

## Subjects of Biochemistry (A) course For first year students

### **I Chemistry of Carbohydrates**

- 1 Families of monosaccharides: aldoses and ketoses, trioses, tetroses, pentoses, and hexoses.
- 2 Stereo isomerism of monosaccharides, epimers
- 3 Mutarotation and anomers of glucose. Furanose and pyranose forms of glucose and fructose. Haworth projection formulae for glucose; chair and boat forms of glucose
- 4 Sugar derivatives, glucosamine, galactosamine, muramic acid, N- acetyl neuraminic acid
- 5 Disaccharides; concept of reducing and non-reducing sugars, occurrence and Haworth projections of maltose, lactose, and sucrose
- 6 Polysaccharides, storage polysaccharides, starch and glycogen. Structural Polysaccharides, cellulose, peptidoglycan and chitin
- 7 Biological importance

### **II. Chemistry of Protein**

- 1 Functions of proteins
- 2 Primary structures of proteins: Amino acids, the building blocks of proteins. General formula of amino acid and concept of zwitterion.
- 3 Classification, biochemical structure .
- 4 Bonds stabilizing protein structure.
- 5 protein structure  
Oligopeptides: Structure and functions of naturally occurring glutathione and insulin  
Secondary structure of proteins: Peptide unit and its salient features. The alpha helix, the beta pleated sheet and their occurrence in proteins  
Tertiary and quaternary structures of proteins. Forces holding the polypeptide together.
- 6 Classification of proteins and biological importance

### **III     Chemistry of Lipids**

- 1     Definition and major classes of storage and structural lipids
- 2     Storage lipids. Fatty acids structure and functions. Essential fatty acids. Triacyl glycerols structure, functions and properties. Saponification
- 3     Structural lipids. Phosphoglycerides: Building blocks, General structure, functions and properties. Structure of phosphatidylethanolamine and phosphatidylcholine. Sphingolipids: building blocks, structure of sphingosine, ceramide. Special mention of sphingomyelins, cerebrosides and gangliosides
- 4     Lipid functions: cell signals, cofactors, prostaglandins
- 5     Rancidity and Fat constant

### **IV     Enzymes**

- 1-     Structure of enzyme: Apoenzyme and cofactors, prosthetic , coenzyme .
- 2-     Enzyme specificity
- 3-     Classification of enzymes
- 4-     Mechanism of action of enzymes.
- 5-     Effect of pH and temperature on enzyme activity. Enzyme inhibition: competitive- sulfa drugs; non-competitive-heavy metal salts
- 6-     Factors affecting enzyme action; concentration of substrate

### **V     Water Soluble vitamins Group A:**

Function , biochemistry and deficiency effects of:

- a) Thiamine
- b) Riboflavin.
- c) Niacine.
- d) Vitamin C.

### **VI     Water Soluble vitamins Group B:**

Function , biochemistry and deficiency effects of:

- a) Pyridoxine.
- b) Panthonic acid.
- c) Coblamin, Vitamin B12
- d) Folic acid
- e) Biotin.

## **VII   Fat Soluble vitamins**

Structure, function, sources, Deficiency symptoms and toxicity of:

Vitamin A, D, E and K

## **VIII   Nucleoproteins**

- 1   Nitrogen bases purines and pyrimidines
- 2   Nucleotides and Nucleosides
- 3   Nucleic acids structure: DNA and RNA
- 4-   Free nucleotides and nucleosides.

## **IX   Oxidative stress**

1-ROS, Reactive oxygen species,

2-Reactive Nitrogen species (RONS)

3- Effects on Macromolecules (carbohydrate, lipid, protein) Nucleic acid

4-Antioxidants: enzymatic and non-enzymatic

## **X   Enzymes and cofactors**

1- Mechanism of action of enzymes.

2-cofactors, prosthetic group and coenzymes

3-Biomedical importance of Coenzyme

4- Example enzymes dependent of different coenzymes and reactions.