloproliferative disorders: General features and classification

Plasma cell disorders: Classification and Disorders

Unit 5

Blood groups: In hematology and transfusion medicine, Erythroblastosis foetalis

Blood transfusion: Indications, Selection of blood donors, autologous transfusions, Complications of blood transfusion, Investigations of suspected transfusion reactions.

Unit 6

Electronic cell counting, Blood cell histogram, Laser Scatter Counting and Flow Cytometry

PRACTICALS - MBC P 117 CLINICAL HAEMATOLOGY

Estimation of Hemoglobin, TC, DC,ESR,PCV,BT,CT,Osmotic fragility, Reticulocyte count, Eosnophil count, PT,APTT, Prepration of peripheral Smear, Determination of fetal hemoglobin, Ames test

PART-II MBC C 115 - BIOMEDICAL INSTRUMENTATION & RESEARCH **METHODOLOGY**

THEORY

Unit I

Laboratory instruments

Laboratory equipments like desiccators, homogenizers, centrifuges, ovens, incubators, magnetic stirrer, vortex mixer, autoclaves, deep freezer, walkin coolers, Diathermy and balances.

Unit II

Spectrometric and Spectroscopic Techniques

Basic principles, instrumentation and applications of fluorimetry, chemi and bio luminometry, flame photometry, Spectrophotometry, principles and applications of biosensors, UV,IR,CD,ORD,ESR, NMR and Mass spectroscopy, X-ray crystallography etc. MRI and CT scanners, Blood gas analyzers

Unit III

Separation Techniques

Electrophoresis- basic principles, practical instrumentation and applications of paper and gel electrophoresis, cellulose acetate and starch, agar, agarose and polyacrylamide gel electrophoresis, isoelectric focusing, isotachopheresis, immuno electrophoresis.

Chromatography

general principles and applications of column and thin layer chromatography, paper chromatography, ion exchange and molecular exclusion chromatography, affinity chromatography, affinity tag chromatography, HP-TLC, HPLC & GLC.

Centrifugal methods

Sedimentation and centrifugation, ultra centrifugation, density gradient centrifugation, determination of molecular weight using centrifugation methods, cell fractionation by differential centrifugation.

Unit IV

Radioisotopic Techniques

Radiations, units of measurement of radioisotopes and radiation, interaction of ionising radiation with matter, biological effects of ionising radiations, measurement of alpha, beta and gamma rays using scintillation counters and GM counters, corrections and precautions for counting radio-activity, statistics of radiation measurements, autoradiography, use of radioisotopes in medicine, maximum permissible levels, radiation protection and disposal of radio active waste, general laboratory guide lines for handling radio isotopes.

Computer related introductory topics : History of development of computers, basic components of computers, Hardware, CPU, input, output, storage devices, software, operating systems, programming languages.

Unit V

Research Methodology

Introduction to research methodology, design of experiments, randomization, replication, local control, completely randomized and randomized block design, nonparametric tests, ethical approval and project proposal writing, preparation and organization of literature search, effective and critical communication in biomedical sciences including peer review process.

Unit VI

Bio-Medical Statistics

Basic concepts of sampling, statistical population, random sampling, tabular and graphical presentation of data, mean, median, mode, normal distribution, probability and probability distribution, frequency distribution and frequency histograms, dispersion of data, standard deviation, coefficient of variation, mean absolute deviation, linear regression analysis, correlation coefficient, tests for distribution, scatter plots, hypothesis testing and tests of

significance of parametric and non-parametric data like Wilcoxon test, Student's 't' test, 'z' test, 'F' test and chi square test, tests of confidence – confidence interval and tolerance limits, statistics in genetics.

Unit VII

Care and management of experimental animals.

PRACTICALS - MBC P 118- BIOMEDICAL INSTRUMENTATION & RESEARCH METHODOLOGY

Separation of carbohydrates using paper chromatography. Thin layer chromatography for the separation of aminoacid and carbohydrates, agar, agarose and polyacrylamide gel electrophoresis of normal and abnormal serum proteins, cellulose acetate electrophoresis of abnormal hemoglobins like hemoglobin S, flame photometric determination of serum sodium, potassium, calcium and lithium, Demonstration of estimation of serum sodium, potassium and chloride by ISE, demonstration of G-M counter and scintillation counters.

Visit to institutions for acquainting with techniques like HPLC, GLC, NMR and ESR.
Recommended institutions- institutions with the above facilities.

PART-II MBC C 120 - ENDOCRINOLOGY AND REPRODUCTIVE BIOLOGY

THEORY

Endocrinology:- Endocrine glands and their secretion - chemistry, biosynthesis, regulation of secretion, metabolism and disorders of the hormones of the hypothalamus, hypophysis, pancreas, thyroid, parathyroid, adrenal, testes, ovaries and placenta, evaluation of endocrine functions with special reference to thyroid and adrenal cortical function tests, hormones of GI tract, kidneys, pineal glands, autocrine and paracrine secretions. Neurotransmitter and related diseases.

Signal Transduction:- Signal transduction pathways and types of hormone receptors-nuclear and cell surface receptors, signal transduction by G protein, calcium messenger system, receptors for insulin and growth factors, receptors for growth hormone and prolactin, protein kinases and their role in cancer.

