

## SEMESTER VI

### **Paper X : ENDOCRINOLOGY AND NUTRITIONAL BIOCHEMISTRY**

#### **Unit I:**

General endocrine functions – classification of Hormones – Regulation of hormone secretion – Bio Rhythms – Mechanism of action of steroid hormones.

#### **Unit II:**

Biochemical, Physiological and Clinical significance of Thyroid, Parathyroid and Steroid hormones. (Biosynthesis not necessary)

Nutritional Biochemistry:

#### **Unit III:**

Introduction and definition of food and nutrition. Basic food groups – energy yielding, Body building and Protective foods.

Basic concepts of energy expenditure, unit of energy, measurements of food stuffs by Bomb Colorimeter. Calorific value of Proteins, Carbohydrates and Fats, RQ of foods.

#### **Unit IV:**

Nutritive value of proteins, essential amino acids, biological values of proteins(animal and plant proteins).evaluation of proteins by nitrogen balance method – DC,BV,NPU and NAP of animal and plant proteins, protein sparing action of carbohydrates, single cell proteins. Protein Malnutrition (Kwashiorkor) and under nutrition (Marasmus) their preventive and creative measures.

#### **Unit V:**

Composition of balanced diet and RDA for infants, children, adolescent, adult male and female, pregnant lactating women and old age. Physiological role and nutritional significance of Carbohydrates, Lipids, Vitamins (Water and Fat soluble) and Minerals.

### **Books Recommended**

1. Harpers Illustrated Biochemistry  
Robert K.Murray, Darnyl K.Granner  
Peter A.Mayes & Victor W.Rodwell  
26<sup>th</sup> Edition (2003)  
Mc Graw Hill, New York

2. Tietz Text Book of Clinical Biochemistry  
Carl A.Burtis & Edward R.Ashwood  
3<sup>rd</sup> Edition (1999)
  
3. Varley's Practical Clinical Biochemistry  
Alan H.Gowenlock, Janet R.McMurray &  
Donald M.Mc Lauchlan  
6<sup>th</sup> Edition (2002)
  
4. Text Book of Medical Biochemistry  
MN. Chatterjea and Rane Shinde  
6<sup>th</sup> Edition (2005)

Jaypee Publications Ltd., New Delhi

5. Nutritional Biochemistry  
S Ramakrishnan & S Venkat Rao  
First Edition, (1995)  
T.R Publications, Chennai

## SEMESTER VI

### **PAPER XI : CLINICAL BIOCHEMISTRY**

#### **Unit I:**

##### **Basic Concepts of Clinical Biochemistry**

Definition and scope of Clinical Biochemistry in diagnosis, a brief review of units and abbreviation used in expressing concentration and standard solution.

- Quality Control
- Manual vs. Automation in Clinical Biochemistry.
- Collection and Preservation of biological fluids (Blood, Serum, Plasma, Urine and CSF only).
- Anticoagulants used in Clinical laboratory

#### **Unit II: Diseases Related To Metabolism**

Carbohydrate Metabolism: Hypo and hyperglycemia, glycogen storage disease, Diabetes Mellitus. GTT (Glucose Tolerance Test), galactosurea, fructosurea.

Amino Acid Metabolism: Phenyl Ketonurea, alkaptonuria, cystinurea, tyrosinemia, Fanconi Syndrome, Albinism.

Lipid Metabolism: lipid malabsorption and Steatorrhea

Plasma lipoprotein- types factors affecting plasma lipoproteins, clinical significance.

#### **Unit III: Functional Tests**

Liver Function Test: Metabolism of bilirubin – Jaundice, Types, Clinical Features – Test based on bile pigments – plasma proteins in health and diseases – PT, PTT, INR.

Gastric Function Test: Collection of gastric contents, Examination of gastric residium, Fractional Test Meal (FTM), Insulin and Histamine Stimulation Test, Tubeless gastric analysis.

