

Annexure No.	30 B
SCAA Dated	29.02.2008

**BHARATHIAR UNIVERSITY :: COIMBATORE – 641 046**

**REGULATIONS FOR B. Sc. CLINICAL LAB TECHNOLOGY DEGREE COURSE  
WITH COMPULSORY DIPLOMA IN CLINICAL NUTRITION  
Semester System  
(with effect from 2007-2008)**

**1. Eligibility for Admission to the Course**

Candidate for admission to the first year of the **B. Sc. Clinical Lab Technology** degree course shall be required to have passed the higher secondary examination conducted by the Govt. of Tamil Nadu with Physics/Botany/Chemistry/Zoology/Biology/Nursing/ Biochemistry/ Microbiology/Computer Science/ Home Science/DMLT or Diploma in Pharmacy or Pharmacology as one of papers only eligible or other examinations accepted as equivalent there to by the Syndicate, subject to such other conditions as may be prescribed therefor.

**2. Duration of the Course**

The course shall extend over a period of three years comprising of six semesters with two semesters in one academic year. There shall not be less than 90 working days for each semester. Examination shall be conducted at the end of every semester for the respective subjects.

**3. Course of Study**

The course of study for the UG degree course shall consist of the following

**a) Part - I**

Tamil or any one of the following modern/classical languages i.e. Telugu, Kannada, Malayalam, Hindi, Sanskrit, French, German, Arabic & Urdu. It shall be offered during the first four semesters with one examination at the end of each semester.

**b) Part – II : English**

The subject shall be offered during the first four semesters with one examination at the end of each semester. During third semester Part II English will be offered as communication skills.

**c) Foundation Course**

The Foundation course shall comprise of two stages as follows:

Foundation Course A : General Awareness (I & II semesters)

Foundation Course B : Environmental Studies (III & IV semesters)

The syllabus and scheme of examination for the foundation course A, General awareness shall be apportioned as follows.

From the printed material supplied by the University	-	75%
Current affairs & who is who?	-	25%

The current affairs cover current developments in all aspects of general knowledge which are not covered in the printed material on this subject issued by the University.

The Foundation course B shall comprise of only one paper which shall have Environmental Studies.

**d) Part – III**

**Group A :** Core subject – As prescribed in the scheme of examination.

Examination will be conducted in the core subjects at the end of every semester

**Group B:** allied subjects -2 subjects-4 papers

Examination shall be conducted in the allied subjects at the end of first four semesters.

**Group C:** application oriented subjects: 2 subjects – 4 papers

The application –oriented subjects shall be offered during the last two semesters of study viz., V and VI semesters. Examination shall be conducted in the subjects at the end of V & VI semesters.

**Group D:** field work/institutional training

Every student shall be required to undergo field work/institutional training, related to the application-oriented subject for a period of not less than 2 weeks, conveniently arranged during the course of 3<sup>rd</sup> year. The principal of the college and the head of the department shall issue a certificate to the effect that the student had satisfactorily undergone the field work/institutional training for the prescribed period.

**Diploma Programme:**

All the UG programmes shall offer compulsory diploma subjects and it shall be offered in four papers spread over each paper at the end of III, IV, V, & VI semesters.

**e) Co-Curricular activities: NSS/NCC/Physical education**

Every student shall participate compulsorily for period of not less than two years (4 semesters) in any one of the above programmes.

The above activities shall be conducted outside the regular working hours of the college. The principal shall furnish a certificate regarding the student's performance in the respective field and shall grade the student in the five point scale as follows

A-Exemplary

B-very good

C-good

D-fair

E-Satisfactory

This grading shall be incorporated in the mark sheet to be issued at the end of the appropriate semester (4<sup>th</sup> or 5<sup>th</sup> or 6<sup>th</sup> semester).

(Handicapped students who are unable to participate in any of the above activities shall be required to take a test in the theoretical aspects of any one of the above 3 field and be graded and certified accordingly).

#### 4. Requirement to appear for the examinations

- a) a candidate will be permitted to appear for the university examinations for any semester if
- i) He/she secures not less than 75% of attendance in the number of working days during the semester.
  - ii) He/she earns a progress certificate from the head of the institution, of having satisfactory completed the course of study prescribed in the subjects as required by these regulations, and
  - iii) His/her conduct has been satisfactory.

Provided that it shall be open to the syndicate, or any authority delegated with such powers by the syndicate, to grant exemption to a candidate who has failed to earn 75% of the attendance prescribed, for valid reasons, subject to usual conditions.

- b) A candidate who has secured less than 65% but 55% and above attendance in any semester has to compensate the shortage in attendance in the subsequent semester besides, earning the required percentage of attendance in that semester and appear for both semester papers together at the end of the latter semester.
- c) A candidate who has secured less than 55% of attendance in any semester will not be permitted to appear for the regular examinations and to continue the study in the subsequent semester. He/she has to rejoin the semester in which the attendance is less than 55%
- d) A candidate who has secured less than 65% of attendance in the final semester has to compensate his/her attendance shortage in a manner as decided by the concerned head of the department after rejoining the same course.

#### 5. Restrictions to appear for the examinations

- a) Any candidate having arrear paper(s) shall have the option to appear in any arrear paper along with the regular semester papers.
- b) "Candidates who fail in any of the papers in Part I, II & III of UG degree examinations shall complete the paper concerned within 5 years from the date of admission to the said course, and should they fail to do so, they shall take the examination in the texts/ revised syllabus prescribed for the immediate next batch of candidates. If there is no change in the texts/syllabus they shall appear for the examination in that paper with the syllabus in vogue until there is a change in the texts or syllabus. In the event of removal of that paper consequent to change of regulation and / or curriculum after 5 year period, the candidates shall have to take up an equivalent paper in the revised syllabus as suggested by the chairman and fulfill the requirements as per regulation/ curriculum for the award of the degree.

#### 6. Medium of Instruction and examinations

The medium of instruction and examinations for the papers of Part I and II shall be the language concerned. For part III subjects other than modern languages, the medium of instruction shall be either Tamil or English and the medium of examinations is in English/Tamil irrespective of the medium of instructions. For modern languages, the medium of instruction and examination will be in the languages concerned.

#### 7. Submission of Record Note Books for practical examinations

Candidates appearing for practical examinations should submit bonafide Record Note Books prescribed for practical examinations, otherwise the candidates will not be permitted to appear for the practical examinations. However, in genuine cases where the students, who could not submit the

record note books, they may be permitted to appear for the practical examinations, provided the concerned Head of the department from the institution of the candidate certified that the candidate has performed the experiments prescribed for the course. For such candidates who do not submit Record Books, zero (0) marks will be awarded for record note books.

#### 8. **Passing Minimum**

- a) A candidate who secures not less than 40% of the total marks in any subject including the Diploma and Foundation courses (theory or Practical ) in the University examination shall be declared to have passed the examination in the subject (theory or Practical ).
- b) A candidate who passes the examination in all the subjects of Part I, II and III (including the Diploma and Foundation courses) shall be declared to have passed, the whole examination.

#### 9. **Improvement of Marks in the subjects already passed**

Candidates desirous of improving the marks awarded in a passed subject in their first attempt shall reappear once within a period of subsequent two semesters. The improved marks shall be considered for classification but not for ranking. When there is no improvement, there shall not be any change in the original marks already awarded.

#### 10. **Classification of Successful candidates**

- a) A candidate who passes all the Part III examinations in the First attempt within a period of three years securing 75% and above in the aggregate of Part III marks shall be declared to have passed B.A/ B.Sc./B.Com./B.B.M. degree examination in **First Class with Distinctions**
- b)
  - (i) A candidate who passes all the examinations in Part I or Part II or Part III or Diploma securing not less than 60 per cent of total marks for concerned part shall be declared to have passed that part in **First Class**
  - (ii) A candidate who passed all the examinations in Part I or Part II or Part III or Diploma securing not less than 50 per cent but below 60 per cent of total marks for concerned part shall be declared to have passed that part in **Second Class**
  - (iii) All other successful candidates shall be declared to have passed the Part I or Part II or Part III or Diploma examination in **Third Class**

#### 11. **Conferment of the Degree**

No candidate shall be eligible for conferment of the Degree unless he / she,

- i. has undergone the prescribed course of study for a period of not less than six semesters in an institution approved by/affiliated to the University or has been exempted from in the manner prescribed and has passed the examinations as have been prescribed therefor.
- ii. Has satisfactorily participated in either NSS or NCC or Physical Education as evidenced by a certificate issued by the Principal of the institution.
- iii. Has successfully completed the prescribed Field Work/ Institutional Training as evidenced by certificate issued by the Principal of the College.

#### 12. **Ranking**

A candidate who qualifies for the UG degree course passing all the examinations in the first attempt, within the minimum period prescribed for the course of study from the date of admission to the course and secures I or II class shall be eligible for ranking and such ranking will be confined to 10

% of the total number of candidates qualified in that particular branch of study, subject to a maximum of 10 ranks.

The improved marks will not be taken into consideration for ranking.

**13. Additional Degree**

Any candidate who wishes to obtain an additional UG degree not involving any practical shall be permitted to do so and such candidate shall join a college in the III year of the course and he/she will be permitted to appear for part III alone by granting exemption from appearing Part I, Part II and common allied subjects (if any), already passed by the candidate. And a candidate desirous to obtain an additional UG degree involving practical shall be [permitted to do so and such candidate shall join a college in the II year of the course and he/she be permitted to appear for Part III alone by granting exemption from appearing for Part I, Part II and the common allied subjects. If any, already passed. Such candidates should obtain exemption from the university by paying a fee of Rs.500/-.

**14. Evening College**

The above regulations shall be applicable for candidates undergoing the respective courses in Evening Colleges also.

**15. Syllabus**

The syllabus for various subjects shall be clearly demarcated into five viable units in each paper/subject.

**16. Revision of Regulations and Curriculum**

The above Regulation and Scheme of Examinations will be in vogue without any change for a minimum period of three years from the date of approval of the Regulations. The University may revise /amend/ change the Regulations and Scheme of Examinations, if found necessary.

**17. Transitory Provision**

Candidates who have undergone the Course of Study prior to the Academic Year 2007-2008 will be permitted to take the Examinations under those Regulations for a period of four years i.e. up to and inclusive of the Examination of April 2012 thereafter they will be permitted to take the Examination only under the Regulations in force at that time.

**HARATHIAR UNIVERSITY, Coimbatore -641 046**  
**B.Sc CLINICAL LABORATORY TECHNOLOGY WITH**  
**COMPULSORY DIPLOMA IN CLINICAL NUTRITION**  
**(For candidates admitted during the academic year 2007-2008)**  
**SCHEME OF EXAMINATION**

SEM	Part	Subjects/Paper	Instruc- tional hours /week	University Examination		
				Duration in Hours	Max Marks	
I	I	Language Paper I	6	3	100	
	II	English Paper I	6	3	100	
	III		Gr.A. Core Paper I Human Anatomy and Physiology	5	3	100
			Gr. A. Core Paper II Biochemistry I- Biomolecules	5	3	100
			Core Biochemistry Practical I	2	-	-
			Gr. B. Allied A-Paper I Computer Science I	4	3	75
			Allied Practical I	2	-	-
II	I	Language Paper II	6	3	100	
		English Paper II	6	3	100	
		Gr.A.Core Paper III Biochemistry II – Cell Biology	4	3	100	
		Core Biochemistry Practical I	4	3	100	
		Gr.B.Allied A Paper II Computer Science II	4	3	75	
		Allied Practical I	4	3	50	
		Foundation Course A	2	3	100	
III	III	Gr.A. cor Paper IV Microbiolgy I- General Microbiology	4	3	100	
		Communicative Skills	4	3	100	
		Gr.A.Core paper V Pathology I - Principles of Pahtology and Clinical Pathology	4	3	100	
		Gr.A.Core Paper VI Biochemsitry III - Enzymology & Intermediary Metabolism	4	3	100	
		Core Biochemistry Practical II	4	-	-	
		Gr.B.Allied B. Paper I Chemistry I	4	3	75	
		Allied Practicals II	3	-	-	
		Diploma Course – Nutrition Through Life Cycle	3	3	100	

IV	III	Gr.A Core Paper VII Microbiology II	4	3	100
		Gr.A.Core Paper VIII Pathology II - Histopathology	4	3	100
		Gr.A.Core Paper IX Biochemistry IV – Clinical Biochemistry	4	3	100
		Core Biochemistry Practicals II	5	6	75
		Gr.B.Allied B Paper II Chemistry II	4	3	50
		Allied Practicals II	4	3	100
		Foundation Course B	2	3	100
		Diploma Course – Diet therapy	3	3	100
V	III	Gr.A.Core Paper X Microbiology III	4	3	100
		Gr.A.Core paper XI Pathology III - Haematology	4	3	100
		Gr.A. Core Paper XII Biochemistry V – Nutrition and Cancer Biology	4	3	100
		Gr.C.Appl.Or.Paper I Blood banking and immuno haematology	4	3	75
		Gr.C. Appl.Or.Paper II Drug Biochemsitry	3	3	75
		Core Practicals III –Microbiology	4	-	-
		Core Practicals IV – Pathology- Clinical Pathology	4	-	-
		Diploma Course – Clinical Nutrition.	3	3	100
VI	III	Gr.A.Core Paper XIII Immunology & Immuno techniques	4	3	100
		Gr.A.Core paper XIV Pathology IV - Cytology	4	3	100
		Gr.C. AOS Paper III Bio instrumentation - Principles and applications	4	3	75
		Gr.C.AOS . Paper IV Clinical laboratory & its interpretations	4	3	75
		Core practical III Microbiology	4	6	100
		Core practicals IV Pathology	4	6	100
		Diploma Practicals I	3	3	50
		Diploma Practicals II	3	3	50

**SEMESTER I**  
**SUBJECT TITLE : CORE PAPER I**  
**HUMAN ANATOMY AND PHYSIOLOGY**

**SUBJECT DESCRIPTION :**

This course presents an Introduction and provides a comprehensive, balanced introduction to this exciting, evolving and multi-disciplinary field of anatomy and physiology.

**GOALS:**To enable the students to learn or to know the biological, physiological activities along with the mechanism of action of various organs.

**OBJECTIVES:**

On successful completion of the course the students should have:  
Understood clearly on various alimentary parts of human body.  
Learnt more specific on the endocrinal activities  
Learnt the mechanisms and actions of vital organs.

**HUMAN ANATOMY:**

**UNIT I:**

I. The Human body as a whole.

Definitions, Subdivision of Anatomy, Terms of location and positions, Fundamental planes, Vertebrate structure of man, Organization of the body cells, Tissues.