Reproductive Biology:- Regulation of spermatogenesis and testicular steroidogenesis, metabolism of testosterone, reproductive and non reproductive effects of androgens, male reproductive cycles and male contraception, biochemistry of ovulation, menstrual cycle, pregnancy, parturition and lactation, metabolism and biological effects of estrogens and progesterone, biochemical changes in pregnancy, feto-placental unit, feto-placental function tests - biochemical tests for detecting Rh incompatibility, fetal lung maturity, neural tube defects and genetic disorders, biochemical aspects of male and female infertility, pharmacological enhancement of fertility.

PRACTICALS - MBC P 123- ENDOCRINOLOGY AND REPRODUCTIVE BIOLOGY

Glucose tolerance tests, analysis of urine for 17-ketosteroids (Zimmerman reaction) HIA and VMA and estriol in urine., determination of serum total and tartarate labile acid phosphatase, analysis of semen for fructose, SDH, citrate and choline. Estimation of T3, T4, TSH, Thyroglobin, Cortisol, Catecholamines.

Clinical Training

Posting in the Biochemistry Lab of hospitals for acquainting with hormone analysis. Recommended institutions - Diagnostic labs with facility of hormone assays using chemiluminescence and immunological techniques.

PART-II MBC C 121 - ENZYMOLOGY

THEORY

Enzymes:- Definition and general properties of enzymes, IUB classification and nomenclature, enzyme specificity, active site and enzyme-substrate complex, factors governing the rate of enzyme catalyzed reactions, chemical kinetics-zero order, first order and second order reactions and activation energy, enzyme inhibitions-reversible, irreversible and partially reversible inhibitions activity, catalytic mechanisms of enzymes - acid - base, metal ion, covalent and electro static catalysis, proximity and orientation effects, preferential transition state binding, enzyme regulation - feedback regulation-kinetics, examples and theoretical models for allosteric enzymes, covalent modifications, zymogen activation, induction and repression, coenzymes, cofactors and prosthetic groups, isoenzymes, isolation and purification of enzymes, various methods for enzyme assay, units of enzyme activity enzymes as analytical, diagnostic and therapeutic agents, immobilized enzymes

PRACTICALS - MBC P 124- ENZYMOLOGY

Effect of temperature, pH, enzyme concentration and substrate concentration on the rate of enzyme catalysed reactions, determination of K_m values of enzymes using hyperbolic and linear plots, determination of enzyme inhibitions, Isolation, purification and characterization of peroxidase

PART-II MBC C 122 - IMMUNOLOGY

THEORY

Unit 1

Basic Immunology- Basic Principles of Immunology, Types of immunity, Different types of immune responses, Components of Immune system, Haematopoiesis, Cells and organs of Immune system

Unit 2

Classification of Immunoglobulins - Their chemistry and role .- Antibody production using Animals., Monoclonal Antibody production, Theories of Antibody production, and subclasses. Isotypes, Allotypes,. Idiotypes, class switching, Abnormal Immunoglobulins

Unit 3

Antigens- definition- classification-chemistry , properties of Antigens & immunogens, haptens, partial antigens, Heterologous and homologous Antigen , super Antigen, Antigenic determinants.

Unit 4

Formation ,differentiation and maturation of B-cells, effector mechanisms and accessory cells of humoral immunity.

Unit 5

Cell mediated Immunity- T cell subtyping – based on CD's, formation, differentiation and maturation of T cells, MHC and MHC genes. Antigen processing and APC's , Lymphokines and cytokines in CMI , Effector mechanism of CMI

Unit 6

Immunoglobulin and T-cell receptor genes and their rearrangements. Genetic basis of heterogeneity, and TCR's. Antigen- Antibody Reaction Precipitation and Agglutination reactions. immunodiffusion, immunological techniques- ELISA, RIA, Immuno blotting techniques, Neutralizations test, Coomb's test, Immunofluorescence, immunocytochemical/histochemical techniques

Unit 7

Complement system, its components, and pathways. Regulation, consequence of complement activation.

Unit 8

Principles of Immunization Molecular basis & Immunological memory. Different types of vaccines and vaccination schedules.
Immunity to infections by viruses, bacteria, fungi, protozoal and other parasites.
Mechanism of - Antibody Mediated inactivation.-Direct and indirect

Unit 9

Definitions, types of hypersensitivity -Allergy, drug allergy: Atopy, Auto immunity, Immune deficiency disorders, Connective tissue diseases, Tumor immunology, Immunology of AIDS

Unit 10

Immunohematology and transfusion immunology, Transplantation immunology, GVHR, Granulomatous reaction, HLA typing.

PRACTICALS - MBC P 125 IMMUNOLOGY

Antigen – Antibody Reaction-Agglutination, Coagulation and Precipitation Reactions
WIDAL and VDRL tests, Immunodiffusion, Immunoelectrophoresis of plasma
Immunoglobulin, Demonstration of RIA, Western Blott, Hemagglutination test – Blood
grouping, Hemagglutination inhibition test. Coomb's test – ICT, DCT, Complement
fixation test.