Kidney Function Test: Clearance test – Urea, Creatinine, Insulin, PAH test, concentration and dilution tests.

#### **Unit IV: Clinical Enzymology**

Definition of functional and non-functional plasma enzymes – Isoenzymes and diagnostic tests. Enzyme pattern in health and diseases with special reference to plasma lipase, amylase, choline esterase, alkaline phosphate, acid phosphatase, SGOT, SGPT, LDH and CPK.

## **Unit V: Clinical Chemistry of Pregnancy**

Maternal serum screening for foetal defects – Laboratory Tests used for maternal serum screening.

Tumor Markers: Definition – markers produced by various tissues – classification and clinical application.

### **Books Recommended**

1. Clinical Chemistry  
MN.Chatterjea  
First Edition (1999)  
Jaypee Publications,
2. Lippincott's Illustrated Review  
Pamela C.Champe & Richard A. Harvey  
Second Edition (1994)  
Lippincott Williams B Wilkins.
3. Harpers Illustrated Biochemistry  
Robert K.Murray, Darnyl K.Granner,  
Peter A.Mayes & Victor W.Rodwell  
26<sup>th</sup> Edition (2003)  
Mc Graw Hill
4. Tietz Text Book of Clinical Biochemistry  
Carl A.Burtis, Edward R.Ashwood  
3<sup>rd</sup> Edition (1999)
5. Text Book of Medical Biochemistry  
S.Ramakrishnan, KG.Prasanna & R.Rajan  
3<sup>rd</sup> Edition (2001)  
Orient Longman

6. Medical Laboratory Technology- A procedure manual for regular Diagnostic Test, Volume I and Volume II (2003)

Kanai L.Mukherjee

Tata McGraw Hill.

Varley's Practical Clinical Biochemistry

Alan H.Gowenlock, Janet R.McMurray &

Donald M.Mc Lauchlan

6<sup>th</sup> Edition (2002)

7. Text Book of Medical Biochemistry

MN. Chatterjea and Rane Shinde

6<sup>th</sup> Edition (2005)

Jaypee Publications limited.

## SEMESTER VI

### Paper XII : IMMUNOLOGY

#### UNIT I: IMMUNITY

- Immunity – concept, classification, humoral & cell mediated immunity.
- Lymphoid organs – classification & function.
- Immunoglobulins – structure, function and types.
- Cells involved in antibody formation.

#### UNIT II: ANTIGEN AND ANTIBODY INTERACTION

- Antigens – nature, Immunogens, Haptens, Epitope, Paratope.
- Binding site of antigen and antibody.
- Binding forces of antigen and antibody.
- Polyclonal, Monoclonal antibodies.
- Monoclonal Antibody – preparation, biomedical application.

#### UNIT III: COMPLEMENT SYSTEM

- Complement – components, classification, classical and alternative pathway.
- Functions of Complement system.
- Complement fixation test.

#### UNIT IV: IMMUNOHAEMATOLOGY AND SCOPE

- Blood group system, Rh factor, Erythroblastosis- Foetolysis.
- Application in medicine, Vaccine preparation, Grouping.
- Tests for Tissue typing transplantation and Surgery.

#### UNIT V: IMMUNOLOGICAL DISORDER

- Immunological tolerance and immunosuppression.
- Hypersensitivity and Allergic reactions – Intermediate and Delayed type.
- Autoimmune disorders.

### **BOOKS RECOMMENDED**

- 1) Roitts Essential Immunology  
Ivan M Roitt & Peter J Delves  
Tenth Edition, (2001)  
Blackwell Sciences Ltd., France
  
- 2) Kuby Immunology –  
Richard A Goldsby & Thomas J Kindt  
Fourth Edition, (2000)  
W H Freeman & Company
  
- 3) Textbook of Microbiology  
R Ananthanarayan , C K J Panicker.  
Sixth Edition, (2002)  
Orient Longman Pvt Ltd.