II. Anatomy of Nervous system.

Central Nervous system : Spinal cord, Anatomy, Functions, Reflex- Arc, Meninges.

III. Anatomy of Circulatory System

Heart: Size, Location, Coverings, Chambers, Blood supply, Nerve supply, and the blood vessel. Names of arteries and veins

**UNIT II**

I. Anatomy of the Respiratory system Organs of the Respiratory system .

Respiratory portion - Pleurae and Lungs - Brief knowledge of parts and position.

II. Anatomy of the Digestive system

Components of digestive system, Mouth , Tongue, Tooth, Salivary glands, Liver, Biliary apparatus, Pancreas - position and their brief functions.

III. Anatomy of the excretory system and reproductive system

Kidneys - Ureters, Urinary Bladder, Urethra Male Reproductive System - testis, Duct system.

Female Reproductive System - Ovaries, Duct system and Accessory glands.

IV. Anatomy of the Endocrine system

Name of all the glands and their position, hormones and their functions - Pituitary, Thyroid, Parathyroid, Adrenal gland and Gonads, Islets of Pancreas.



## HUMAN PHYSIOLOGY

### UNIT III

I. Blood - Composition, properties and function of blood.

RBC - Size, Shape, functions, count, physiological variations of RBC count, Haemoglobin - Function, concentration, physiological variations, WBC - Functions , production, Life span, count, Differential count,

Platelet - Size, shapes, count, production.

ESR and PCV - definition, values, variation factors affecting, significance, Blood volume.

Lymph - Lymphoid tissue, formation, circulation, composition, and functions.

II. Cardiovascular system.

Cardiac output - Definitions, factors affecting, physiological variations, regulation of heart rate.

Pulse - Jugular pulse, radial pulse and triple response.

Heart sounds - Cause, characteristics and significances:;

### UNIT IV

I. Digestive System

Functions of Digestive system -function of salivary glands, Saliva - properties, Functions of stomach - properties and functions of gastric juice. Regulation gastric digestion.

Functions of Pancreas - Composition, properties and function of pancreatic juice. Functions of Liver - Properties, composition and function of Bile, Regulation of bile secretion, gall bladder functions and its emptying. Functions of large intestine -Regulation of intestinal secretion, composition and functions of success entericus.

II. Respiratory system

Functions of respiratory system - Respiratory tract, Respiratory muscles and respiratory organs- lungs, stages of respiration.

Respiratory Physiology - Transportation of oxygen - Direction, pressure gradient, forms of transportation, oxygenation of Hb, Quantity of O<sub>2</sub> transported.

### UNIT V

I. Excretory System -

Kidney- vasa recta, cortical and juxta medullary nephrons - structure and functions.

Mechanism of urine formation - GFR, Plasma fraction, EFP, Factors affecting GFR, Determination of GFR, Selective reabsorption - sites for reabsorption, substances reabsorbed, Mechanism of reabsorption, Glucose, Urea, HCl, aminoacids, etc.,TMG, Tubular load, Renal Thershold Percentage of reabsorption for different substances, Selective secretion.

Properties and composition of normal urine.

II. Reproductive systems

Function of reproductive system, puberty, male reproductive system, functions of testis, spermatogenesis site and stage factors influencing semen, Endocrine functions of testis -Androgens - Testosterone - structure and functions.

Female Reproductive system Ovulation, Menstrual cycle, physiological changes during pregnancy Actions of estrogen, progesterone, functions of placenta.

Lactation - Composition of milk and factors controlling lactation.

REFERENCES:

ANATOMY

Ester.M. Greishcimer. Physiology and anatomy with Practical Considerations. J.P. Lippin Cott, Philadelphia.

Willam Davis. Understanding Human Anatomy and Phsiology, MC Graw Hill.

Willam's ( Pter, L) Gray's Anatomy, 38lfl eds. Churchill Livingstone, 1995.

T.S. Ranganathan, A text book of Human Anatomy.

Fahana, Human Anatomy ( Descriptive and Applied ) Saunder;s & Co., Prism Publishers, Bangalore.

PHYSIOLOGY

Guyton, Textbook of Physiology. 8lh Eds. Prism Publishers. Bangalore. 1991.

Chatterjee, Human Physiology, 10th Eds., Medical Allied agency.

Choudhari, Concise Medical Physiology, 1st, Eds, New Central Books, Calcutta, 1993.

Ganong ( Willams), Review of Medical Phsiolog>, 18lh eds., Appliton and Lange, 1997.

Endocrinology by Williams.

**SEMESTER I**

**SUBJECT TITLE: CORE PAPER II. BIOCHEMISTRY -I -BIOMOLECULES**

SUBJECT DESCRIPTION:

This course emphasizes on various bio-molecules and its significance.

GOALS:To enable the students to learn the basic functions, structures and biological importance of lifeless chemical compounds.

OBJECTIVES:

On successful completion of the course the students should have understood the significance of the complex bio-molecules, polysaccharides, lipids, proteins, nucleic acids, vitamins and minerals.

UNIT-I

Carbohydrates:Monosaccharides-cl,jssification, stereochemistry;cyclic staicture and anomeric forms: Haworth projection. Reactions of monosaccharides-characteristics of aldehyde and ketone groups.

Action of acids and alkalies on sugars. Reactions of sugars due to hydroxyl groups.

Disaccharides-Classification ,structure,chemistry and functions.

Trisaccharides-Structure and functions of raffinose.

Polysaccharides: Storage polysaccharides-Starch,glycogen,dextrin and inulin.

Structural polysaccharides: Cellulose, chitin, glycosaminoglycans (Structures not required).

Artificial sweeteners – Saccharin Aspartame, Monellin, Neohesperidine dihydrochalcone.

## UNIT-II

Lipids: Definition;classification of lipids-simple,compound and derived lipids, Simple lipids: Physical and chemical properties of fats.

Compound lipids- Structure and function of phospholipids, glycolipids and lipoproteins. Derived lipids: Fatty acid-saturated and unsaturated.

Fatty acids: Essential fatty acids; Steroids-structure of cholesterol, ergosterol and stigmastanol. Value of lipids in cardiovascular diseases (Atherosclerosis).

## UNIT-III

Amino acid and proteins Amino acids: Definitions. Amino acids as ampholytes. Structure and classification of amino acids. Chemical reactions of amino acids to carbonyl groups and amino groups. Peptides: Structure and properties. Identification of N and C terminal residues. Determination of primary structure of peptides.

Proteins: Classification; properties, structure of proteins: Strong and weak bonds; primary structure-insulin, secondary structure- collagen and keratin.

Determination of primary structure of peptides-Glutathione, Oxytocin and Vasopressin

## UNIT IV

Nucleic acids: Structure of purines and pyrimidines; nucleotides and nucleosides, DNA. Double helix; A, B & Z forms; DNA denaturation and renaturation. RNA: Types, unusual bases. Enzymatic hydrolysis of nucleic acids. DNA as genetic material  
Structure of chromatids, nucleosome and histones.

## UNIT V

Vitamins and Minerals:

Vitamins: Definition, classification, fat soluble vitamins- sources, structure and physiological functions; water soluble vitamins-sources, structure and physiological functions.

Minerals: Mineral requirement, essential macro minerals and essential micro minerals. Sources and functions.

## REFERENCES:

1. Ambika shanmugam, Fundamentals of Biochemistry for Medical students.
2. Deb, AC, Fundamentals of Biochemistry, New central Agency, Calcutta, 3rd edition, 1989.
3. Lehninger. A.L., Nelson .D.L., Cox. M M, Principles of Biochemistry, CBS Publishers, 2nd edition, 1993.
4. Lubert stiver, Biochemistry, Freeman and company, 4th edition, 1995.
5. Harpers text book of biochemistry- Revised edition, 2004.

**SEMESTER I & II**  
**BIOCHEMISTRY PRACTIAL I**

Determination of the following Biochemical Constituents:

Blood Glucose – Fast, PP, Random.

Blood Urea

Blood Urea Nitrogen

Serum Albumin

Serum Creatinine

Serum Calcium

Serum Electrolytes

Serum Globulin

Serum Iron

Serum Phosphorus

Plasma Fibrinogen

Serum Potassium

Total Serum Proteins

Serum A/G ratio

Triglycerides

Bicarbonate

Bilirubin

Serum Chloride

Cholesterol

Glycosylated Hb

HDL Cholesterol

LDL Cholesterol

Serum Uric acid

Serum Sodium

VLDL Cholesterol

The following Biochemical parameters in Urine:

Protein

Potassium

Calcium

Copper

Creatinine

Phosphorus

Urea

Spot Phosphorus

Spot Potassium

Spot Sodium

Spot Urea

Spot Uric acid

Bence Jones Protein

Spot Calcium

Porphyryns

## **SEMESTER II**

### **SUBJECT TITLE: CORE PAPER 111 -BIOCHEMISTRY II - CELL BIOLOGY**

#### **SUBJECT DESCRIPTION:**

This course presents to identify the range of the cellular activities that are very much specific to the multicellular activities and also the basic ways that cells associate to form the tissue.

**GOALS:**To enable the students to get themselves aware on how different tissue types are combined to form organs and how the organs function which follows from the structure and function of the constituent tissue.

#### **OBJECTIVES:**

On successful completion of the course the students should have:

Understood the relationship between cellular organization and biological function of normal cell, pro and eukaryotic cells.

Learnt on the various cell organelles with their functions and actions.

Learnt the application of cell biology in research.

#### **UNIT-I**

An overview of cells:- origin and evolution of cells. Cell theory. Classification of cells:- prokaryotic and eukaryotic cells: comparison of prokaryotic and eukaryotic cells. Molecular composition of cells:- Water, carbohydrates, lipids, nucleic acid and proteins.

#### **UNIT-II**

Cell membrane:- Fluid mosaic model of membrane structure. Membrane proteins and their properties. Membrane carbohydrates and their role.

Transport across membrane:- Diffusion ,active and passive transport.

#### **UNIT-III**

Endoplasmic reticulum:- Types, structure and functions. Golgi apparatus:- structure and functions.

Lysosomes:- structure and functions, morphology and functions of peroxisomes and glyoxysomes.

#### **UNIT-IV**

Mitochondria:- structure and functions. Biological oxidation- Electron transport chain, theories of oxidative phosphorylation, uncouplers and inhibitors of oxidative phosphorylation.

Cytoskeleton: Types of filaments and their functions. Microtubules:- chemistry and functions : cilia and flagella.

#### **UNIT-V**

Nucleus: - structure and functions. Chromosomes; chromatin structure.

The cell cycle:-Phases of cell cycle. Meiotic and mitotic cell divisions.

Oncogenesis: Development and causes of cancer, Types of cancer, Properties, early detection, Treatment.

Oncogenes: Retro viral, proto, tumor suppressor gene.

REFERENCES:

1. Cell biology organelle structure and functions, David E Sadava. Jones Bartlett publishers.
2. Cooper, M. (1995). The cell molecular approach, ASM Press.
3. Principle of cell and molecular biology, 2nd edition - Lewis, J. Kleinsmith, Valerie, M. Kish.
4. De Robertis. E.D.P.E.M.R. Robertis. 71'1 edition (1980) Cell and molecular biology, Saunders Company.
5. Harvey Lodish, Baltimore Arnold Berk, et.al (1995) 3rd ed Molecular cell biology.

**SEMESTER III**

**SUBJECT TITLE : CORE PAPER IV.  
MICROBIOLOGY I - GENERAL MICROBIOLOGY**

SUBJECT DESCRIPTION :

This course presents the Morphological characteristics of Micro organisms, their cultivation methods, identification. Life cycle, economic importance and microbial diseases.

GOALS: To enable the students to learn the basic functions and components of microorganisms and their economic uses.

OBJECTIVES:

On successful completion of the course the student should have:

Understood the structure and types of microorganisms

Learnt the economical uses of microorganisms

Learnt about the pathogenesis of various microbes in the environment

UNIT-I

Historical introduction - with special reference to the contribution of Louis Pasteur, Joseph Lister, Robert Koch, Edward Jenner and Alexander Fleming; Importance of microbiology in laboratory medicine.

UNIT-II

Classification of microorganisms; Microscopy- Light microscope, Dark-ground microscope, Fluorescent microscope, Phase contrast microscope, and Electron microscope; Observation of microorganism - Wet preparations, Staining preparations; Anatomy of Bacterial cell; Morphological Classification of bacteria with example.

UNIT -III

Morphology of viruses, classification and cultivation of viruses; plaque assay.

Phages: - T4 Phages stages - lifecycle; synthesis and assembly of protein

Lambda Phages - Life cycle; switch between lysogeny and lytic cycle.

RNA viruses: - Retroviruses and life cycle- HIV.

DNA viruses: - Oncogenic viruses.

Mechanism of oncogenesis.

#### UNIT- IV

Microbial diseases: - Normal human micro flora; host - parasitic interaction; epidemics; exo Endotoxins.

Air borne diseases: - Aetiology, symptoms and prevention of Tuberculosis, Diphtheria, Polio - myelitis and Influenza, Food and Waterborne diseases:- Aetiology, symptoms and pathogenesis of Typhoid, Cholera, Bacillary dysentery and Hepatitis.

Direct contact disease: - Aetiology and symptoms of Rabies

#### UNIT –V

Water microbiology: - Microbes in water, Bacteriological examination of water; sewage and its treatment; purification of drinking water.

Soil microbiology: - Symbiotic and Non- symbiotic Nitrogen fixing organisms: Rhizosphere

Food microbiology ; Microbiology of food borne diseases- Botulism, Salmonellas, Staphylococcal poisoning Perfringens poisoning and Mycotoxins.

#### UNIT-III

Bacterial growth and nutrition; Bacterial metabolism; Bacterial genetics and variation; Artificial culture media; Identification of bacteria-Morphology, Culture, Biochemical reactions, antigenic character, typing of bacteria, animal pathogen city and toxicogenicity tests.

#### UNIT-IV

Sterilisation -Definition,Physical agents employed with example, Sterilisation controls;Disinfection-Definition,Classification of Chemical methods of disinfection, its mechanism; Testing of disinfectants;

#### UNIT-V

Antibiotics- Definition, Classification, Modes of action, Antibiotic susceptibility testing.