Lymphocyte culture, Delayed type hypersensitivity testing, Detection of Tumor
markers, Histocompatibility testing, Detection of Immuno complex, FITC Conjugation
of Antibody, Isolation of lymphoid organs of mice, Neutrophil function test

PART-II MBC C 127 – METABOLISM & INHERITED METABOLIC DISORDERS

THEORY

Inborn errors of carbohydrates metabolism - intestinal lactase deficiency, glycogen storage diseases, glucose 6 phosphate dehydrogenase and other enzyme deficiencies, mucopolysaccharidoses, galactosemia, fructosemia, etc.

Inborn errors of lipid metabolism- obesity, cachexia, idiopathic hyperlipidemia, Goucher's disease, Niemann-Pick disease, Tay-Sach's disease, Fabry's disease, hyper and hypo lipoproteinemias etc.

Inborn errors of amino acid and protein metabolism- alkaptonuria, phenyl ketonuria, maple syrup urine disease, hypervaleremia, hyperoxaluria, glycinuria, cystinuria, cystinosis, homocystinuria, Hartnup disease etc.

Inborn errors of metabolism of purines and pyrimidines- gout, Lesh-Nyhan syndrome, hypo-uricemia, orotic aciduria etc.

Hemoglobinopathies, porphyrias etc

PRACTICALS – MBC P 129 - METABOLISM & INHERITED METABOLIC DISORDERS

Screening test for urinary PKU, porphobilinogen (modified Ehrlich reagent) G6 PD deficiency, (MB spot test). Identification of galactose and fructose in urine, Test for diagnosing inborn errors of metabolism like alkaptonuria, phenyl ketonuria, maple syrup diseases, Cysteine and homocystine in urine, Hemoglobin electrophoresis, hydroxy protein estimation in urine, detection and identification of amino acids and mucopolysaccharidosis in urine

Practical Training

Visit to institutions for acquainting with the diagnosis of inherited metabolic disorders. Recommended institutions- institutions with the facilities for detecting inherited metabolic disorders.

PART-II MBC C 128 MOLECULAR BIOLOGY AND MEDICAL GENETICS

THEORY

Unit I

Microbial genetics-structure recombination and variations in bacterial and viral genome, mutations, recombinations and transposable elements.

Unit II

DNA replication in prokaryotes and eukaryotes, DNA damage, repair mechanisms and human diseases, telomeres, telomerase and end replication, inhibitors of replication.

Transcription in prokaryotes and eukaryotes, post transcriptional processing of mRNA-snRNA, hnRNA and small nuclear ribonucleo proteins, rRNA processing- self splicing RNA's and ribozyme, processing of tRNA, DNA- protein interactions and DNA binding motifs.

Unit 3

Genetic code, ribosomes and translation, post-translational modifications, protein folding and chaperonins, prions, prion diseases, Alzheimer's disease and other tauopathies, protein targeting, protein sorting, transport, secretion and trafficking of proteins, compartment disorders, inhibitors of protein synthesis and related disorders, regulation of gene expression in prokaryotes and eukaryotes, molecular bases of morphogenesis and ageing, theories of ageing.

Mitochondrial genome, expression of mitochondrial DNA, mt.DNA mutations, deletions and human diseases, tRNA mutations.

Unit 4

Molecular Oncology:- Molecular events in cell cycle-cyclins, CDK's, growth factors and transcription factors in the regulation of cell cycle and their role in apoptosis and cancer, nomenclature of tumors, alterations in morphology, ultrastructure and metabolism of cancer cells, metastasis, molecular basis of cancer - procarcinogens and their activation, oncogenes, protooncogenes, pseudogenes and tumour suppressor genes, role of growth factors in

malignant transformation, role of proteinases and proteinase inhibitors in metastasis and anticancer therapy, anticancer therapeutic agents and their mechanism of action.

Unit 5

DNA Technologies and Genetic Engineering :- Restriction endonucleases and their nomenclature, DNA sequencing techniques - chemical, enzymatic and automated sequencing methods, restriction mapping, recombinant DNA technology - cloning techniques, cloning vectors, ligation of foreign DNA, methods of gene transfer, cDNA and genomic library, screening for recombinants, blotting techniques - Western, Southern, and Northern blotting, PCR and LCR and their applications, RFLP's and DNA finger printing, RNA finger printing, applications of recombinant DNA technology in bio-medical sciences, transgenes, transgenic animals and their uses.

Unit 6

Medical Genetics:- Organization of the human genome, gene and chromosome structure, function and inheritance, repetitive DNA in human genome, functional organization of telomeres and centromeres, methods for human genetic study-pedigree analysis, chromosomal analysis, biochemical analysis, somatic cell and molecular genetic analysis, human genome mapping – genetic mapping, physical mapping, RFLP's, pulse field gel electrophoresis, yeast artificial chromosomes, bacterial artificial chromosomes, P1 derived artificial chromosomes, expressed sequence tags, sequence tagged sites, microsatellite and single nucleotide polymorphisms, human genome project, identification and isolation of disease genes, karyo-typing, preimplantation, prenatal, perinatal and neonatal screening for inherited disorders using gene cloning, RFLP's, PCR, mini-satellites and micro satellites, socio-ethical and medico-legal considerations of human genetics and genetic counseling, gene therapy.