## Semester VI

### PAPER XIII : MICROBIOLOGY AND BIOTECHNOLOGY

#### Microbiology

##### Unit I

###### Introduction

History and evolution of microbiology, microbes and its distribution. Scope of microbiology, classification of micro organisms with special reference to bacteria.

Microscopy: Principle, types - Dark field, Fluorescent, phase contrast, Transmission and scanning electron microscope.

##### Unit II

###### **Morphology, Nutrition and Physiology of Micro Organisms**

Morphology and the fine structure of bacteria, cultivation of micro organisms, methods of microbial growth(Binary fission, Budding, Filamentation and sporulation), Growth curve of bacteria.

Staining Techniques: Simple staining, differential staining. Gram stain, Acid fast stain, Special stain- spore, capsule, granule stain.

Culture Media: Simple, complex, synthetic, enriched, selective, enrichment, assay, indicator, transport, anaerobic and fungal media.

Methods of culturing bacteria: Batch Culture, continuous culture, synchronous culture, fed – batch culture. Pure culture and its technique- Streak plate, Pore plate, spread plate.

##### Unit III

###### **Control of Microorganisms and Bacterial Genetics**

Fundamentals of control, Definition of terms- sterilization, disinfectant, antiseptic, bacteriostatic and bacteriocidal agents

Physial agents- Temperature, moist heat and dry heat, chemical agents, radiation, and filtration. Quality control of sterilization

Bacterial genetics: Gene Transfer mechanism- Transformation, conjugation, transduction and transposition.

## **Biotechnology**

### **Unit IV**

#### **Introduction**

Microorganisms and biotechnological processes, Fermentation media, bioreactor, batch versus and continuous processes, immobilized enzymes.

Concepts of transgenic animals and transgenic plants.

### **Unit V**

#### **Scopes and Application of Biotechnology**

Production of Antibiotics (penicillin and streptomycin), production of vaccines and vitamins (general concepts only). Production of hormones- Insulin, Human growth hormone, Interferon. Production of enzymes (amylase). Production of monoclonal bodies.

### **Books recommended**

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|---|--|
| 1. Concepts in Biotechnology<br>Balasubramanian<br>University Press             | 4. Text book of Microbiology<br>R. Anantanarayanan & C.K.J. Paniker<br>Orient Longman, New Delhi |
| 2. A text book of Biotechnology<br>R.C. Dubey<br>S. Chand & Company, New Delhi. | 5. Principles of Microbiology<br>Ronald M. Atlas<br>WCB McGraw Hill                              |
| 3. Microbiology<br>Michael J. Pelczar Jr<br>Tata McGraw Hill, New Delhi         | 6. Microbiology<br>Davis Bernard<br>7. Microbiology<br>Prescott                                  |

## SEMESTER VI

### **PAPER XIV : ECOTECHNOLOGY AND HUMAN RIGHTS ECOTECHNOLOGY**

#### **Unit I**

##### **Pollution, Pollutants and characteristics**

General Pollutants, classification of air pollutants, Biochemical effect of important air pollutant on human beings and animals. Air quality standards, Classification of water pollutants, characterization of waste water (Physical, chemical and biochemical), water quality standards.

#### **Unit II**

##### **Environmental Management and Technology**

Sewage and wastewater treatment - preliminary treatment, primary, secondary and tertiary treatment. Digestion process, Aerobic treatment system - Trickling filter tank, activated sludge process. Industrial wastewater treatments. Bioleaching,( copper and uranium) recovery and control of oil spills. Bioremediation - (petroleum hydrocarbons), Biodegradation - (Polymers)

#### **Unit III**

##### **Biochemical Toxicology**

**Introduction:** Evaluation of toxic effects of pollutants in animals, toxicity dose(LD<sub>50</sub>), Acute toxicity, Sub-acute toxicity and chronic toxicity, carcinogenic, mutagenic and teratogenic effects of toxicants.