#### REFERENCES:

- 1 .Mackie and McCartney - Practical Medical Microbiology by J.G.Collee/A.G. Frazer, B.P. Marimion/A.Simmon
2. Textbook of Microbiology by Ananthanarayan,R and Jayaram Panicker.K.
3. Pelczer J, R E. C .S John Noel R Krieg, Microbiology: MC Graw Hill Book Company, 1986.
4. Prescott L. M; J.H Harley and D. A Klein, Microbiology, C. Brown Publishers, 1993.
5. Ronald M. Atlas, Microbiology-Fundamentals and Applications, Macmillan Publishing Company, New York, 1993.

**SEMESTER III**  
**SUBJECT TITLE : CORE PAPER V. PATHOLOGY - I**  
**PRINCIPLES OF PATHOLOGY AND CLINICAL PATHOLOGY**

**SUBJECT DESCRIPTION :**

This course provides precise information of techniques for pathological and clinical analysis.

**GOALS:** To students will have the knowledge about the histopathology, clinical pathology and methods of analysis of various specimens.

**OBJECTIVES:**

After completion of this course the student would have understood:

Techniques in histopathology.

Examination of urine and stool.

Serum analysis.

Calculi analysis.

**UNIT-I**

Histopathology:

Introduction to histopathology.

- Receiving Specimens in Laboratory
- Grossing techniques

Various fixatives - Mode of action, Indications, Preparation

Decalcification of calcified tissue before sectioning

- Processing of tissues for routine paraffin sections and other methods of embedding.

**UNIT II**

Laboratory organization

Reception of organization, dispatch of reports, "Records keeping" coding the lesions of cases Follow up programme, quality control of techniques etc.,

**UNIT-III**

Clinical pathology.

1. Urine examination

Physical .

Chemical

Microscopic

2. Stool examination.

**UNIT - IV**

Examination of body fluids, cell counts

Ascitic fluid, pleural fluid, synovial fluid, pericardial fluid, urinary calculi.

**UNIT-V**

Semen analysis

CSF ( Cerebro Spinal Fluid )



**REFERENCES:**

1. Todd and Sanford, Clinical diagnosis by laboratory method.
2. Culling -Histopathology techniques.
3. Dycie and Lewis -Practical haematology.
4. Ramani Sood, Laboratory technology (Methods and interpretations) 4th Ed. J.P. Bros, New Delhi, 1996.
5. Satish Gupta, -Short text book of medical laboratory for technicians, J.P. Bros, New Delhi.

**SEMESTER III**  
**SUBJECT TITLE: CORE PAPER VI. BIOCHEMISTRY-III**  
**ENZYMOLGY & INTERMEDIARY METABOLISM**

**SUBJECT DESCRIPTION:**

Enzymes are protein catalyst that regulates the rates at which physiological process takes place. Consequently defects in enzyme function frequently cause diseases. Hence, sound knowledge about enzymes is essential for life science students.

The nature of the diet sets the basic pattern of metabolism in the tissues. Mammals such as humans need to process the absorbed products of digestion of dietary carbohydrates, lipids and protein. These are mainly glucose, fatty acids, glycerol and amino acids respectively. The fate of dietary components after digestion and absorption constitutes intermediary metabolism. Knowledge of metabolism in the normal human being is a pre requisite to a sound understanding of abnormal metabolism underlying many diseases.

**GOALS:**

To enable the students to learn the basic functions, principles and concepts of metabolism, different types of enzymes and its isolation and purification which will pave the ways in which the students can enter in research field..

**OBJECTIVES:**

Provides much information related to carbohydrate, fat and protein metabolism that takes place in our body. On successful completion of the course the students will acquire knowledge about

Interrelationship between carbohydrate, fat and protein metabolism.

Role of purine and pyrimidines in nucleic acid metabolism.

Various disorders related to each metabolism.

Techniques of isolation & purification of the enzymes.

Kinetics of the enzymes

Enzymes that are used in medicine and industry

**UNIT-I**

Enzymes: Introduction, International classification of enzymes, six main classes of enzymes. Extraction, purification and characterization of enzymes.

Factors affecting enzyme activity, Enzyme kinetics- Michaelis menten equation(M.M Equation), Lineweaver burk plot. Mechanism of chymotrypsin and lysozyme.

#### UNIT-II

Enzyme Inhibition: Competitive, Non-competitive and uncompetitive enzyme inhibition . Co-enzymes: Definition, structure and functions of thiamine pyrophosphate, nicotinamide, flavin nucleotides, coenzyme A, biotin and folate coenzymes. Metal cofactors (Mechanism of action of coenzymes are not required). Use of enzymes in analysis, enzyme electrodes, Biosensors.

#### UNIT-III

Metabolism of carbohydrates:

Glycolysis: Introduction, overview, pathway and energetics.

Oxidation of pyruvate to acetyl Co A.

TCA Cycle. Introduction, overview, pathway and energetics. Amphibolic nature of TCA Cycle.

Glycogenesis and glycogenolysis: Introduction, overview pathway and energetics.

Pentose phosphate pathway (HMP Shunt).

#### UNIT-IV

Metabolism of proteins.

Fate of dietary proteins , metabolic nitrogen pool.

Catabolism of amino acid- oxidative deamination, non-oxidative deamination, transamination, decarboxylation. Catabolism of glycine, phenylalanine, and tyrosine.

Lipids:

Fate of dietary lipids, Biosynthesis of saturated Fattyacids. Extra mitochondrial and microsomal system for synthesis of fatty acids.

Oxidation of fatty acids, alpha oxidation, beta oxidation and omega oxidation.

Biosynthesis of phospholipids.

#### UNIT-V

Metabolism of Nucleic acids:

Metabolism of purines. Introduction, biosynthesis , de novo synthesis , salvage pathway and catabolism of purines. Regulation of purine metabolism.

Metabolism of pyrimidines Introduction, biosynthesis , de novo synthesis , salvage pathway and catabolism of pyrimidines, Regulation of pyrimidine metabolism.

#### REFERENCES:

Lehninger L.S., et.al. Principles of Biochemistry. CBS Publishers. 2nd edition, 1993.

Murray.K.Robert.et.al., Harpers Biochemistry, 2 Isl edition, 1988.

Voet and Voet. Biochemistry. John Wiley & Sons, 2<sup>nd</sup> edition, 1995.

Trevor palmer, Understanding enzymes, F. llis Horwood Ltd, 3rd edition,

Enzyme technology -Chapline & Bucke.

**SEMESTER III & IV.  
BIOCHEMISTRY PRACTICAL II**

Determination of the following Enzymes

Acid phosphatases  
Alkaline phosphatases  
Alpha- Amylase  
CPK  
CPK MB  
I. DM  
Cholinesterase  
SGOT  
SGPT  
Gamma GT

Determination of the Hormones:

Beta HCG  
CEA  
Free T3  
Free T4  
FSH  
Progesterone  
Prolactin  
PSA  
T3  
T4  
Testosterone  
TSH  
Alpha feto protein

Determination of Immunoglobulins

IgA  
IgE  
IgG  
IgM  
Serum Immunoglobulins

Determination of the following in CSF

Cellcount  
Chloride  
Glucose  
Protein  
CSF analysis (Comp)  
Globulin

Determination of the following

Arterial Blood gas analysis  
Glucose Tolerance Test  
Electrophoresis of plasma proteins.  
Inborn Errors of Metabolism  
Iron Binding capacity  
Lipid Profile  
Liver Function Test  
Paper Chromatography – Urine  
Partial Thromboplastin  
Pertioneal Fkuid Analysis  
Pleural fluid Analysis  
Prothrombin Time  
Renal Calculi analysis  
Renal Function Test  
Urea Clearance Test

### **SEMESTER III (DIPLOMA) NUTRITION THROUGH LIFE CYCLE**

#### **UNIT I**

Concept of different food groups, recommended dietary allowances for Indian's, basis for requirement, computation of allowance.

Nutrition in pregnancy - nutritional requirements, storage of nutrients, physiological cost of pregnancy, complications of pregnancy, implications of public health and prophylaxis programme for pregnant women.

#### **UNIT II**

Nutrition in Lactation – special foods during lactation, nutritional requirements during lactation, implications of public health programmes.

Nutrition in infants – Rate of growth, weight as the indicator, premature infant, feeding premature infants, low birth weight, nutritional allowances, supplementary feeding, weaning foods.

#### **UNIT III**

Nutrition in Preschool Children – Growth and development of preschool children, prevalence of malnutrition (Vitamin A, infection, anaemic, IDD) in preschool age, nutritional requirements, supplemental foods, feeding programmes for preschool children.

Nutrition in School Age – Early and middle childhood, physiological development, food habits, nutritional needs and feeding, RDA, Foods habits and intervention programmes and its implications.

#### **UNIT IV**

Nutrition During Adolescence – Physical growth, physiological and psychological problems associated with pubertal changes, nutritional needs, eating disorders – anorexia bulimia, nutrition and medical problems in adolescent pregnancy and its requirements and complications.

Nutrition During Adulthood – Nutrition and work efficiency, basis for requirements, RDA.

#### UNIT V

Nutrition for Old Age – socio economic and psychological factors – nutritional requirements, factors affecting food intake, clinical needs and malnutrition, institutionalized changes in old age. Advances in geriatric nutrition.

Exercise and thermogenesis, role of carbohydrate, fat and protein as a fuel for exercise, fluid and electrolyte balance during prolonged exercise, nutritional requirements in sports, dietary intake before, during and after exercise.

#### REFERNCES

Vinodhni Reddy, Prahlad Rao, Govinth Sastry and Kashinath, “Nutrition Trends in India”, NIN, Hyderabad, 1993.

Sahills, E.M. Olson, A.J. and Shike, Lea and Febiger, “Modern Nutrition in Health and Diseases”.

Frances, J.Zeman, Nutrition and Dietetics, 1983.

B. Srilakshmi, “dietetics”, New Age International Pvt.Ltd., 2003.

B. Srilakshmi, “Nutrition Science”, New Age International Pvt. Ltd., 2003.

### SEMESTER IV

#### SUBJECT TITLE: CORE PAPER VII. MICROBIOLOGY II

##### SUBJECT DESCRIPTION:

This course provides the precise information of systemic bacteriology.

GOALS:To enable the students to learn the basic sterilization procedures and thorough knowledge about bacteriology.

##### OBJECTIVES:

On successful completion of the course the students should have understood:

Clostridium group of organisms.

Mycobacterium tuberculosis.

Rickettsials.

Borrelia.

##### UNIT-I

Sterilisation -Definition,Physical agents employed with example, Sterilization controls;Disinfection-Definition,Classification of Chemical methods of disinfection, its mechanism; Testing of disinfectants;

##### UNIT II

Bacterial growth and nutrition; Bacterial metabolism; Bacterial genetics and variation; Artificial culture media; Identification of bacteria-Morphology, Culture, Biochemical reactions, antigenic character, typing of bacteria, animal pathogen city and toxicogenicity tests.

### UNIT-III

Brief morphological Feature, Colonial morphology, identification characters, laboratory diagnosis and porpylaxin of the following microorganisms a) cocci- Staphylococci, Streptococci, Pneumococci, Neisseria b) Bacilli- Corynebacterium, Diphtheriae, Bacillus anthracis, Clostridium tetani.

### UNIT-IV

Clostridium group of organisms, Enterobacteriaceae, Pseudomonas, Vibrio Cholerae, Brucella, Yersenia, Haemophilus and Bordetella.

### UNIT-V

Borrelia; Treponema; Leptospira; Rickettsiales; Chlamydiae. Mycobacterium tuberculosis. Mycobacterium leprae. Antibiotics- Definition, Classification, Modes of action, Antibiotic susceptibility testing.

### REFERENCES:

1. Bailey and Scott, Diagnostic microbiology by Sydney M. Finegold and Ellen Jo Barbara
2. Medical Microbiology by Satish Gupta
3. Mackie and McCartney - Practical Medical Microbiology by J.G. Collee/A.G. Frazer, B.P. Marimion/A. Simmon
4. Textbook of Microbiology by Ananthanarayan, R and Jayaram Panicker. K.

**SEMESTER IV**  
**SUBJECT TITLE: CORE PAPER VIII. PATHOLOGY II-**  
**HISTOPATHOLOGY**

**SUBJECT DESCRIPTION** This course provides the information about instruments and techniques used in histopathology.

**GOALS** To enable the students the basic procedures of histopathology.

**OBJECTIVES**

On successful completion of this course the students would have understood:

Instruments used in Histopathology.

Techniques.

Maintenance of slides.

Microphotography.

**UNIT-1**

1. Instrumentation:

a) Tissue Processor b) Knife sharpener c) Automatic slide stainer d) Microtome, knives e) Freezing microtome; Cryostat f) Instruments for grossing g) Electric saw.

**UNIT-II**

Frozen section techniques: Co<sub>2</sub> Freezing, Cryostat and freezing microtome.

Techniques and principles of sections cuttings and routine staining, and special stains.

Mounting Techniques, various mo lining.

**UNIT-III**

Use of microscope, polarisers.

Introduction to Electron Microscopy and technique of preparing slides

**UNIT-IV**

Maintenance of records and filing slides, Familiarisation with computer.

Microphotography - technique.

**UNIT-V**

Museum technology- preservation,

Coding-. ICDS - Classification.

**REFERENCES:**

1. Todd and Sanford, clinical diagnosis by laboratory method.

2. Culling -Histopathology techniques.

3 ,Dycie and Lewis -Practical haematology.

4 .Ramani Sood,Laboratory technology(Methods and interpretations) 4th Ed. J.P. Bros, New Delhi, 1996.

5 Satish Gupta, -Short tect book of medical laboratory for technicians, J.P. Bros, New Delhi.

## **SEMESTER IV**

### **SUBJECT TITLE: CORE PAPER IX. BIOCHEMISTRY-IV –CLINICAL BIOCHEMISTRY**

#### **SUBJECT DESCRIPTION**

This course emphasizes the students to realize the diagnostic importance of various metabolic disorders.

**GOALS** This course enables the students to know the clinical aspects of various metabolic disorders.

#### **OBJECTIVES**

This course would have made the students understand the significance of diagnostic bio chemistry.

#### **UNIT I**

Disorders of carbohydrate metabolism : Normal sugar level in blood, renal threshold and regulation of blood glucose concentration.

Hypoglycemia - Definition and causes.

Hyperglycemia - Definition and causes.

Diabetes mellitus: Introduction, aetiology, types of diabetes mellitus, clinical pathology and diagnosis. Urine testing , random blood sugar and GTT.

Glycosuria, differential diagnosis of glycosuria, complication of diabetes mellitus-

Diabetic ketoacidosis, Diabetic coma, Fructosuria, pentosuria, Galactosemia, and

Glycogen storage diseases.