Unit 7

Genomics-data bases in gene and genome analysis, data mining, inventories and sequence homology search, introduction to pharmacogenetics and toxicogenetics, elements of nano technology.

Proteomics- 2-D analysis of cell proteins, analysis and sequencing of individuals spots by Mass spectrometry (Malditoff) and protein microarrays.

Unit 8

Cell culture – Basic principles of animal and human cell and tissue culture, culture media, culture equipments, decontamination etc., long term and short term cultures, lymphoblastoid cell lines and stem cell biology, applications of cell and tissue cultures in biomedical sciences.

PRACTICALS - MBC P 130 - MOLECULAR BIOLOGY AND MEDICAL GENETICS

Study of mitotic and meiotic stages, Isolation of nucleic acids from prokaryotes and eukaryotes, determination of rat spleen DNA content by diphenylamine method, Electrophoretic separation of nucleic acids, PAGE isolation of rat spleen DNA, isolation of plasmids, isolation of mutants, Ames test, Karyotype preparation, PCR.

Visit to molecular biology lab of reputed institutions for acquainting with DNA manipulations and molecular diagnostic techniques. Recommended institutions – institutions with the facilities of PCR and other DNA manipulation techniques.

PART-II MBC C 134 - CLINICAL BIOCHEMISTRY

THEORY

AIDS & Cancer : HIV genes and gene products, biochemical changes during HIV infection, diagnosis and precautions, Etiology and major symptoms of cancer, preventive steps, oncogenic viruses, Oncogenes, antimutagens, antioncogenes, oncosuppressor genes, Tumor kinetics, tumour markers, anticancer drugs, drug resistance

Acute phase proteins : Diagnosis and clinical significance of C-reactive proteins, alpha fetoprotein, alpha 1 antitrypsin, alpha 2 macroglobulin, haptoglobin, ceruloplasmin....etc.

Laboratory Management:- Specimen collection-blood specimen types, collection of blood by veni puncture, skin puncture and special collection procedures, anticoagulants, specimen transport and processing, random and timed urine collections, methods of urine preservation and storage, collection of other body fluids like CSF, semen, peritoneal and amniotic fluids, methods of de-proteinization, laboratory safety-safety equipments, chemical, radiation, electrical and fire safety, control of laboratory hazards and disposal of hazardous materials, good laboratory practices and standard operating procedures.

Quality Control:- Pre-analytical, analytical and post-analytical errors in clinical biochemistry, standardization of laboratory methods, use of pooled serum, acquisition of standards for laboratory estimations, selection and evaluation of methods - with special reference to the determinations of blood glucose, urea creatinine, cholesterol, plasma proteins and serum enzymes, measurement of imprecision and inaccuracy, gross, systematic and random errors, quality assurance and quality control, statistical methods of analysis of results, determination of precision, reference ranges, statistical analysis of reference range data, diagnostic sensitivity, specificity and predictive value.

Automation and Computers:- Automation in clinical biochemistry-classification and working principles of autoanalyzers, micro processors and computers in clinical biochemistry-automated data processing, basics of computer software and hardware, hospital and laboratory information system, acquiring and implementing laboratory information system, microcomputers and work-station computers.

PRACTICALS - MBC P 136- CLINICAL BIOCHEMISTRY

Practical

Detection/estimation of C reactive proteins, AFP, Haptoglobin, Ceruloplasmin. Diagnosis of HIV. Demonstration of Western blotting. Determination of serum glucose, cholesterol and triglycerides using automated enzymatic techniques and comparison with nonenzymatic methods, analysis of pooled serum and preparation of QC chart using Levi-Jenning graph,

Clinical Training

Posting in the Biochemistry Lab of hospitals/ diagnostic labs for acquainting with QC programmes and clinical enzyme assays. Recommended institutions - Diagnostic labs with the facility for training with autoanalyzers.

PART-II MBC C 135 - NUTRITION AND DIETETICS

THEORY

Nutrition:- Energy values of different foods, energy requirements, respiratory quotient, basal metabolic rate, specific dynamic action, proximate principles of food, essential fatty acids, essential amino acids, protein efficiency ratio and biological value of proteins, protein quality, protein requirement, requirement of carbohydrate and lipids, role of fibre in nutrition.

Benefits of exercise and dieting, nutritional deficiencies, food toxins and additives, contraceptives and tobacco smoking related diseases. Role of diet and lifestyle with relation to major diseases and their prevention and cure.

Dietetics:- Balanced diet, recommended dietary allowances, nutritional requirements in infancy, preschool and school children, adolescents, adults, geriatric groups and in pregnancy and lactation, formulation of balanced diet and nutritional adaptation, undernutrition, malnutrition and overnutrition, energy metabolism and obesity, biochemical mediators of obesity, assessment of nutritional status in individuals and populations, nutritional management of diseases like diabetes, obesity, CAD, renal and hepatic diseases, vitamin deficiencies, nutritional anemias, etc, food toxins, food additives, preservatives, nutraceuticals etc.

PRACTICALS - MBC P 137 NUTRITION AND DIETETICS

Analysis of milk fat, Lactose and Casein. Estimation of fructose in fruits, Analysis of honey, estimation of Vitamin C content in orange and iron in bittergourd, Determination of thiamine, riboflavin, niacin, folic acid and cyanocobalamin in blood.