Impact of toxic chemicals on enzymes.

Biochemical effects of heavy metals- Arsenic, Cadmium, Chromium, Copper, Lead and Mercury.

Biochemical effects of pesticides- classification of pesticides and mode of action.

Mechanism of toxicity- Bioconcentration, Bioaccumulation, Biomagnification, Biotransformation and Bioactivation.

#### **Human Rights and ethics (Human Relations Education)**

#### **Unit IV**

##### **Human Rights, Categories and Institutions**

Historical Background, Definition, meaning, scope and need for the study of Human Rights and Relations- Indian Constitution and Human Rights.

Categories: Definition of Human Rights, Rights of women and children.

Institution: UNHR, NHRC, SHRC - National Commission for minorities, SC/Stand women.  
Universal Declaration of Human Rights.

## Unit V

### Issues in 21<sup>st</sup> Century

Fundamentals of Human Rights- Education - Human Rights. and Democracy, Human Rights and Globalization - Human Rights and Information Communication and technology(ICTs) and HIV/AIDS and Human Rights- Role of Voluntary organization - Violation of Human Rights- judiciary and Human Rights.

#### Books Recommended

1. Environmental Biology  
H.R.Singh  
S.Chand and Company, New Delhi.
2. Fundamentals of Environmental Pollution  
Krishnan Kannan  
S.Chand and Company, New Delhi.  
Environmental Chemistry  
A.K.De  
Third edition  
New age international Pvt. Ltd.
3. Text book of Environmental Chemistry  
S.S.Dara  
S.Chand and Company, New Delhi.
4. Principles of Microbiology  
Ronald M. Atlas  
WCB McGraw Hill
5. Human Rights  
N.Jayapalan
6. Atlantic Publishers and Distributors  
Human Rights in 21<sup>st</sup> Century  
Sudhir Kapoor  
Mangal Deep Publication.
7. Human Rights and Fundamental Freedom  
Rahul Rai  
Author Press
8. Human Rights and Social Justice  
Gokul Sharma  
Deep and Deep publications

## MAJOR BIOCHEMISTRY PRACTICAL III

### COLORIMETRIC ESTIMATIONS

- 1) Estimation of Creatinine – Alkaline Picrate Method
- 2) Estimation of Urea – DAM Method
- 3) Estimation of Glucose – OT Method
- 4) Estimation of Glucose – Folin Wu Method
- 5) Estimation of Cholesterol – Zak's Method
- 6) Estimation of Bilirubin
- 7) Estimation of Total Protein, Albumin, Globulin and A/G ratio
- 8) Estimation of DNA – Diphenylamine Method
- 9) Estimation of RNA – Orcinol Method

### I. QUALITATIVE ANALYSIS OF URINE

1. Collection and preservation of Urine sample
2. Microscopic examination of Urine
3. Qualitative analysis of normal and pathological constituents  
(Glucose, protein, bile pigments, ketone bodies, calcium and Blood)

### 3. ELECTROPHORESIS

1. Separation of Protein using SDS PAGE

### 4. CHROMATOGRAPHY

1. Separation of Amino Acids – Paper, TLC
2. Separation of Chlorophyll – Column Chromatography

### 5. HAEMATOLOGY

1. Enumeration of RBC, WBC and Leucocytes.

2. Estimation of Haemoglobin – Sahlis Method
3. Erythrocyte Sedimentation Rate – Westergren's Method

## **6. ENZYME STUDY**

Activity of SGPT, SGOT, Urease, Salivary Amylase, alkaline Phosphataes  
Effect of Temperature, pH and Substrate concentration.

### **BOOKS RECOMMENDED**

- 1) Clinical practical Biochemistry  
Harold Varlae  
4<sup>th</sup> Edition
- 2) Practical Biochemistry  
Dr. S.Ramakrishnan, Dr. G.Rajagopal
- 3) Practical Biochemistry  
Dr. J.Jayaraman