#### **UNIT II**

Disorders of Lipid Metabolism: Plasma lipids and lipoproteins - Introduction. Hyperlipoproteinemia - Type I, II, III, IV, V and alpha- lipoproteinemia. Hypolipoproteinemia - A - beta lipoproteinemia, Hypo- beta - lipoproteinemia, Tangiers disease and LCAT ( Lecithin Cholesterol Acyl Transferase) deficiency; Artherosclerosis. Fatty liver and hyper lipidemia, Hypercholesterolemia, and Hypocholesterolemia, Lipidosis and Xanthomatosis. Taysch's diseases, Niemann - Pick disease.

#### **UNIT III**

Disease of Aminoacid Metabolism; Plasma proteins.

Abnormalities: Total plasma ( serum ) proteins, Fibrinogen, Albumin, Pre-albumin, and Globulins. Abnormal Non- protein Nitrogen: Urea, Uric acid, Creatinine, and Ammonia, Prophyria.

Aminoacid Metabolism: Cystinuria, Phenylketonuria, Maple Syrup Disease, Alkalptonuria, Albinism, and Hartnup disease.

Disorders of Purine and Pyrimidine metabolism:

Disorders of purine metabolism: Norrna' level of uric acid in blood and urine, miscible uric acid pool. HyperUricemia and Gout; Hypouricemia - Xanthinuria and Xanthinelithiasis.

Disorders of Pyrimidine metabolism: Orotic aciduria



#### UNIT IV

##### Gastric, Pancreatic and Intestinal Functions

Gastric function: Introduction, Tests for gastric function- The Insulin Stimulation test, determination of Gastrin in serum and Tubeless gastric analysis.

Pancreatic function: Introduction, pancreatic function tests, serum amylase and lipase; direct stimulation test, indirect stimulation test,

Intestinal function: Introduction, Test used in the diagnosis of malabsorption- determination of total faecal fat ( fat balance test), test of monosaccharide absorption (xylose excretion test) and determination of total protein ( Lowry's method).

#### UNIT V

Liver disease and liver function tests: Introduction, bilirubin metabolism and jaundice, Liver function tests, Estimation of conjugated and total bilirubin in serum ( Diazo method), detection of bilirubin and bile salts in urine ( Fouchet;s test and Hay's sulphur test), Thymol turbidity test, Prothrombin time. Serum enzymes in liver disease- serum Transaminases- SGPT, SGOT and Lactate dehydrogenases (LDH).

Kidney Function test: Introduction, physical examination of urine, elimination tests, Clearance tests- Inulin clearance test, Creatinine clearance and Urea clearance tests, Renal blood flow and filtration fraction.

#### REFERENCES:

1. Burtis A. Carl and Edward R. Ashwood. Tietz Text book of Clinical Chemistry. W.B. Saunders Company, 2nd edition. 1994.
2. Philip D. Maync. Clinical Chemistry in Diagnosis and Treatment. ELBS Publications, 6lh edition, 1994.
3. Varley . Text book of Clinical Biochemistry.
4. Montgomery, Conway, Spector. Biochemistry- A case oriented approach. C.V Moshby Company, 5 edition, 1990.

### **SEMESTER IV (DIPLOMA) DIET THERAPY**

#### UNIT-I

Diet therapy – Definition, Principles, classification of therapeutic diets. Routine Hospital diet – Regular diet, Light diet, soft diet, clear diet, full fluid diet. Professional code and ethics for dietetician, Indian dietetic Association.

#### UNIT – II

Modification of Diet for fever, Infection, Diarrhea, constipation, Gastritis and peptic ulcer.

#### UNIT – III

Dietary Management in Diabetes Mellitus, Acute and Chronic Cardiac disease, Hypertension, Atherosclerosis, Congestive heart failure, Sodium restricted diet.

#### UNIT- IV

Dietary management in kidney disease – nephrosis, acute renal failure, acute and chronic glomerulonephritis, kidney transplant and dialysis.

#### UNIT – V

Diet in relation to deficiency disease – Protein Calorie deficiency, Vitamin A deficiency, Anaemia. Obesity, Underweight, Importance of Maintenance diets.

#### REFERENCES

Townsend, C.E and Roth, R.A (1999) Nutrition and Diet Therapy, 7th edition, Delman Publishers.  
Gopalan,C. and et al (1996), Nutritive value of Indian foods.  
Mohar,L.K and Stump,S.E.(2000) Food, Nutrition and Diet Therapy, 10th edition, W.B.Saunders Company.

### **SEMESTER V SUBJECT TITLE: CORE PAPER X. MICROBIOLOGY III**

#### SUBJECT DESCRIPTION

This course provides the information regarding serological tests, skin tests, hospital infection and diagnostic methods for viral diseases.

#### GOALS

To enable the students to have precise knowledge in endemic, epidemic and pandemic disease, viral infection, malaria etc.

#### OBJECTIVES

On successful completion of the course students should have understood:

Microbial pathogenicity.

Viral diseases.

Dermatophytes and mycetoma.

Malaria and different types of worms.

#### UNIT -I

Factors pre disposing to microbial pathogenicity- Sources of infection-Susceptable host - Mean of transmission- Definition and example of endemic , epidemic.and pandemic.

#### UNIT-II

Normal Flora- Collection and transport of Clinical species, Infective syndromes and their diagnostic procedures (Respiratory tract infections, Intestinal infections, Urinary tract infections,Meningeal infections, Wound infections; Reproductive system infections :Pyroxia;

#### UNIT- III

Serological tests - widal; Brucella agglutination tests; Aso test; Cold agglutination tests,Paul Bunner Tests, Weil relic test.

Skin Tests (Tuberculin;Lepromin; Fries test and Colonies test)

Hospital infection-Definition,aetiology, Laboratory diagnosis

UNIT-IV

General properties of Viruses- Viral diagnostic methods of Poliomyelitis,Hepatitis,Rabies and HIV

UNIT-V

Brief outline on Caudidiasie,Cryptocococolin,Dermatophytes and Mycetoma

Brief outline on Giardian , Malaria, Round worm, Hook Worm, Pin Worm. Tape, worm and Fluke worm.

REFERENCES:

- 1.. Textbook of Microbiology by Ananthanarayan,R and Jayaram Panicker.K.
2. Parasitology (Protozoology and Helminthology) By K.D.Chatterjee. 3. Clinical diagnosis and Management By Laboratory methods - ToDD Stauford Davidson.
4. Mackie and McCartney - Practical Medical Microbiology by J.G.Collee/A.G. 1 ra/.ei, B.P. Marimion/A.Simmon

## SEMESTER V

### SUBJECT TITLE: CORE PAPER XI. PATHOLOGY III - HAEMATOLOGY

SUBJECT DESCRIPTION:

The paper encompasses the basic concepts of hematology and the diseases related to it.

GOALS:

To enable the students to acquire knowledge about the composition of blood and the laboratory methods to identify the various disorders related to it.

OBJECTIVES:

On successful completion of the course the students should have understood:

Composition of blood.

Methods for the determination of blood cells and staining techniques.

Techniques of bone marrow aspiration

Various diseases related to it.

UNIT I

Introduction

Blood collection

Anticoagulants used in Haematology

Normal values in Haematology

Basic Haematological techniques

- a. RBC Count
- b. Haemoglobin estimation
- c. Packed cell volume
- d. WBC counts - Total and differential
- e. Absolute eosinophil oount
- f. Platelet count
- g. Erythrocyte sedimentation rate
- h. Reticulocyte count

Preparation of blood films

Stains used in Haematology

Morphology of red cells

Morphology of Leukocytes and platelets

Bone marrow

- a. Techniques of aspiration, preparation and staining of films
- b. Bone marrow biopsy
10. Preparation of buffy coat smears.

#### UNIT II

Laboratory methods used in the investigation of anemia:

- a. B 12 and folate assay
- b. Schilling test
- c. Serum iron and iron binding capacity

Laboratory methods used in the investigation of haemolytic anaemias:

- a. Osmotic fragility
- b. Investigation of G-6 PD deficiency
- c. Test for sickling
- d. Estimation of Hb-F, Hb-A2
- e. Plasma haemoglobin and Haptoglobin, demonstration of haemosiderin in urine
- f. Haemoglobin electrophoresis
- g. Test for auto immune hemolytic anaemias
- h. Measurements of abnormal Hb pigments.

#### UNIT- III

Investigation of Haemorrhagic disorders

- a. Mechanism of coagulation
- b. Collection and anticoagulants used in coagulation studies
- c. Bleeding time and clotting time
- d. Other coagulation studies PT, KPTT, TGT, etc.,
- e. Assay of clotting factors

#### UNIT-IV

Test for blood fibrinolytic activity and detection of FDP Platelet function tests Demonstration of LE cells Cytochemistry

#### UNIT-V

Automation in haematology

Organisation and quality control in haematology laboratory

Preparation of glassware and disposal of the waste in the laboratory

#### REFERENCES:

1. Todd and Sanford, clinical diagnosis by laboratory method.
2. Culling -Histopathology techniques.
3. Dacie and Lewis -Practical haematology.
4. Ramani Sood.Laboratory technology\*Methods and interpretations 4 th Ed. J.P. Bros, New Delhi, 1996.
5. Satish Gupta, -Short text book of medical laboratory for technicians, J.P. Bros, New Delhi.

**SEMESTER V**  
**SUBJECT TITLE: CORE PAPER XII. BIOCHEMISTRY V**  
**NUTRITION AND CANCER BIOLOGY :**

**SUBJECT DESCRIPTION:**

This course provides the basic concept of nutrition, therapeutic diets and cancer biology.

**GOALS:**

To enable the students to acquire knowledge in the field of principles of nutrition, diets, cancer biology, endocrinology and free radical biology

**OBJECTIVES:**

On successful completion of the course the students should have understood:

Basics of nutrition.

Diets for different diseased conditions.

Different types of cancer and its treatment

Enzymic and non-enzymic antioxidants.

**UNIT-I**

Objectives of diet therapy. Principles of diet preparation and counseling.

Dietary treatment of kidney diseases.

Diet in allergy-definition,classification and common food allergy tests of allergy,dietetic treatment

**UNIT-II**

Therapeutic diets for the following disorders.

a. Underweight - definition, etiology, treatment.

b. Obesity-definitioon, etiology treatment, diseases of the gastro intestinal tract.

C. Peptic ulcer and duodenal ulcer.

d. Dumping syndrome, constipation.

e. Acute and chronic diarrhea- dehydration, therapy.

f. Diabetes, anaemia, hypertension.

**UNIT III**

**Cancer Biology**

Classification, characteristics of the cancer cells, factors causing cancer, chemical Carcinogenesis, and role of radiation in Carcinogenesis.

Classification and characteristics of tumor antigen, detection of myeloma protein , alpha feto protein and prostate specific antigens.

**UNIT IV**

**Endocrinology**

Hormones - Definition, local and general hormones, properties of hormones, mechanism of action - AMP, major endocrine glands and their location.

General characteristics, biosynthesis and action of peptide hormones, adrenal hormones, thyroid hormones and pancreatic hormones.

Vasoactive peptide hormones and sex hormones.

## UNIT V

### Free Radical Biology

Process of Lipid peroxidation, measurement of lipid peroxidation, pathological consequences of lipid Peroxidation.

Formation of free radical. Free radical in tissue injury and cancer Enzymic antioxidants - chemistry, mechanism, antioxidant effect of SOD, Catalase, Glutathione peroxidase

Non- Enzymic antioxidants - chemistry, mechanism, antioxidant effect of vit A, vit C, vit E, Glutathione and selenium.

### REFERENCES:

Food, Nutrition and Diet Therapy. 6th Edition. Kraure and Mohan. WB Saundars Company, London.

Clinical Dietetics and Nutrition. Anitha . F.P. Oxford University press, NewDelhi.

Fundamentals of Clinical Chemistry. TeitzN.W. ( 1994). W.B. Saunder's Company

Molecular biology of Cell. Alberts & Bray ( 1994). Garland Publishers.

Biochemistry of oxygen toxicity. Annual Review of Biochemistry. Enrique Cadinar, Vol 58, 1989, pp 78- 110.

Free radicals in biology. William A. Pryor, Academic Press, 1980, pp 96 - 150.

Vitamins- Annual research review. Horrobin, Eden Press Pub., Vol. 1980.

## SEMESTER V

### SUBJECT TITLE: AOS I - BLOOD BANKING AND IMMUNO HEMATOLOGY.

#### SUBJECT DESCRIPTION:

This course provides the information about blood transfusion, hurdles and diseases related to it.

#### GOALS:

To enable the students to acquire knowledge about the blood grouping, methods of blood transfusion and cytogenesis.

#### OBJECTIVES:

On successful completion of the course the students should have understood:

Blood group systems.

Investigation of transfusion reactions.

Care and selection of blood donors

Cytogenetics.

#### UNIT-I

ABO Blood group system, Rh typing and weaker variants in Rh system, Subgroup and weaker variants of A and B and Bombay phenotype.

#### UNIT-II

Preparation and standardization of anti human globulin reagent, Coomb's test. Blood grouping and cross- matching in blood bank, investigation of transfusion reaction.

### UNIT-III

Care and selection of donors, Role of Australia antigen and hepatitis C virus (HCV) in Blood transfusion, Screening for Australia antigen and HCV HAL antigens and their significance in blood transfusion.

### UNIT-IV

Preparation o blood, principles and its application in Blood banking, Component therapy in clinical practice, Blood Bank administration, Screening the blood for infective material.

### UNIT-V

Cytogenetics:

Human genetics, an introduction to the subjects.

Terminology classifications and nomenclature of human chromosomes.

Methods for karyotypic analysis

a. Culture of bond marrow, peripheral blood lymphocytes, solid tumors, skin fibroblast, etc.

b. Direct preparations from tumor material.

4.Characterisation of human chromosomes by various banding techniques

5.Sex chromatin identification.

6.Karyotyping and analysis of chromosomal abnormalities.

7.Common chromosomal observations in cancer, mechanisms of their prod action and of oncogenes.

### REFERENCES:

1.Guyton, Textbook of Physiology. 8lh Eds. Prism Publishers. Bangalore. 1991. 2.Chatterjee, Human Physiology, 10lh F.ds., Medical Allied agency. 3.Choudhari, Concise Medical Physiology, 1st, Eds, New Central Books, Calcutta, 1993.

4.Ganong ( Willams), Review of Medical Phsiology, 18th eds., Appliton and Lange, 1997.,

## **SEMESTER V**

### **SUBJECT TITLE: AOS II. DRUG BIOCHEMISTRY**

**SUBJECT DESCRIPTION:**This course presents to focus on the chemical principles used for drug discovery and it also covers human biology where ever relevant.