PART-II MBC C 138 RESEARCH PROJECT

Students in the Sixth Semester after completion of their Practical/ Clinical Training will progress to the curricular Research Project. Each student is required to undertake and carry out a brief research work on a topic in Bio-Medical Sciences of current importance. After completion of the research project in the stipulated time, each student has to submit 3 hard copies and 2 soft copies of the dissertation report of the work before registering for the final Semester Examinations.

LEARNING RESOURCE MATERIALS

A. Suggested Reading

Anatomy

1. Ross and Wilson-Anatomy and Physiology in Health & Diseases, Churchill Livingstone , (2001)
2. Kyung Won Chung-Gross Anatomy, Board Review Series
3. Inderbir Singh-Text Book of Anatomy & Embryology, Jaypee Publishers
4. Tansey E.M- Gray's Atlas of Anatomy
5. Ranganathan -Human Anatomy
6. Johnson K.E. -Histology & Cell Biology, NMS, Williams and Wilkins
7. Cunningham's practical anatomy-3volumes
8. Clinically oriented anatomy by regions- R.Snell
9. Human embryology- I.B Singh
10. Human histology- I.B. Singh
11. Neuroanatomy-I.B.Singh.
12. Gray's Anatomy
13. Grants method of Anatomy
14. Grants Atlas of Anatomy

Physiology

1. Keele C.A., Neil.E. & Joels N.-Samson Wright's Applied Physiology, Oxford University Press
2. Ganong W.F. - Review of Medical Physiology, Appleton Lange
3. Green J.H.-Basic Clinical Physiology, ELBS
4. Text book of medical Physiology-Arthur.C.Guyton
5. Concise Medical Physiology – Sujith K. Choudhuri.
6. Essentials of Medical Physiology – Anil Bavan singh and Maha Pathra.
7. Review of medical Physiology – William F.Ganong
8. Physiological basis of medical Practice – Best & Taylor
9. Applied Physiology – Samson Wright.
10. Text book of Medical Physiology-Prof. A.K.Jain
11. Essential Medical Physiology- Leonadr R.Johnson

12. Essential of Medical Physiology- K. Sembulingam & Prema Sembulingam
13. Manual of Practical Physiology- A.K. Jain
14. Text book of Medical Physiology – Indu Khurana

Microbiology

1. Text book of Microbiology – R.Anantha Narayanan & C.K. Jayaram Panicker.
2. Sterilization and Disinfection-G.Sykes.
3. Mackie and McCartney practical Medical Microbiology.
4. Microbiology-Daniel Lim
5. Antimicrobials in Laboratory medicine – Ashok Ratan.
6. Microbiology – Prescott.
7. Microbiology -Pelczar
8. Microbiology an introduction-Tortora
9. Hand book on care and management of Lab animals-U.Faw.
10. Javetz, Melnick and Adelbergs et.al-Medical Microbiology, Prentice Hall

Biophysical Chemistry

1. van Holde K.E.-Biophysical Chemistry, Prentice Hall
2. Volkenstein M.V.-Biophysics, Mir Pub.
3. Debajyoti Das-Biophysics and Biophysical Chemistry, Academic Pub.

Biochemical Techniques

1. Keith Wilson & John Walker-Practical Biochemistry Principles and Techniques, Cambridge University Press
2. Boyer R.-Modern Experimental Biochemistry, Brooks Cole Thomson Learning
3. Wharton D.C. & Mc Carty R.E. -Experiments and Methods in Biochemistry, Mac Millan
4. Work T.S. & Work E.- Laboratory Techniques in Biochemistry and Molecular Biology
5. Cooper T.G.-The Tools of Biochemistry, Wiley

Biochemistry

1. West E.S, Todd W.R., Mason H.S. & Bruggen J.V. - Biochemistry, Oxford and IBH Pub.Co. Pvt.Ltd.
2. Stryer L. -Biochemistry, W.H. Freeman and Co.
3. Nelson Nelson D.L. & Cox. M.M Lehinger's Principles of Biochemistry, Mc Millan Worth Publishers.
4. Voet, D. & Voet, J.G. Biochemistry John-Wiley & Sons.
5. Debajyoti Das-Biochemistry, Academic Pub.
6. Conn E.E. & Stumpf P.K. -Outlines of Biochemistry, Wiley Eastern
7. Boyer D. -Concepts in Biochemistry, Brook Cole Thomson Learning
8. Zubay G. -Biochemistry, Vol. I, II& III, WCB Pub.
9. Smith E.L. Hill R.L. Lehman I.R. Lefkowitz R.Z, Handler P. and White A.- Principles of Biochemistry, Vol. I & II, Mc Graw Hill International
10. Mazur A. and Harrow B. A Text Book of Biochemistry, Saunders
11. Mathews C.K, van Holde K.E. Ahern K.G.-Biochemistry Pearson Education Asia Pte. Ltd.

