



SAHARA MEDICAL COLLEGE, NAROWAL

DEPARTMENT OF BIOCHEMISTRY

STUDENTS' GUIDE

Learning Objectives

2nd Year

1. Bioenergetics and Biological Oxidation

At the end of lectures, students must understand and be able to describe the following:

1. Endergonic and exergonic reactions, their coupling through ATP.
2. Biologic Oxidation and reduction, methods of electron transferring, redox potential, enzymes and coenzymes of biologic oxidation and reduction
3. Respiratory chain and oxidative phosphorylation, components of respiratory chain, electron carriers
4. ATP synthesis coupled with electron flow, phosphorylation of ADP coupled to electron transfer.
5. ATP-synthase, their relation to proton pump, PMF and active transport
6. Uncouplers and inhibitors of oxidative phosphorylation

2. Introduction to Metabolism:

Metabolism of Carbohydrates

At the end of lectures, students must understand and be able to describe the following:

1. Glycolysis
2. Phases and reactions of glycolysis
3. Energetics of aerobic and anaerobic glycolysis and their importance

4. Regulation of glycolysis
5. Cori's cycle
6. The fate of pyruvate

2. The Citric Acid Cycle

3. Reactions, Energetics ,

- Regulation and Importance of Citric Acid Cycle
- Amphibolic nature of citric acid cycle.
- The anaplerotic reactions and regulations of TCA cycle

4. Gluconeogenesis

- Important three bypass reaction of gluconeogenesis
- Entrance of amino acids and intermediates of TCA cycle and other nutrients as gluconeogenic substrates Clinical significance of gluconeogenesis

5. Glycogen Metabolism

- Reactions of glycogenesis and glycogenolysis
- Importance of UDP-Glucose
- Regulation of glycogen synthase and glycogen phosphorylase
- Glycogen phosphorylase 'a' and the blood glucose sensor
- Disorders of glycogen metabolism (Glycogen storage diseases)
- Secondary Pathways of Carbohydrate (Hexose) Metabolism
- Hexose Mono Phosphate Shunt, its reactions and importance
- Glucuronic acid pathway, its reactions and importance

7. Metabolism of Fructose, Galactose and Lactose

8. Regulation of Blood Glucose Level

- Hyperglycemia, hypoglycemia and their regulating factors
- Biochemistry of Diabetes Mellitus, its laboratory findings and diagnosis

2. Metabolism of Lipids:

At the end of lectures, students must understand and be able to describe the following:

1. Mobilization and transport of fatty acids, triacylglycerol and sterols

2. Oxidation of fatty acids

- Activation and transport of fatty acid in the mitochondria
- β -oxidation, fate of Acetyl CoA, regulation of β -oxidation
- Other types of oxidation, i.e. α -oxidation, ω -oxidation, peroxisome oxidation, oxidation of odd number carbon containing fatty acids and Unsaturated fatty acids etc.

3. Ketogenesis

- Mechanism and utilization of ketone bodies and significance
- Ketosis and its mechanism

4. Biosynthesis of fatty acids

5. Eicosanoids, synthesis from arachidonic acid, their mechanism and biochemical functions

6. Triacylglycerol synthesis and regulation

7. Synthesis and degradation of phospholipids and their metabolic disorders

8. Cholesterol synthesis, regulation, functions, fate of intermediates of cholesterol synthesis, hypercholesterolemia, atherosclerosis

9. Plasma lipoproteins, VLDL, LDL, HDL, and chylomicrons, their transport, functions and importance in health and disease

10. Glycolipid metabolism and abnormalities

3. Metabolism of Proteins and Amino Acids:

At the end of lectures, students must understand and be able to describe the following:

- Amino acid oxidation, metabolic fates of amino acid, transamination, deamination, decarboxylation, deamidation and transdeamination
- Transport of amino group, role of pyridoxal phosphate, glutamate, glutamine, alanine
- Ammonia intoxication, nitrogen excretion and urea formation, urea cycle and its regulation, genetic defects of urea cycle
- Functions, pathways of amino acid degradation and genetic disorders of individual amino acids

5. Integration and Regulation of Metabolic Pathways in Different Tissues

7. Metabolism of Nucleotide:

At the end of lectures, students must understand and be able to describe the following:

- De novo purine synthesis Synthesis of pyrimidine
- Recycling of purine and pyrimidine bases (the salvage pathway) Degradation of purine, formation of uric acid
- Disorders of purine nucleotide metabolism

8. Biochemical Genetics (Informational Flow in the Cell):

At the end of lectures, students must understand and be able to describe the following:

- 1. The structural basis of the cellular information**
- 2. DNA, chromosomes, discovery and organization of DNA in genomes**
- 3. Super coiling of DNA**
- 4. The replication of DNA (DNA dependant DNA synthesis)**
DNA polymerase, its components and functions
 - Initiation, elongation and termination of replication
 - DNA repair, mutation and cancers
- 5. The Transcription (DNA dependant RNA synthesis)**
 - RNA polymerase, its components and functions
 - Initiation, elongation and termination of transcription
 - RNA processing
 - RNA dependant synthesis of RNA and DNA
 - Reverse transcription-DNA synthesis from Viral RNA
 - Retroviruses in relation to Cancer and AIDS
- 6. The Translation (Protein Synthesis)**
 - The genetic codes and their characteristics
 - Initiation, elongation, and termination of protein synthesis
 - Post-translational modification
 - Regulation of gene expression

7. Molecular biology technology

- DNA isolation
- DNA-recombinant technology
- Hybridization, blotting techniques

8. Genetic disorders

9. Biochemistry of Endocrine System:

At the end of lectures, students must understand and be able to describe the following:

- Chemistry, secretion, mechanism of action, regulation of various hormones.

9. Biochemistry of Digestive Tract

At the end of lectures, students must understand and be able to describe the following:

- Digestion and absorption
- Composition, function and daily secretion of saliva, gastric juice, gastric acid(HCL), pancreatic juice, bile, and intestinal secretion
- Digestion of proteins, carbohydrates, nucleic acids and lipids
- Biochemical disorders of GIT i.e achlorhydria, acid peptic disease, lactose intolerance and cholelithiasis