**GOALS:**Course provides for the specific needs and interests of students wishing to obtain experience in a modern research program

### **OBJECTIVES:**

On successful completion of the course the students should have:

Understood the development of the traditional and modern methods used for drug discovery; of how molecules interact.

Learnt the fact that the pharmaceutical industry is by far the largest employer of medicine

Learnt and developed skills in the use of reaction mechanisms and how a knowledge of reaction mechanisms can aid in understanding the mode of action of a drug, and the method by which it can be synthesized, and developed.

#### UNIT I

Introduction and receptor concept; Introduction to drugs, classification of drugs, passage of drugs across biological membrane, absorption and distribution of drugs, binding of drugs to plasma proteins. Drug receptor interaction, binding forces in drug - receptor interactions, types of receptors. Receptor theories, consequences of drug receptor interaction.

#### UNIT II

Drug metabolism and elimination: Drug metabolism, methods to study drug metabolism, microsomal metabolism, Metabolism via hydroxylation, conjugation, deamination, N-oxidation, azo and nitro reduction, non-microsomal oxidation, oxidative deamination, purine oxidation, dehalogenation, hydrolysis, action of choline esterase, Elimination of drugs from the body with reference to renal system.

#### UNIT III

Chemotherapy : Mode of action of sulfonamides, antimetabolites of folate, purines and pyrimidines, Antibacterials - mode of action and resistance to penicillin, streptomycin, tetracycline. chloramphenicol.

Antiviral, antimalarials, and anti TB drugs.

#### UNIT IV

Drugs acting on CNS and cardiovascular system. CNS structure and action of barbiturates, salicylates, MAO inhibitors and drugs for Parkinson disease. Cardiovascular disease: Structure and mode of action of cardiac glycosides, Heparin and Coumarin.

#### UNIT V

Drugs of plant origin; Drug dependence and abuse - Management of self poisoning, cancer. Chemotherapy - Cytotoxic drugs, immunosuppressive drug therapy.

#### REFERENCES:

Satoskar, R.S., Bhandakar, S.D and S.S. Ainapure. Pharmacology and Pharmacotherapeutics, 141<sup>st</sup> Eds. ( 1995), Popular Prakashan , Bombay.

Willam Foye . Principles of Medicinal Chemistry. #rd eds. 1986.

Patrik.L.Grahm. An Introduction to Medicinal Chemistry. Oxford University Press.

### **SEMESTER V & VI CORE PRACTICALS III – MICROBIOLOGY**

#### Unit I

1.Safety in the microbiology Laboratory; Instruments in Microbiology laboratory- Use and Care. ( Centrifuge, Balance, Refrigerator, Hot air oven. Autoclave, Incubator, Anaerobic Jar, Incubator loop, Magnifying lens, suction pump, Elisa Reader, VDRL Western blot, shaker) .,

#### 2. Microscopy

1. Hanging drop preparation

2. Staining reactions

3. Preparation of sterile container

4. Preparation of Culture media

5. Inoculation of Culture media

6. Study of Colonial morphology



7 Tests for the identification of Bacteria- Media Preparation; Method of inoculation; Observation of results  
8. Antibiotic susceptibility tests

#### Unit II

9. Cultural, Biochemical and identification tests of IO. Staphylococci  
Streptococci  
Neisseria  
13. Corynebacterium diphtheriae  
14. Salmonella  
15. Shigella  
16. Pseudomonas  
17. E. Coli 18. Klebsiella

#### Unit III

19. Culture characteristics of Candida, Aspergillus, Mucor, Rhizopus, Penicillium -  
Block culture technic, Wet Ash staining procedure for fungal observation.

#### Unit IV

Serological tests ; Widal, Brucella, Agglutination tests, Weil Felix test, Coombs Agglutination test, Pregnancy test, Latex Test ( RF, ASO, CRP ), ELISA test ( HIV, HbsAg, TORCH), Western blot test ( HIV ).

#### Unit V

Demonstration of bacteriological analysis of water, milk and air.

### **SEMESTER V & VI PRACTICALS IV - PATHOLOGY CLINICAL PATHOLOGY**

(i) Examination of urine sample.

a. Physical examination: Volume, colour, odour, appearance, specific gravity and pH.

b. Chemical examination:

Protein - Heat and acetic acid test, sulphosalicylic acid method.

Reducing sugar - Benedict's test:

Ketone Bodies - Rothera's test.

Bile pigment - Fouchet's method.

Bile salts - Hay's test.

Blood - Benzidine test.

Urobilinogen and porphobilinogen - Orhlich's aldehyde and Schwartz test.

Bence Jones' protein.

c. Microscopic examination.

(ii) Stool examination.

a. Physical examination.

b. Chemical examination - Occult blood

-Reducing sugar.

- c. Microscopic examination for ova, cysts, crystals and fat globules.
- (iii) Semen analysis.
- (iv) C.S.F Examination.
- (v) Examination of body fluids - pleural , pericardial and peritoneal fluid, (vi) Synovial fluid analysis.

#### HISTOPATHOLOGY:

##### Part I:

Grossing techniques.

Preparation of various fixatives

Decalcification of calcified tissue before sectioning.

Processing of tissue for routine paraffin sections and other methods of embedding.

##### Part II:

Rotary microtome, microtome knives.

Techniques and principles of honing and sharpening, section, cutting.

Mounting techniques and various mounting medias.

4 Routine haematoxylin and Eosin staining.

5. Special stains.

a. Periodic acid schiff stain.

b. Alcian blue pH 1 and p H 2.5.

c. Mucicarmine- southgateds method.

d. Reticulin-Gordon and vmeets method.

e. Van-gieson stain.

f. Masson's trichrome- methods.

g. PTAH.

h. VerhoefFs Vangieson stain for elastic fibres.

i Perks-Purssian blue stain

j. Masson- Fontana method of stain melanin pigment and melanin bleach

k. Frozen section- Demonstration- freezing microtome, cryostat.

l. Museum technique- Demonstration.

#### HAEMATOLOGY

Haemoglobin estimation by cyanmethaemoglobin method.

R.B.C total count.

W.B.C total count-Micropipette method and bulk dilution.

Platelet count-Direct and indirect method.

Absolute eosinophil count.

Reticulocyte count.

Preparation of blood smears and staining with Leishman stain.

Differential W.B.C Count.

Packed cell volume- Wintrobe's method.

Calculation of erythrocyte indices.

Erythrocytes sedimentation rate- wetergrens methods.

Osmotic fragility test.

Sickling test

Bleeding time and clotting time.

Preparation of buffy coat smears and demonstration of L.E cells.

Bone marrow smear preparation and staining procedure.

Demonstration of malarial parasites and microfilaria by smear and fluorescent method.

## **SEMESTER V (DIPLOMA) CLINICAL NUTRITION**

### **UNIT – I**

Diseases of GI tract: Effect on digestion, absorption and nutritional status.

Clinical manifestations in – Diarrhea, constipation, Gastritis, Colitis, Ulcer.

Malabsorption syndrome.

### **UNIT – II**

Diseases of Liver, Gall bladder and Pancreas: Etiology, Symptoms, Metabolic and Clinical implications of Hepatitis, Cirrhosis and Hepatic coma.

Pancreatitis, Cholecystitis, Cholelithiasis.

### **UNIT –III**

Carbohydrate Metabolism disorder & Renal disorder:

Diabetes, Inborn errors of metabolism, Gout.

Renal disorders – Aetiology, symptoms, Metabolic and Clinical implications of nephritis, Renal failure, Renal Calculi.

### **UNIT –IV**

Cardiovascular Disorder: Aetiology, symptoms, Metabolic and Clinical implications of hypertension, Atherosclerosis, Cardiac failure.

### **UNIT –V**

Nutritional therapy: Nutritional therapy and conditions like burns, Trauma Sepsis, HIV infection, Anaemia, Pulmonary disease, neurological disease, Food allergy and food intolerance.

### **REFERENCES**

Shils, E.M. Olson, A.J Aand Shike (1994) – Modern nutrition in health and diseases, Vol –II.

Anderson,L,(1982),Nutrition in health and diseases,17th edition.

Davidson Passmore,P.and Break,J.P.(1986),Human nutrition and Dietetics.

## **SEMESTER VI**

### **SUBJECT TITLE: CORE PAPER XIII. IMMUNOLOGY AND IMMUNO TECHNIQUES**

#### **SUBJECT DESCRIPTION:**

This course will provide the basic concepts of immunology which follows the course of immune response. The course will introduce the various mechanisms by which microbial pathogens cause disease and the interaction with the host.

**GOALS:** To enable the students to acquire a knowledge in the field of infectious diseases and interaction with the host's immune system.

#### **OBJECTIVES:**

On successful completion of the course the students should have:

Understood the foundation for the future subjects in microbiology and immunology.

Learnt the basic terminology and techniques in microbiology and immunology.

Learnt on how much immune system is important to the humans.

#### **CONTENTS:**

##### **UNIT – I**

Historical development of the science of the immunology. Innate and acquired immunity, Antibody mediated and cell mediated response tolerance.

Primary and secondary lymphoid organs. Structure of T, B and NK cells. Receptors on the surface of lymphocytes. Structure and functions of neutrophils, Macrophages – phagocytosis and inflammation, eosinophils and basophils.

##### **UNIT – II**

Antigen: Properties, Specificity and Cross reactivity, antigenicity, immunogenicity, antigen determinants, Haptens, adjuvants, Self antigens (MHC) an outline only.

Antibodies: Properties, classes and subclasses of immunoglobulins: Structure, specificity and distribution, Clonal selection theory of antibody formation.

Antigen-antibody interaction – Precipitation and agglutination – Definition and mechanism of formation. Complement component. Cytokines and their junctions.

##### **UNIT – III**

Precipitation in gel. Oudin procedure, oahley – Fulthope procedure, immune diffusion, Ouchterlony procedure, Immuno electrophoresis and electro immuno diffusion.

Agglutination: Slide agglutination, Table agglutination, Widal test.

Principle and application: RIA, ELISA, Flouresent antibody technique, monoclonal antibodies and their application.

##### **UNIT – IV**

Allergy and Hypersensitivity – Type I, II, III and IV, their clinical manifestations.

Immuno Disease: Rheumatoid arthritis, Myasthenia gravis.

Immunity to bacteria and viruses.

Skin Test: Montex and Penicillin test.

#### UNIT – V

Transplantation: Allograft rejection: Graft Vs Host Diseases: Immuno suppressors: mechanism of graft rejection.

Resistant to tumors: NK Cells: Tumor immuno therapy: Lymphoid tumors.

Vaccination: Passive and active immunization: Recombinant vaccines: DNA vaccines. Benefits and adverse effects of vaccination.

CD4 Cell count in HIV infection.

#### REFERENCES:

Immunology – An introduction, Tizzard R Jan, 1995.

Immunology – Roitt Ivann, Jonathan Brastoff, David Male, 1993.

Text book of microbiology – Ananthanarayanan. R. and Yayaraman Panikar, 1996.

Immunology – Janis Kuby, 3rd edition.

#### SEMESTER VI

#### SUBJECT TITLE: CORE PAPER XIV. PATHOLOGY - IV - CYTOLOGY

#### SUBJECT DESCRIPTION:

This course provides information about hormone cytology, tissue culture and immunochemistry.

#### GOALS:

To enable the students to have a sound knowledge on the methods of staining, characterization of culture cell lines and immunocytochemistry.

#### OBJECTIVES:

On successful completion of the course the students should have understood:

Hormone cytology.

Malignant cytology.

Characterization of cell lines

Basic concepts of immunochemistry.

#### UNIT-I

I 1 Normal cell structure and function

2. Normal Histology and cytology of epithelial and connective tissue.

II 1. Collection and preparation of samples

Fixation, fixatives

Staining - Principles, Preparations of reagents, techniques

a. Papanicolaou's stain

b. May - Grunwald Giemsa stain

#### UNIT-II

Hormone Cytology.

a. Various Cytological indices

i. Maturation Index

ii. Karyopyknotic Index

iii. Maturation value

### Malignant Cytology:

Female genital tract, techniques of collection of specimen

#### Cervical Malignancy

Classification of cervical smear and characteristics of normal inflammatory, and dysplasia (mild, moderate, severe), Ca-in-situ, sq Cell carcinoma and adenocarcinoma of endocervix.

(c). Characterization and radiation changes in cells.

(d). Endometrial Malignancy, cytology of normal hyperplasia and adenocarcinoma. (e). Miscellaneous - Ovarian carcinoma etc.,

(f) Cytological screening of cervical cancer (organ screening) programme, evaluation and follow up. Respiratory tract.

(a). Collection, selection of material and making smear.

(b). Cytology of various types of bronchogenic carcinomas.

#### Urinary Tract.

(a). Collection and preparation of samples.

(b). Cytology of normal, non-malignant and malignant tissues of urinary tract.

#### VII. Gastrointestinal tract:

a. Classification and preparation of samples.

b. Characteristics of normal and malignant cytology.

#### VIII Effusion & CSF

2. Collection and preparation of fluid for cytological examination. 3 Cytological features of non-indignant and malignant effusions.

#### IX. Glands

a. Cytological features of fine needle (FNAC) aspiration and discharge.

### UNIT III

#### Automation cytology

1. Flow cytometry.

2. Image analysis

3. Principles, equipments, procedure and evaluation.

### UNIT-IV

1. Tissue culture and immuno-histochemistry

a. Equipments necessary for carrying out tissue culture studies

b. Laminar Flow equipment

c. Carbon dioxide incubator.

d. Inverted microscope.

2. Basic procedure for preparation of glassware, media etc for sterilization.

b. Dry heat sterilization.

c. Autoclaving in an atmosphere of steam.

d. Chemical sterilization.

e. Filter sterilization of liquid media etc.

3. Derivation of culture from the tissue

a. Enzymatic digestion of the tissue using collagens, protease etc.

b. Plating of cells in tissue culture media.

- c. Observation of cells in invertoscope.
  - d. Sub culturing and derivation of cell lines
- 4 Characterization of cell lines
- a. Determination of biochemical markers in cells
  - b. Chromosomal and DNA content of cells.
  - c. Immunological properties of cells.
5. Preservation of immortalized cell lines
- a. Storage in glycerol in liquid nitrogen
  - b. Storage in dimethyl sulfoxide in liquid nitrogen.

#### UNIT-V

Immuno-cytochemistry.

- 1. Introduction
- 2 Basic concepts of immunochemistry.

Monoclonal antibodies and their preparations.

Fluorescence reactions.