Haematology

1. Dacie & Lewes Practical Hematology, International Edition- 11th Edition
2. Clinical Hematology & Fundamentals of Hemostasis- Denise. M.Harmening- 5th Edition
3. Essentials in Hematology& Clinical Pathology- Ramadas Nayak, Sharada Rai, Astha Gupta- 1st Edition
4. Hematology: Clinical Principles and Applications- Bernadette.F. Rodak, George.A.Fritsma, Elaine.M.Keohane- 4th Edition
5. Hematology in Clinical Practice - Robert.S.Hillman, Kenneth.A. Ault, Michel Leporrier, Henry. M.Rinder- 5th Edition
6. Practical Manual of Hematology- Girish Kamat- 1st Edition
7. Wintrobe's Clinical Hematology- 13th Edition
8. Text book of Medical Laboratory Technology- Godker- 2nd Edition
9. Medical Laboratory Technology Vol: I, II & III – Kanai. L . Mukherjee- 2nd Edition

Enzymes

1. Dixon M. and Webb E.C.-Enzymes , Academic Press
2. Boyer P.D. The Enzymes , Academic Press

Bioenergetics

1. Lehninger AL-Bioenergetics -The Molecular Basis of Biological Energy Transformations, Benjamin
- 2.

Medical Biochemistry

1. Murray R.K, Granner D.K, Mayer P.A. and Rodwell V.W.-Harper's Biochemistry, Appleton Lange
2. Devlin. T.M. Text Book of Biochemistry with Clinical Correlations Wiley-Liss
3. Bhagavan N.V-Medical Biochemistry, Elsevier
4. Vasudevan D.M. and Sreekumari S-Text Book of Biochemistry, Jay Pee Bros.
5. Nagini S-Text Book of Biochemistry- Molecular and Clinical Aspects, Scitech Pub.

Clinical Biochemistry

1. Burtis C.A, Ashwood E.R-Teitz Text Book of Clinical Chemistry, Harcourt Brace and Co.
2. Mayne P.D-Clinical Chemistry in Diagnosis and Treatment, ELBS

Inborn Errors of Metabolism

1. Stanbury J.B. Wyngaarden J.B and Frederickson D.S-The Metabolism of Inherited Diseases -Mc Graw Hill Co.
2. Hoffman-Inherited Metabolism, J.B. Lippincott.
3. Scriver C.R. et.al. -The Metabolic and Molecular Basis of Inherited Diseases, Mc Graw Hill.
4. Marshall W.J. Bangert C.K. -Clinical Biochemistry-Metabolic and Clinical Aspects, Churchill Livingstone

Endocrinology and Reproductive Biology

1. Wilson J.D. Foster D.W, (eds.) William's Text Book of Endocrinology W.B. Saunders Co.
2. Smith L.H, Their S.O. (eds.) Pathophysiology- The Biological Principles of Disease, Saunders,
3. Lavin -Manual of Endocrinology and Metabolism
4. Insler V. Lunenfeld B. -Infertility Male and Female Churchill Livingstone
5. Speroff.L, Glan R.H, Kase N.G. Clinical Gynaecologic Endocrinology and Infertility , Williams and Wilkins,
6. Talwar C.P.-Text Book of Biochemistry and Human Biology

Immunology

1. Goldsby R.A. Kindt T.J. Osborne B.S. and Kuby. J- Immunology-W.H. Freeman and Co.
2. Roitt I and Delves P.J. - Essential Immunology, Blackwell Science
3. Roitt I, Brostoff J, Male. D-Immunology, Mosby
4. Weir D.M. and Stewart J- Immunology, Churchill Livingstone
5. Stites D.P, Terr A.I. and Parslow T.G- Basic and Clinical Immunology Prentice Hall International Inc.

Molecular Biology, Medical Genetics and Oncology

1. Lewin B- Genes VII, Oxford University Press
2. Freidfelder, D- Molecular Biology, Oxford Immunity Press
3. Elliot W.H. and Elliot D.C-Biochemistry and Molecular Biology, Oxford University Press
4. Sheeler P. and Bianchi D.E-Cell and Molecular Biology, John Wiley and Sons
5. Tamarin R.H.-Principles of Genetics, Tata Mc Graw Hill
6. Gardener, Simmons and Snustad-Principles of Genetics
7. Gelehrter -Principles of Medical Genetics, J.B. Lippincott
8. Mueller R. and Young L-Emery's Elements of Medical Genetics, Churchill Livingstone
9. Primrose S.B.-Principles of Gene Manipulation, Blackwell Science

10. Ruddle R.W(ed) -Cancer Biology, Oxford University Press
11. Tannock I. F. and Hill R.P- The Basic Science of Oncology, Pergamon Press
12. Franks L.M. and Teich N.M. -Introduction to Cellular and Molecular Biology of Cancer, Oxford University Press
13. Kumar A and Srivastava A.K-Advanced Topics in Molecular Biology, Horizon Scientific Press

Nutrition

1. Garrow J.S, James W.P.T. and Ralph A. -Human Nutrition and Dietetics, Churchill Livingstone
2. Passmore R. and Eastwood M.A.-Davidson and Passmore's Human Nutrition and Dietetics, Churchill Livingstone
3. Swaminathan M-Principles of Nutrition and Dietetics, Bapcco

Pharmacokinetics and Toxicology

1. Gilman A.S, Goodman L.S, Rall T.W, Murad F-Goodman and Gilman's The Pharmacological Basis of Therapeutics, Mc Millan
2. Kaye S-Handbook of Emergency Toxicology, Charles C Thomas
3. Sunshine I-Methodology for Analytical Toxicology, CRC Press
4. Mungal D.R- Applied Clinical Pharmacokinetics, Raven Press