PAP techniques- principle, preparation of reagents and procedure.

#### REFERENCES:

- 1. Todd and Sanford, Clinical diagnosis by laboratory method
- 2. Culling -Histopathology techniques.
- 3 Dycie and Lewis -Practical haematology.
- 4. Ramani Sood. Laboratory technology (Methods and interpretations) 4th Ed. J.P. Bros, New Delhi, 1996.
- 5 Satish Gupta, -Short text book of medical laboratory for technicians, J.P. Bros, New Delhi

### **SEMESTER VI**

### **SUBJECT TITLE: AOS PAPER III - BIOINSTRUMENTATION- PRINCIPLES AND APPLICATIONS**

#### SUBJECT DESCRIPTION:

This course presents the principles, instrumentation, working and application of the instruments commonly used in the laboratories.

#### GOALS:

To enable the students to learn about the functioning components of the various instruments.

#### OBJECTIVES:

On successful completion of the course the students would have learnt the principles and applications of the instruments

#### UNIT I

Microscopy - Principles and application- Bright Field, Dark field, Phase contrast, Fluorescence, SEM & TEM's.

## UNIT II

Autoclave, Hot air oven, Incubator, Water bath, Laminar air flow, BOD incubator, Centrifuges - Bench top, High speed, Ultracentrifuge.

pH meter, Lyophilizer, Anaerobic jar, metabolic shaker, ELISA reader and washer.

## UNIT III

Tissue processor - Microtome - Knife sharpener, Tissue Floatation bottle. UNIT IV

Chromatography - Paper, Thin layer, Column, Ion exchange, Gas and HPLC, Electrophoresis - SDS - PAGE, and Agarose gel electrophoresis.

Colorimetry, Turbidometry, Spectrophotometry - UV, Visible Spectrophotometer, Flame photometer.

## UNIT V

Biochemical Waste Management; Safety regulations, Biosafety, Biohazard levels, Types of biochemical waste, Collection methods of biochemical waste, Handling of waste - blood, urine and tissues

Disposal of waste - Waste disposal issues, Disposal of pathological samples - blood, urine, tissue samples, Hazards of disposal, safety measures during disposal.

## REFERENCE:

Gedder .A. and L.E. Balsler, John Wiley and Sons. Principles of applied Biomedical Instrumentation.

Dean, Willard and Merrit, Instrumental Methods of analysis. Asian Ed.,

Fritschen.L.J and L.W Gay. Springer varlag. Environmental Instrumentation. 1979. Newyork.

Boyer, Rodney, I. Benjamin and Cummins. Modern Experimental Biochemistry. 2nd Edition.

## SEMESTER VI

### **SUBJECT TITLE: AOS IV- CLINICAL LABORATORY TESTS AND ITS INTERPRETATION**

**SUBJECT DESCRIPTION:**This course presents the various clinical laboratory tests and its interpretation.

**GOALS:**To enable the students to have a sound knowledge in clinical chemistry tests, microbiology and blood bank.

#### **OBJECTIVES:**

On successful completion of the course the students should have understood:

Biochemical constituents and enzymes that are used as marker for various diseases.

Serodiagnostic procedures.

Skin tests.

Haemogram and blood bank.

## UNIT I

### **CLINICAL CHEMISTRY TESTS**

Blood glucose, Glycoslyated Hb, Fructosmaine, Glucose tolerance test, Uric acid, Calcium, Phosphorous, Iron, Ferritin, Copper, CSF analysis, Electrolytes - Sodium, Potassium, Chloride and Bicarbonate, Serum protein electrophoresis.



## UNIT II

Enzymes : Acid phosphatases, LDH, Gamma GT, CPK, CPK-MB, Alpha amylase.

Profile - Liver function test, Renal function tests,, Lipid profile.

Hormones - T3, T4,TSH, FSH, LH, Prolactin, Estradiol, Insulin.

Immunoglobulins - IgA, IgM, Ig G, Ig E.

## UNIT III ( MICROBIOLOGY)

Infective syndrome and their diagnostic,procedures - Respiratory tract infection, Intestinal infection, Urinary tract infection, Meningeas infection, Wound infections, Reproductive system infection and pyrexia.

Serodiagnostic procedures - Precipitation tests, VDRL test, Khan test, Immunodiffusion test, Agglutination test - Widal test ( Slide and tube method), Brucella agglutination test, Weil Felix test. Cold agglutination test, ASO test, RA test, CRP test, Complement fixation test- Wasserman test, Immunofluorescence test, FT A test, Enzyme linked immunosorbent assay HIV test, Hepatitis markers, Antinuclear antibodies ( ANA), - 6 Profiles, Lepospiral Ig G ans IgM, TORCH test, Immunoelctroblot technique - Western blot test,

Skin tests - Mantoux test, Casonis test, I.epramin test, Fries test.

## UNIT IV

Complete haemogram, Complete Urine analysis, Complete Motion analysis and Semen analysis.

## UNITV

Blood bank - Blood group & Rh factor, Coomb's test - Direct/ Indirect. Coagulation studies - Prothrombin time (PT), Partial Thromboplastin (PTT). D - Dimer, Plasma Fibrinogen, Inborn errors of metabolism - 1. Benedict's test for reducing substances, 2. Test for Phenyl ketonuria, 3. DNPH test for presence of ketoacids, 4. Cyanonitroprusside test for Cysteinuria and Homocysteine, 5. Cetrimide V for mucopolysaccharides. Paper chromatography.

## REFERENCES:

Practical Clinical Biochemistry - Harold Varley

Clinical Biochemistry - Teitz.

Metabolic Disease and Control - Bonde

Interpretation of Diagnostic Te\*ts - A Synopsis of Laboratory Medicine - Jacques Wallach, 5th Eds. Little Brown & Co., London, 1992.

Clinical Chemistry in Diagnosis & Treatment.

Joan Zilva & PR. Pannall. P.G

Publishing Pvt Ltd., NewDelhi.

**SEMESTER VI (DIPLOMA)  
PRACTICAL I**

Menu Planning for the following Nutritional Status

Pregnant Women  
Lactating Women  
Infants  
Pre School Children  
School going Children  
Adolescent  
Old Age.

**REFERENCES**

Kaushik, V.B (1999). Problem of food nutrition and dietetics.  
Gopalan C and et al. (1996). Nutritive value of Indian foods.

**PRACTICAL II**

Preparation of routine hospital diet:

Regular  
Light  
Soft  
Clear  
Full liquid diet

Planning and preparation of diet:

Fever,  
Diarrhea,  
Constipation  
Peptic ulcer,  
Protein calorie,  
Malnutrition,  
Vitamin A deficiency

**REFERENCES**

Kaushik, V.B (1999). Problem of food nutrition and dietetics.  
Gopalan C and et al. (1996). Nutritive value of Indian foods.

**MODEL QUESTION PAPERS  
ANATOMY & PHYSIOLOGY.**

Time :3 Hrs                      Answer **ALL** Questions.                      Max. marks:100.

**SECTION –A** ( 10 x 1 = 10 )

**Fill up the blanks.**

1. Hormones are ----- Substances.
2. The main function of liver is storage of -----.
3. The specific gravity of blood in male is -----.
4. The blood vessels which carry blood from heart to different organs is called as ----
5. The male reproductive organ is -----.

**Give short answer.**

6. Give the significance of nephron.
7. What is the percentage of total count of plasma in blood?
8. Give the amount of RBC in new born.
9. Define physiology.
10. What is the unit of nervous system.

**SECTION – B** ( 5 x 6 = 30 )

11. a). Write about various parts of brain.                      (or)  
b). Give the size , location & covering chambers of heart.
12. a). Give an account on respiratory system.                      (or)  
b). Explain the position and function of liver & pancreas.
13. a). Write about the size , shape & variations of RBC.                      (or)  
b) What is Lymph? Give the composition and functions.
14. a). Give the properties and functions Salivary glands.                      (or)  
b). Write the functions of large intestine.
15. a). Mention the composition urine.                      (or)  
b). Give the structure of Nephron.

**SECTION - C** (5 x 12 = 60)

16. a). Give the definition, subdivisions and various organization of body.                      (or)  
b). Explain in detail about the Central Nervous System.
17. a). Give the structure & function of Excretory System.                      (or)  
b). Give the structure & function of Endocrine Glands.
18. a). Explain Cardiac output. Give the factors affecting variation and regulation of heart.                      (or)  
b). Describe pulse. What are the cause & characteristics of Radial pulse. Define Heart sounds.
19. a). Give the structure and functions of Respiratory system.                      (or)  
b). Explain the composition and function of various pancreatic & intestinal juices.
20. a). Explain the mechanism of urine formation.                      (or)  
b). Write an account on male and female reproductive hormones.

**BIOMOLECULES..**Time :3 Hrs      Answer **ALL** Questions.      Max. marks:100.**SECTION –A** ( 10 x 1 = 10 )**Fill up the blanks.**

1. Gangliosides are -----
2. The lipoprotein which has the largest size and density is -----.
3. The back bone of nucleic acid structure is contributed by -----.
4. The denaturation of DNA is accompanied by -----.
5. The rich source of iron is -----.

**Give short answer:**

6. Define iodine number.
7. Name the aminoacid which is present in high concentration in keratin.
8. Who discovered Z-DNA .
9. List the materials which are rich in vitamin – C.
10. Which element prevent the development of dental caries?

**SECTION – B** ( 5 x 6 = 30 )

11. a). Write an account on the structure of water molecule. (or)  
b). How are carbohydrates classified ?
12. a). How are lipoproteins classified ? Mention the composition and functions. (or)  
b). Give an account on derived lipids.
13. a). How is primary structure of peptide determined ? (or)  
b). Explain the classification and structure of amino acid.
14. a). Illustrate Watson and Crick model of DNA structure. (or)  
b). Illustrate the difference between DNA & RNA and unusual bases.
15. a). Write the structure and function of vitamin B12. (or)  
b). What are the sources rich in iron and state the biological functions.

**SECTION - C** (5 x 12 = 60)

16. a). Write the cyclic structure of glucose and its properties. (or)  
b). Write the chemistry and chemical reactions of disaccharides.
17. a). What are essential fatty acids and their significance ? (or)  
b). Write the structure of sphingomyelin , phosphatidyl choline , inositol .  
phospholipide.
18. a). Explain the secondary structure of protein. (or)  
b). What are the strong and weak bonds? Explain in detail.
19. a). Explain the different types of RNA in detail. (or)  
b). Describe the degradation of nucleic acids by enzymes.
20. a). Give the structure , sources and physiological functions of vitamin A. (or)  
b). Discuss the sources and importance of Na, Ca, Mg.

**CELL BIOLOGY.**Time :3 Hrs            Answer **ALL** Questions.            Max. marks:100.**SECTION –A** ( 10 x 1 = 10 )**Fill up the blanks.**

1. ----- is not found in the membrane.
2. Phospholipids are ----- in nature.
3. Nuclear membrane is considered to be specialisation of -----.
4. Intermediate filaments are found in -----.
5. The marker enzyme of golgy complex is -----

**Give short answer:**

6. How biologically active molecules are formed in prebiological earth?
7. What is the specificity in active transport process?
8. In which phase RNA & Proteins are actively synthesized during?
9. Who coined term cell ?
10. Which is the most common pattern in microtubular arrangement ?

**SECTION – B** ( 5 x 6 = 30 )

11. a). How is the origin of cell accomplished ?            (or)  
b). What are the structural difference between a prokaryotic & eukaryotic cells ?
12. a). Discuss the role of carbohydrates as a membrane components.            (or)  
b). Explain the passive transport ?
13. a) Discuss the different type of ER & Mention their role. (or)  
b). Discuss the secretory role of Golgi.
- 14 a). Discuss the functions of microfilaments.            (or)  
b). Describe about the structure of cilia and flagella.
- 15 a). Explain the types of cancer and treatment.            (or)  
b). Explain the properties of cancer cell.

**SECTION - C** (5 x 12 = 60)

- 16) a). Describe the morphology of eukaryotic cells ?            (or)  
b). Describe the structure of plasma membrane.
- 17) a). Describe the morphology and functions of lysomes.            (or)  
b). Describe the morphology and functions of ribosomes.
- 18) a). Describe the various phases of meiosis.            (or)  
b). Describe the morphology and functions of nucleus.
- 19) a). Describe the morphology and functions of microtubules & microfilaments. (or)  
b). Describe the structure & functions of mitochondria.
- 20) a). Describe the development and causes of cancer. (or)  
b). Explain about Retero viral & proto oncogenes.

**Core paper-IV – MICROBIOLOGY I**

Time : 3 Hours

Max : 100 marks

**SECTION – A [10X1=10 Marks]**Answer **ALL** the questions

1. Bacterial cell is
  - (a) Prokaryotes
  - (b) Eukaryotes
  - (c) Multi cellular
  - (d) Diploid
2. Plasmid is
  - (a) Extra chromosomal DNA
  - (b) Genetic material
  - (c) mRNA
  - (d) cDNA
3. Resting and resistant form of bacteria
  - (a) Capsule
  - (b) Spores
  - (c) Vegetative form
  - (d) Normal cell
4. Anaerobic bacteria
  - (a) Strepto Cocci
  - (b) E.Coli
  - (c) Clostridium
  - (d) Staphylococci
5. Basophilic bacteria
  - (a) Pseudomonas
  - (b) Acromonas
  - (c) Vibrio
  - (d) Plasma cells
6. Phenols used for
  - (a) Antiseptic
  - (b) Antibiotic
  - (c) Antiviral agent
  - (d) Bacteriostatic
7. Anaerobic media
  - (a) Blood Agar
  - (b) Robert Son Cooked Meat Media
  - (c) Nutrient Agar
  - (d) Phenol AgarM and O
8. Use of dark field microscope
  - (a) Identify the Bacterial Structure
  - (b) Identify the Spirocheates
  - (c) Identify the Bacterial Capsule
  - (d) Spore Identification
9. Antibiotic susceptibility test done by
  - (a) Disc diffusion Method
  - (b) Lawn Culture Method
  - (c) Two fold Dilution Method
  - (d) Phenol Agar method
10. Magnification power of Electron microscope
  - (a) 0.2nm
  - (b) 0.5nm
  - (c) 0.8nm
  - (d) 0.3nm

**SECTION – B [5X6=30 Marks]**Answer **ALL** the questions

- 1.a) Write short notes on bacterial growth curve . Or  
b) Difference between prokaryotes and eukaryotes.
- 2.a) Write short notes on sporulation. Or  
b) Classify Bacteria based on the structure and arrangements.
- 3.a) Write short notes on Autoclave. Or  
b) Write short notes on Hot air oven.
- 4.a) Write short notes on Enriched and Enrichment media. Or  
b) Write short notes on Louis Pasteur and Alexander Fleming.
- 5.a) Write short notes on Phase contrast microscope. Or  
b) Write short notes on Dark field microscope.

**SECTION – C [5X12=60 Marks]**Answer **ALL** the questions

- 1.a) Describe briefly on bacterial anatomy. Or  
b) What are the techniques used for the identification of bacteria?
- 2.a) What are the growth requirements for bacterial cultures and write about the culture methods used for bacterial culture?  
Orb) Define sterilization. Write about chemical sterilization.
3. a) What are the methods used for antibiotic sensitivity test? Write briefly Disc diffusion method.  
Orb) Define antibiotics. Write briefly about classification of antibiotics.
- 4.a) Write about Electron microscope.  
Orb) Write about staining method and wet preparation.
- 5.a) Write briefly on Light microscope.  
Orb) Write about the sterilization controls.

**Core paper-VI – ENZYME TECHNOLOGY AND INTERMEDIARY METABOLISM**

Time : 3 Hours

Max : 100 marks

**SECTION – A [10X1=10 Marks]**Answer **ALL** the questions

1. Allosteric kinetics is characteristic of which enzyme?  
a. Hexokinase   b. Lactate dehydrogenase   c. Aspartate transcarbamylase   d. None of the above
2. The following enzyme is used in cheese production  
a. Collagenase   b. Renin   c. Trypsin   d. Bromelains
3. The non protein organic part of an enzyme is known as  
a. Coenzyme   b. apoenzyme   c. holoenzyme   d. active enzyme
4. The place at which the substrate bind to the enzyme is called as  
a. active site   b. substrate binding   c. inhibitor binding   d. inactive site
5. The liver marker enzyme is  
a. alkaline phosphatase   b. insulin   c. glucose   d. glycogen
6. The breakdown of glucose to glycogen is known as  
a. glycogenesis   b. glycogenolysis   c. glycolysis   d. HMP shunt
7. The no of ATP produced when a molecule of acetyl coA is oxidized through TCA is  
a. 12   b. 24   c. 38   d. 15
8. ----- is the organ that synthesis urea  
a. liver   b. kidney   c. heart   d. lung
9. The deoxyribonucleic acid is -----  
a. DNA   b. RNA   c. Both   d. none
10. Oratic aciduria is a disorder of ----- metabolism  
a. pyrimidine   b. purine   c. DNA   d. RNA

**SECTION – B [5X6=30 Marks]**

Answer ALL the questions

11. a. Define the structure and functions of flavin nucleotides. [or]  
b. Write on mechanism of enzyme action.
12. a. Write about Co-enzyme. [or]  
b. Brief on Biosenser
13. a. Explain about aspartate transcarbamylase [or]  
b. Describe : Energetics of TCA
14. a. Discuss on alpha oxidation [or]  
b. Write on ammonia toxicity.
15. a. Discuss the synthesis of DNA. [or]  
b. Degradation of uric acid.

**SECTION – C [5X12=60 Marks]**

Answer ALL the questions

16. a. Explain about the structure and function of Biotin and lipoic acid as co enzyme [or]  
b. Discuss LB plot
17. a. Define active site of an enzyme, add note on uncompetitive enzyme [or]  
b. Define cofactor and how metal acts as cofactor.
18. a. Discuss on glycogen metabolism. [or]  
b. Brief on HMP shunt.
19. a. Brief on beta oxidation [or]  
b. Describe on degradation of tyrosine
20. a. Write a note on salvage pathway of purine nucleotides [or]  
b. Write a note on salvage pathway of pyrimidine nucleotides

**Microbiology – II**

Time : Three hours

Maximum: 100 marks

Answer all questions

**SECTION – A (10X2=20 marks)****Fill in the blanks:**

1. Cyanobacteria are ----- phototrophic bacteria.
2. An agent usually a chemical that kills the growing forms but not necessarily the resistance spore forms of disease producing microorganisms is -----.
3. ----- illness is caused by *staphylococcus aureus*
4. Mycobacterium tuberculosis can survive and multiply within phagocytic cells such as -----.
5. The members of haemophilus genes requires -----.

**Write short notes on the following:**

6. Which is the chemical substance that confers rigidity to the cell wall of bacteria?



7. Name the process that destroys all the forms of microbial life.
8. Which organism is causative for botulism?
9. The infection caused by Salmonellosis is called?
10. Who defined antibiotics?

**SECTION – B (5X6=30 marks)**

11. (a). Define sterilization. Write a note on various sterilization controls. OR  
(b). Explain the classification of chemical methods of disinfections.
12. (a). Describe the characteristics of culture media. OR  
(b). Give an account on photosynthetic bacteria.
13. (a). Write a note on the following  
(i). Clostridium tetani OR  
(ii). Staphylococcal poisoning
14. (a). Write an account on aetiology, symptoms and prevention of haemophilus. OR  
(b). Write an account on aetiology, symptoms and prevention of vibrio cholera.
15. (a). Briefly explain on  
(i). Mycobacterium tuberculosis OR  
(ii). Mycobacterium leprae.

**SECTION – C (5X10=50 marks)**

16. (a). Write a brief note on various techniques involved in sterilization? OR  
(b). Explain the testing procedure involved in disinfection.
  17. (a). Explain synthetic, semisynthetic and natural culture media with examples. OR  
(b). Write briefly the identification of bacteria.
  18. (a). Write notes on the following:  
(i). Bacillus cereus  
(ii). Bacillus anthracis.
- OR
- (b). Write a detailed account on the ill effect of streptococci and pneumococci.
  19. (a). Explain on any two clostridium group of organism. OR  
(b). Write an account on  
(i). Yersinia. (ii). Brucella.
  20. (a). Name any two antibiotics and explain its mode of action. OR  
(b). Write a note on: (i). Leptospira. (ii). Rickettsia.

**CLINICAL BIO CHEMISTRY**

Time: 3 Hrs

Max : 100 Marks

Answer **ALL** Questions

SECTION A (10 X1 = 10 Marks)

**Fill up the blanks**

- 1) Glucose 6 phosphatase enzyme defect leads to \_\_\_\_\_
- 2) Gaucher's disease is due to the deficiency of \_\_\_\_\_
- 3) Fibrinogen content of plasma is \_\_\_\_\_
- 4) GTT is usually done to assess \_\_\_\_\_
- 5) Icteric index is used to detect \_\_\_\_\_

**Answer the following**

- 6) What is the normal renal threshold level for glucose?
- 7) What is LCAT?
- 8) Give the aminoacid that leads to Alkaptonuria?
- 9) Which acid is predominant in gastric juice?
- 10) What is the normal value of creatinine clearance?

SECTION B (5 X 6 = 30 Marks)

- 11) – a) Mention the sugar levels for a normal healthy individual at various states. OR  
–b) What is meant by Glycosuria. How does it occur.
- 12) –a) What is the normal level of cholesterol in blood. Explain Xanthomatosis OR  
–b) Write about various lipoproteins
- 13) –a) Explain Orotic aciduria OR  
–b) Mention the normal levels of various serum proteins
- 14) –a) What do you mean by stimulants. Give two examples for weak and strong stimulants. OR  
–b) Explain fat balance test.
- 15) –a) Explain the various urinary tests for determination of urobilinogen OR  
–b) What do you mean by RBF and FF

SECTION C (5 X 12 = 60 Marks)

- 16) –a) How will you perform GTT. Interpret the results OR  
–b) Write about glycogen storage diseases
- 17) –a) Explain various types of hyperlipoproteinemia OR  
–b) Write about (i) Fatty Liver  
(ii) LCAT Deficiency
- 18) –a) What is meant by aminoaciduria's . Explain any four aminoaciduria's OR  
–b) Detail on the disorders of purine metabolism
- 19) –a) Explain tubeless gastric analysis OR  
–b) Write about the monosaccharide absorption test.
- 20) –a) Discuss on the clinical significance of serum enzymes in liver diseases OR  
–b) Write a clearance test for estimating GFR.

**Core paper – PATHOLOGY**

Time : 3 Hours

Max : 100 marks

**SECTION – A [10X1=10 Marks]** Answer **ALL** the questions

1. Fouchets test is ment to identify -----
2. Acetone is one of the -----
3. Normal value of urine out put level is -----
4. Normal specific gravity is -----
5. Mention a confirmatory test for occult blood is -----
6. Sugar confirmatory test is -----
7. Temperature of tissue floatation bath is -----  
a.55C b. 43C c.65C d.35C
8. Most commonly used mounting media is  
a.DPX b.Xylene c.Paraffin wax d.Alcohol
9. Optimal clearance angle should be  
a. 15-20 b. 5-10 c.45 d. 35
10. Decalcifying agent is  
a. Absolute alcohol b.5% Nitric acid c. 10% Formalin d.Glacial acetic acid.

**SECTION – B [5X6=30 Marks]**Answer **ALL** the questions

- 11.Short notes  
a. Polyuria b. Haematuria c. Azoospermia d. ADH (OR)  
What is the normal specific gravity of urine? How will you test the same?
12. What is proteinuria?What are the methods used to identify the presence of protein in the urine. (OR)  
Mention the test to deduct occult blood in the motion.Describe any one of the same.
13. Describe urine physical examination. (OR)  
What is the method used to identify the presence of sugar in the urine.
14. Write a note on various types of Microtomes and type of microtome knives. (OR)  
Write a note on Sharpering of microtome knife.
15. Write a note on Histokinete. (OR)  
Write a note on process of embedding and other embedding medias.

**SECTION – C [5X12=60 Marks]** Answer **ALL** the questions

16. Describe in detail the analysis of semen. (OR)  
Detail the method confirmatory test for Acetone.
17. Detail confirmatory test in urine Bile pigment. (OR)  
Short notes ; Haematuria, oligozoospermia,chyluria,oliguria.
18. Write about the normal composition of urine. (OR)  
Write about complete analysis of CSF
- 19.What is fixation? Discuss about various fixative.(OR)  
Mention the various decalcifying agents used to describe the process of Decalcification.
- 20.Describe the procedure involved in the presentation of museum specimens. (OR)  
Write a note on organization of clinical laboratory.

### Microbiology – III

Time : Three hours

Maximum: 100 marks

Answer all questions

#### SECTION – A (10X2=20 marks)

##### Fill in the blanks:

1. Disease transmission by medium such as water food and air is called ----- transmission.
2. ----- is the abbreviation for antibodies.
3. HIV contains ----- type of nucleic acid.
4. The rabies virus enters the tissue from ----- of biting animals
5. The fungi infected men and animals are called -----.

##### Write short notes on the following:

6. Give the other name for Pandemic disease .
7. Define innate immunity.
8. Where does the *candida albicans* mostly found?
9. Which part of the alimentary canal does the pinworms is found?
10. Which worm looks like cylindrical and tapered on each end?

#### SECTION – B (5X6=30 marks)

Short answer questions:

11. (a). Write an account on disease vectors. OR  
(b). Briefly describe pandemic disease.
12. (a). Write short notes on acquired immunity. OR  
(b). Describe the innate immunity.
13. (a). Write short notes on general properties of viruses. OR  
(b). Describe the replication of HIV.
14. (a). Write an account on culture characteristics of dermatophytosis. OR  
(b). Describe the epidemiology of dermatophytosis.
15. (a). Write short notes on malarial fever. OR  
(b). Briefly describe the round worms.

#### SECTION – C (5X10=50 marks)

16. (a). Write in detail about the transmission of disease. OR  
(b). Explain in detail about the endemic and epidemic disease.
17. (a). Describe in detail the antigen and antibody reaction. OR  
(b). Write in detail about the scope of immunology.
18. (a). Describe the symptoms, diagnosis and treatment of rabies. OR  
(b). Describe in detail about poliomyelitis.
19. (a). Explain the epidemiology, clinical types and culture characteristics of candidiasis. OR  
(b). Write a brief account on cryptococcolin.
20. (a). Explain in detail about tapeworm and pimworm. OR  
(b). Write an essay on fluke worms and hookworms.

**AOS Paper II – BIOCHEMISTRY OF DRUGS**  
**Model Question paper**

Time : 3 Hours

Max : 75 marks

**SECTION – A [10X1=10 Marks]**Answer **ALL** the questions

1. For safe therapeutic application of a drug, its therapeutic index must be
  - a. less than one
  - b. more than one
  - c. equal to one
  - d. Zero
2. Basic drugs are absorbed in
  - a. Small intestine
  - b. Stomach
  - c. Large intestine
  - d. None
3. Example for cell surface receptor is
  - a. ion channels
  - b. G-protein coupled receptors
  - c. Tyrosine kinases
  - d. All the above
4. The father of modern chemotherapy
  - a. Kornberg
  - b. Einstein
  - c. Ehrlich
  - d. Lehninger
5. Allopurinol is used as an inhibitor in
  - a. MAO
  - b. Xanthine oxidase
  - c. DAO
  - d. Uric acid
6. Acyclovir inhibits
  - a. protein synthesis
  - b. RNA synthesis
  - c. DNA synthesis
  - d. None
7. Prontosil and sulfasalazine are the examples of
  - a. Azo compounds
  - b. thiol compounds
  - c. Mercaptopurine
  - d. hydrazines
8. The dose which produces a desired response in 50% of the test population is
  - a. LD
  - b. ED
  - c. 50
  - d. Quantal dose
9. Amphetamine is converted to phenylacetone by
  - a. N-oxidation
  - b. Azo reduction
  - c. Oxidative deamination
  - d. S-oxidation
10. Co-Trimoxazole is the ----- drug
  - a. Anti viral
  - b. Anti-fungal
  - c. Anti bacterial
  - d. purine derivative

**SECTION – B [5X5=25 Marks]**Answer **ALL** the questions

11. a. What are the effects of protein binding on drugs? [or]  
 b. Define LD 50 and ED50.
12. a. Explain oxidative deamination of drugs with examples. [or]  
 b. Explain nitroreduction with examples.
13. a. Explain the mode of action of penicillin [or]  
 b. Write a short note on antimalarial drugs.
14. a. Write a brief note on coumarin [or]  
 b. Give two uses of salicylates.
15. a. Explain the mode of action of streptomycin. [or]  
 b. Outline the classification of sulfonamide according to their therapeutic utility.