Bio-Medical Statistics

1. Campbell M.J. and Machin D-Medical Statistics A. Commonsense Approach, John Wiley and Sons
2. Bailey N.T.J-Statistical Methods in Biology, Cambridge University Press

Miscellaneous

1. Williams W. et.al (eds)-Hematology, Mc Graw Hill
2. Wintrobe M. et.al-Clinical Hematology, Lea and Febiger
3. Champe P.D-Illustrated Biochemistry, JB Lippincott
4. Stedman-Stedman's Medical Dictionary, JB Lippincott

Practical

1. Oser B.L. (ed)-Hawk's Physiological Chemistry, Mc Graw Hill Book Co.
2. Plummer D.T- An Introduction to Practical Biochemistry , Tata Mc Graw Hill
3. Varley H-Practical Clinical Biochemistry, CBS Pub.
4. Varley H, Gowenlock A.H and Bell M-Practical Clinical Biochemistry, Vol. I &II, William and Wilkins
5. Gowenlock A.H-Varley's -Practical Clinical Biochemistry, CBS Pub.
6. Fraiss F.- Practical Biochemistry, Butterworths
7. Mohanty B. and Basu S-Fundamentals of Practical Clinical Biochemistry, BI Pub. Pvt. Ltd.
8. Raphael S (ed)-Lynch's Medical Laboratory Technology, Saunders
9. Kaplan A. et.al- Clinical Chemistry, Mosby
10. Henry J.B-Clinical Diagnosis and Management by Laboratory Methods, W.B. Saunders
11. Richterich R. Colombo J.P. Clinical Chemistry, Theory, Practice & Interpretation John Wiley and Sons
12. Bishop M.L, Duben-Engelkirk J.L. and Fody F.P, Clinical Chemistry, Principles, Procedures and Correlations -J.B. Lippincott
13. Godkar P.B. and Godkar P.D- Medical Laboratory Technology, Bhilani Pub. House
14. Mukharjee K.L- Medical Laboratory Technology- A Procedure for Routine Diagnostic Tests Vol. I & III, Tata Mc. Graw Hill
15. Bauer J.D-Clinical Laboratory Methods

M.Sc. MEDICAL BIOCHEMISTRY – ELECTIVES

1. CLINICAL EMBRYOLOGY

Unit I

Fundamentals of Clinical Embryology

Fundamentals of Clinical Embryology

Meiosis

Gametogenesis

Endocrinological control of human reproduction

Molecules of human reproduction

Investigating the male and female patient

Molecular and cellular biology and related techniques eg PCR.

Genetics of infertility.

Reproductive function and causes of subfertility

Unit II

IVF and Embryo Culture

The development of ART

Tissue culture technique

IVF culture media and techniques

Quality control

Health and safety in the laboratory

COSHH.

Handling and culture techniques particular to oocytes and embryos

Oocyte retrieval

Oocyte preparation for ICSI

IVM of oocytes

Follicular culture.

Sperm retrieval methods

Sperm preparation techniques

Preimplantation embryo development

Implantation and placentation.

Miscarriage and ectopic pregnancy

Principles and practices of laboratory design

Unit III

Micromanipulation

Assisted fertilisation and micromanipulation techniques (ICSI, SUZI, Zona Dissection etc.), microtools, assisted hatching.

Embryo biopsy-cleavage stage biopsy, blastocyst biopsy, polar body biopsy, biopsy for PGD + PGD molecular methods.

Embryonic Stem cells, developmental biology, derivation and application

Epigenetics and ART-induced disorders of genomic imprinting

Unit IV

Cryobiology and Cryopreservation

Basic cryobiology.

Cryopreservation of gametes, sperm freezing, egg freezing.

Gonadal cryopreservation.

Embryo cryopreservation.

Unit V

Ethics and Law for Embryologists

Ethics and clinical embryology.

Ethical issues and problems in clinical embryology.

References

1. Text book of Clinical Embryology. Kevin coward, Dagan Wells. First Edition, 2013
2. Human Embryology and Developmental biology. Bruce carlson. Fifth Edition, 2013
3. *Larsen's human embryology* (5th ed.). New York; Edinburgh: Churchill Livingstone. Schoenwolf, G.C., Bleyl, S.B., Brauer, P.R., Francis-West, P.H. & Philippa H. (2015).
4. *The developing human: clinically oriented embryology* (10th ed.). Philadelphia: Saunders. Moore, K.L., Persaud, T.V.N. & Torchia, M.G. (2015)
5. Langman's Medical Embryology 11th ed., Sadler, T W, (Thomas W.); Langman, Jan. Philadelphia : Wolters Kluwer Lippincott Williams & Wilkins, c2010

2. ENVIRONMENTAL TOXICOLOGY

Unit I

Introduction to Environmental Toxicology

Definition ,Terminology,History, Subdiscipline , Ecological Concepts ,Relevance of Environmental Toxicology to the human species

Unit II

Toxicological Concepts

Toxicity, Toxicokinetics & Toxicodynamics,Classification of Toxicants, Variables affecting toxicity, Dose-response relationship