**SECTION – C [5X8=40 Marks]**Answer **ALL** the questions

16. a. Describe the classification of drugs [or]  
 b. Give an account on receptor theories.
17. a. Give an account on conjugation of drugs [or]

- b. Explain the non microsomal oxidation with examples.
18. a. Explain the structure, mechanism of action, absorption, excretion and adverse reaction of INH. [or]
- b. Write down the chemistry and pharmacological actions of any two antimetabolites of purine.
19. a. Brief on beta oxidation [or]
- b. Give an account on heparin and coumarin
20. a. Write an essay on phase-I reactions of drug metabolism [or]
- b. Give an account on the consequences of drug abuse.

**PATHOLOGY -III**  
**Core paper-XI – HAEMATOLOGY**  
**Model Question paper**

Time : 3 Hours

Max : 100 marks

**SECTION – A [10X1=10 Marks]**Answer **ALL** the questions

1. The anticoagulant which prevent blood clotting by neutralizing thrombin is -----
2. Deficiency of glucose-6-phosphate dehydrogenase leads to ----- disease
3. The vitamin involved in blood coagulation is -----
4. Deficiency of blood clotting factor VIII leads to -----
5. ----- equipment is used to identify haemoglobin levels in routine clinical use
6. Define the term packed cell volume
7. Define haemolytic anemia
8. What is meant by thrombocytopenia?
9. Write the process of fibrinolysis.
10. What are photosensitive chemicals?

**SECTION – B [5X6=30 Marks]**Answer **ALL** the questions

11. a. Discuss the morphology of RBC. [or]
- b. List out the normal values in haematology.
12. a. Discuss the test used for screening autoimmune haemolytic anemia. [or]
- b. Describe the laboratory method used for the investigation of osmotic fragility
13. a. Discuss bleeding time [or]
- b. Give an account on PT coagulation studies
14. a. Write the test for blood fibrinolytic activity [or]
- b. Describe platelet function test
15. a. What are the methods followed in automation of haematology laboratory. [or]
- b. Describe on the quality control methods in haematology laboratory.

**SECTION – C [5X12=60 Marks]** Answer **ALL** the questions

16. a. Give a brief account on the anticoagulants used in haematology [or]
- b. Discuss in detail on the following techniques

- (i) RBC count (ii) WBC count (iii) Platelet count
17. a. Describe the laboratory methods used in the investigation of anemia [or]  
b. Discuss on  
(i) test for sickling (ii) Estimation of Hb –A2 (iii) Hb electrophoresis
18. a Explain the mechanism of blood coagulation. [or]  
b. What are the methods used for assay of clotting factors? Discuss.
19. a Discuss briefly on cytochemistry in haematology [or]  
b. How will you demonstrate LE test and platelet function test?
20. a. Describe the methods used in organization and quality control in haematology lab [or]  
b. Discuss on the various methods used in disposal of wastes in the haematology laboratory

**Core paper-XII – NUTRITION AND CANCER BIOLOGY**  
**Model Question paper**

Time : 3 Hours

Max : 100 marks

**SECTION – A [10X1=10 Marks]**Answer **ALL** the questions

1. cAMP is cleaved by -----  
a. protein kinase    b protein phosphorylase    c. phosphodiesterase    d. Phospholipase C
2. The following hormone is not under the control of ACTH  
a. Aldosterone    b Deoxy corticosterone    c. Cortisterone    d. Cortisol
3. Vasopressin is also is known as  
a. antidiabetogenic hormone    b. antidiueritic hormone    c. somatotrophic hormone    d. pitokin
4. Antibody involved in allergy is -----  
a. IgA    b. IgE    c. IgM    d. IgD
5. 50% excess of body weight indicates ----- obesity  
a. mild    b. severe    c. moderate    d. very severe
6. BMI =  
a. Body mass index    b. Basic metabolic index    c. body metabolic index    d. none of the above
7. Which of the following is false about free radicals  
a. highly reactive    b. have an electron deficient  
c. attack biological molecules    d. highly beneficial when produced in excess
8. Kempner's rice diet is given in  
a. Diabetes    b. hyper tension    c. Diarrhoea    d. anemia
9. Pernicious anemia is due to the deficiency of -----  
a. Vit C    b. Vit D    c. Vit B<sub>6</sub>    d. Vit B<sub>12</sub>
10. PSA is  
a. protease specific antigen    b. pulmonary specific antigen  
c. protease specific antibody    d. pulmonary specific antibody

**SECTION – B [5X6=30 Marks]**Answer **ALL** the questions

11. a. Write the etiology of Diabetes. [or]  
b. Write down the reasons for nutritional anemia.
12. a. What is a therapeutic diet and detail on the principles. [or]

- b. Explain on the tests in the detection of allergy
13. a. Explain about the properties of hormone [or]  
b. Brief account on thyroid hormone
14. a. Explain the formation of free radicals [or]  
b. Write the pathological consequences of lipid peroxidation.
15. a. Detail on the classification of cancer. [or]  
b. Explain the factors causing cancer.

**SECTION – C [5X12=60 Marks]**Answer **ALL** the questions

16. a. Describe about the dietary treatment for kidney diseases [or]  
b. Define allergy and classify. Describe about the dietary treatment for allergic reactions.
17. a. Explain on dumping syndrome [or]  
b. Explain on the types of ulcer, etiology and dietary treatment.
18. a. Describe about carcinogens. [or]  
b. Explain on tumour antigens.
19. a. How will you measure lipid peroxidation? [or]  
b. Describe about enzymic antioxidants
20. a. Describe in detail about sex hormones [or]  
b. Explain about the role of pancreatic hormones

**BIOMEDICAL INSTRUMENTATION**

Time: 3 Hrs

Max : 100 Marks

Answer **ALL** the questions**SECTION A (10 X1 = 10 Marks)****Fill up the blanks**

- 1) The pH of blood is \_\_\_\_\_
- 2)  $R_f$  value is always \_\_\_\_\_
- 3) For fractionation of subcellular organelles \_\_\_\_\_ is used.
- 4) Ultrasonic sound waves are used in \_\_\_\_\_
- 5) GM Counter works on the principle of \_\_\_\_\_

**Answer the following**

- 6) Define Mole fraction?
- 7) Give the technique by which volatile substances are separated?
- 8) Name the technique by which serum proteins are separated?
- 9) What is used as radiation source in colorimetry
- 10) Name the isotopes used for long term dating?

**SECTION B (5 X 6 = 30 Marks)**

- 11) – a) Define molality and molarity. OR  
–b) Define equivalent weight and normality.



- 12) –a) Give the principle and working of HPLC OR  
 –b) Give the application of GC-MS
- 13) –a) Explain the principle of ELISA OR  
 –b) Explain the principle and description of analytical centrifuge.
- 14) –a) Explain the principle of CT Scan and MRI Scan OR  
 –b) Give the principle of fluorimetry
- 15) –a) Explain the technique and application of auto-radiography OR  
 –b) Explain the principle and working of liquid scintillation counter

## SECTION C (5 X 12 = 60 Marks)

- 16) –a) Derive the Henderson Hasselbatch equation OR  
 –b) Elaborate on the blood buffers
- 17) –a) Give the principle and application for molecular sieve chromatography OR  
 –b) How are enzymes purified using affinity chromatography
- 18) –a) Give the technique, types and application of immunoelectrophoresis OR  
 –b) How will you determine the molecular weight of a macromolecule by sedimentation velocity method.
- 19) –a) Explain the principle, instrumentation of spectrophotometry OR  
 –b) Explain the Beer-Lambert law. Compare and contrast the colorimeter and spectrophotometer.
- 20) –a) How are radioisotopes used for scanning different organs. Explain its applications OR  
 –b) Explain the principle and working of GM Counter.

**BSc Clinical Laboratory Techniques**  
**Diploma course**  
**Paper I-Nutrition Through Life Cycle**  
**Section A**

1. Deficiency of ----- during pregnancy leads to foetal mortality  
 a.) Zinc                      b) Iodine                      c) Sodium                      d) Calcium
2. Normal iron requirement of an adult woman is ----- /day  
 a) 30mg                      b) 15mg                      c) 10mg                      d) 12mg
3. The essential fatty acid that is necessary for infant's growth  
 a) linoleic acid                      b) oleic acid                      c) linolenic acid                      d) arachidonic acid
4. Folate requirement in lactating women is -----  
 a) 150mcg                      b) 200mcg                      c) 50mcg                      d) 40mcg
5. Expand PCM
6. Expand ICDS
7. ----- is an eating disorder  
 a) Anorexia nervosa                      b) Obesity                      c) Anaemia                      d) PCM
8. ----- is essential for Haemoglobin synthesis  
 a) Fe                      b) Zn                      c) Mn                      d) Cu
9. Fibre stimulates -----  
 a) peristalsis                      b) constipation                      c) rickets                      d) osteoporosis
10. Define Sarcopenia

**Section B**

- 11.a) Write a note on preconceptual nutrition or  
b) What are the major prenatal nutrition alteration that occur in expectant mothers
- 12a) Write a note on Weaning foods or  
b) Write on the nutritional requirements during lactation
- 13a) What are the factors responsible for rejecting the food by preschool child or  
b) Describe the feeding problems in school children
- 14a) Write notes on Anorexia or  
b) Write on Bulimia
- 15a) Describe modification of diet during old age or  
b) What are the socio, economic & psychological factors affecting the nutrition for old age

**Section C**

- 16a) What are the complications that occur during pregnancy or  
b) Discuss the implications of public health & prophylaxis programme for pregnant women
- 17a) Relate height and rate of growth as an indicator in the growth of infants or  
b) Describe the special foods to be followed during lactating period
- 18a) Discuss the nutrition related problems of preschoolers or  
b) Describe the RDA of school going children
- 19a) Elaborate on the nutritional & medical problems relating to adolescence stage or  
b) Relate nutritional requirement & work efficiency during adulthood
- 20a) Describe Exercise & Thermogenesis  
b) Write about the nutritional requirements in Sports

**Paper II – Diet Therapy****Section A**

1. Define Glycaemic index
2. Full fluid diet gives -----kcal  
a) 1200                  b) 1500                  c) 1800                  d) 2000
3. Elevation in body temperature is  
a) fever    b) cold    c) tuberculosis    d) vomiting
4. Plasmodium falciparum is responsible for  
a) malaria                  b) tuberculosis                  c) influenza                  d) typhoid
5. Juvenile onset diabetes is otherwise termed as  
a) IDDM                                  b) NIDDM  
c) Malnutrition related diabetes                  d) none of the above
6. Development of atheroma occurs in  
a) atherosclerosis                  b) hypertension  
c) fatty liver                          d) chronic cardiac disease
7. Define Glomerular Filtration Rate
8. List the foods low in Sodium
9. Atkin's diet constitutes  
a) High protein, low carbohydrate                  b) low protein, high carbohydrate  
c) high fat, low protein                          d) low fat, high protein
10. Blood transfusion is recommended when Haemoglobin level is under -----g/dl

- a)4                      b)8                      c)6                      d)10

### Section B

- 11a).Classification of therapeutic diet or  
 b)Write a note on professional code & ethics for dietetician  
 12a)Describe the types and causes of fever or  
 b)Write on the dietary management during constipation  
 13a)Describe the risk factors of heart attack or  
 b)Explain why sodium is restricted in hypertension  
 14a)Differentiate between nephritis & nephrosis or  
 b) What is dialysis? Discuss diet control in dialysis  
 15a)How do you assess an obese & underweight individual or  
 b)Explain grades of obesity

### Section C

- 16a)Write about the origin, aims & objectives and membership of Indian Dietetic Association or  
 b)Describe the types of Routine Hospital Diet  
 17a)What are the metabolic changes that occur during fever or  
 b)How will you modify the diet for a patient suffering from Peptic ulcer  
 18a)Explain the objectives and principles in planning a diet for atherosclerotic patient or  
 b)Differentiate atherosclerosis & congestive cardiac failure  
 19a)Explain the dietary modifications for treatment of Glomerulonephritis or  
 b)What are the foods included & avoided in the diet planned for a nephrotic patient  
 20a)Write the principles & dietary management in obesity or  
 b)What measures are taken to prevent anaemia in India

## Paper III-Clinical Nutrition

### Section A

- 1.Discomfort in the digestive tract is termed as  
 a)Indigestion                      b)Ulcer                      c)Infection                      d)constipation  
 2.Define atonic constipation  
 3.Alcohol acts on lipid metabolism in liver by  
 a)enhancing FA synthesis      b)decreasing FA synthesis      c)decreasing FA oxidation      d) both a & c  
 4. Destruction of liver cells is seen in  
 a)Cirrhosis                      b)Hepatitis                      c)Cholecystitis                      d)Hepatic coma  
 5.Excretion of Glucose in urine is  
 a)Glycosuria                      b)Fructosuria                      c)Pentosuria                      d)Galactosuria  
 6.Accumulation of Uric acid is termed as  
 a)Gout      b)Glomerulonephritis      c)Acute renal failure      d)Nephrosis  
 7.Main carrier of Cholesterol is a)LDL                      b)HDL                      c)VLDL                      d)chylomicrons  
 8.Increased Platelet aggregation results in  
 a)thrombosis      b)fibrous plaque      c)arrhythmia      d)atheroma  
 9.----- plays an important role in diagnosis & management of food intolerance  
 a)Elimination diet                      b)Provocative test  
 c)Skin test                      d)Radio allergosorbent test  
 10.Differentiate Food Allergy & Inhalent Allergy

**Section B**

- 11a) Describe the mechanism of ulcer formation or  
b) How do you prevent constipation
- 12.a) Explain the agents responsible for liver damage or  
b) Write on the precipitating factors & symptoms of hepatic coma
- 13a) Differentiate Diabetes mellitus & Diabetes insipidus or  
b) Write a note on types of calculi
- 14a) Describe the role of fat in the cause of atherosclerosis or  
b) Describe the risk factors in cardiac failure
- 15a) Write on the types of allergic reactions or  
b) Write short note on lactose intolerance

**Section C**

- 16a) Describe the etiology, symptoms & clinical findings of Gastric ulcer or  
b) Discuss the effect of digestion, absorption and nutritional status on malabsorption syndrome
- 17a) Describe Cholecystitis & Cholelithiasis or  
b) Bring out the relationship between alcohol & cirrhosis of liver
- 18a) Explain the metabolic changes, clinical symptoms & diagnosis of diabetes or  
b) What is acute renal failure? Explain the causes & treatment
- 19a) Describe the etiology, symptoms & clinical implications of hypertension or  
b) Describe the etiology, symptoms & clinical implications of atherosclerosis
- 20a) Discuss the clinical manifestations in HIV infection or  
b) What are the causes of Anaemia. Describe the diagnosis, clinical findings & treatment of different types of anaemia