Unit III

Environmental Toxicants

Introduction , Air/ Water/Food related toxicants ,Classes of toxicants – organic toxicants and organic solvents ,Metals, plastics, pesticides & other environmental toxicants ,Environmental carcinogens and mutagens ,Biomarkers

Unit IV

Risk Assessment

System toxicity- Pulmonary ,hepato ,Renal ,Neuro ,Immune ,Endocrine ,Heart ,Vascular ,Reproductive ,Visual & Occupational Toxicity. Introduction to risk Management & Assessment and safety

References

- 1.Essentials of Environmental Toxicology -W.William Hughes
- 2.Environmental Toxicology -David .A. Wright and Pamela Wellbourn
- 3.Basic Environmental Toxicology edited by Lorris G.Cockerham,Barbara S. Shane

3. GENERAL AND CLINICAL PATHOLOGY

UNIT 1

Definition and causes of diseases - definition in pathology and causes of cell injury
Modes of cell injury - Mechanisms of cell injury and the morphological changes
Necrosis & gangrene - types of necrosis and gangrene at gross and microscopic levels.
Apoptosis and its relevance

UNIT 2

Acute Inflammation

Chemical mediators of Inflammation – definition, classification, description of each type ,
role of acute & chronic Inflammation

Chronic Inflammation (including granulomatous) – aetiology, patterns, & systemic effects
of granulomas

Regeneration and repair (general) – Regeneration & repair and understand the mechanisms
and list factors modifying repair

Repair in specialized tissues – Oedema – definition, classification, pathogenesis & correlate
morphology with emphasis on transudates and exudates

Shock – definition, classification, pathogenesis, mediators and stages of shock

Thrombosis – etio-pathogenesis, fate, morphology and effects of thrombosis

Embolism & Infarction - types, recognition of morphological changes & correlate clinical
significance

UNIT 3

Collection, transport, preservation and processing of various Clinical specimens

Urine – Physical, chemical & microscopic examination

Sputum – Macroscopic & microscopic study, sputum for AFB

Semen – Examination, interpretation

CSF – Examination

Pregnancy tests

Faeces – Examination of samples for parasites, concentration, floatation techniques

References

12. Robbins & Cotran Pathologic basis of Disease – Vinay kumar, Abdul.K.Abbas,
Jon.C.Aster- 9th Edition
13. Boyd's Textbook of Pathology- Vol 1: General Pathology- J.R Bhardwaj,Prabal Deb-
10th Edition
14. Walter & Israel General Pathology- J.B Walter & I.C Talbot- 7th Edition
15. Anderson's Pathology- Ivan Damjanov, James Linder- 10th Edition
16. Textbook of Pathology- Harsh Mohan- 7th Edition
17. An Introduction to General Pathology- Timothy David Spector, John.S.Axford- 4th
Edition

4. ETHICS, PATENCY AND IPR

UNIT -1: ETHICS

Need of Bioethics, Ethics in patient care, Bioethics in cloning, Stem cell research, Gene therapy, Organ transplantation, Use of animals in research, Human volunteers for clinical trials.

UNIT -2: PATENCY

Patent and kind of inventions protected by a patent.

Patent document, Granting, Rights, Searching and filling of a patent.

The different layers of the international patent system (national, regional and international options).

UNIT -3: INTELLECTUAL PROPERTY RIGHTS

Overview of intellectual property

Introduction and the need for intellectual property right (IPR)

IPR in India- Genesis and Development

IPR in abroad, Different forms of IPR, their relevance to Biomedical industry.

REFERENCES:

1. The Regulatory Challenge of Biotechnology, Human Genetics and Patents., Han Somsen, 2007
2. The role of intellectual property rights in biotechnology innovation., Dvid Castle, 2009
3. The ethics of science: An introduction , David B. Resnik, 1998
4. The Routledge Companion to Bioethics, John D.Arras, Elizabeth Fenton, and Rebecca Kukla,2015.

5. PREVENTIVE MEDICINE AND PUBLIC HEALTH

Unit I

Definition- Concept of Health,Disease & Prevention,Determinants of Health,Indicators of Health, Public Health & HealthSystem,
Health related prevention, Organization, Agencies, Institution & Healthcare resourses.

Unit 2

Preventive medicine activities in Public health, risk factor evaluation, levels of prevention-primary, secondary & tertiary, side effects of immunization.

Unit3

Public Health- Mission,Assessment,Policy develepoment,Assurance
Vital statistics-the certificate of live birth, of death etc
Tools of trade-Qualitative mesurement-Ratio,Propotion,Rate(mortality)

Unit 4

Definition,Concepts, Levels & Methods of Health Education,
Education Progrmmes- National &International Programmes

REFERENCES

- 1.Preventive Medicine&Public Health- Sylvie Ratelle-9th edition
- 2..Preventive Medicine&Public Health- Brett J Cassens- 2nd edition
- 3 Textbook of Preventive & CommunitiyDentistry. SS Hiremath elsvier
- 4.Essentials of Public Health - Bernard J Turnock
- 5.Community & Public Health Nursing Promoting the Public Health- Judith Ann Allenders, Cherie Rectore,Kristine D Warner