

## **QUESTION BANK**

(Short and Long questions on theory topics)

### **1. The Cell**

#### **SAQ**

1. Lysosomes and Peroxisomes
2. Mitochondria
3. Structure and functions of plasma membrane
4. Fluid Mosaic Model of Plasma Membrane
5. Endoplasmic Reticulum
6. Golgi apparatus

### **2. Carbohydrate chemistry**

#### **LAQ :**

1. Define Carbohydrates. Classify them with suitable examples.
2. Describe the structure and functions of Mucopolysaccharides.
3. Define polysaccharides. Classify them and write their importance.

#### **SAQ :**

1. Explain why sucrose is called as invert sugar
2. Give diagrammatic representation of proteoglycans aggregate.
3. Structure and properties of starch.
4. Osazone formation.
5. Clinical importance of Inulin and Dextran.

6. Structure and functions of three biochemically important disaccharides.
7. Sugar derivatives.
8. Explain the structure of starch and glycogen.

### **3. Lipid Chemistry**

#### **LAQ**

1. Define lipids and classify them with suitable examples.
2. Classify fatty acids in various ways with suitable examples.
2. Define phospholipids. Classify them with suitable examples and state their functions.

#### **SAQ**

1. Chemistry and functions of cholesterol
2. Lipoproteins
3. Prostaglandins
4. Essential fatty acids

### **4. Protein Chemistry**

#### **LAQ**

1. Explain in detail the structural organization of proteins.
2. Classify aminoacids in various ways with suitable examples.
3. Classify proteins in various ways with suitable examples.

#### **SAQ**

1. Give the functional classification of proteins.
2. Explain the alpha-helical structure of protein with examples.
3. Describe the beta pleated structure of protein with examples.
4. Write a short note on the functions of albumin.
5. Write a short note on the isoelectric pH of protein and its importance.
6. Write a short note on the biologically important peptides.
7. Write a short note on nonstandard aminoacids.
8. Write a short note on plasma proteins and their functions.

## **5. Enzymes**

### **LAQ**

1. Define enzymes. Explain nomenclature and IUBMB classification with suitable examples.
2. Define enzyme inhibition. Explain in detail the different types of inhibitions with suitable examples.
3. Define isoenzymes and explain their structure, organ distribution and diagnostic importance.
4. Explain the different theories proposed for mechanism of enzyme substrate complex formation.
5. Explain factors affecting enzyme activity.

### **SAQ**

1. Specificity of enzyme.

2. Allosteric modulation.
3. Define  $K_m$  and explain the effect of substrate concentration on enzyme activity.
4. Competitive and non competitive inhibitions.
5. Diagnostic and therapeutic uses of enzymes.

## **6. Nucleic Acid Chemistry**

### **LAQ**

1. Explain the Watson and Crick model of DNA. Add a note on different forms of DNA (DNA polymorphism).
2. Explain the structure and functions of different type of RNAs.
3. Explain the process of DNA replication. Add a note on its inhibitors.
4. Explain the process of transcription. Add a note on its inhibitors.
5. Explain the process of protein biosynthesis (translation)

### **SAQ**

1. Nucleosides and Nucleotides.
2. Biologically important free nucleotides
3. Clover leaf structure of t-RNA
4. Post-transcriptional modifications
5. Characteristics of genetic code
6. Post-translational modifications.
7. Inhibitors of translation

## 7. Vitamins

### LAQ

1. Chemistry, sources, RDA, biochemical functions and deficiency manifestation of Vit A.
2. Chemistry, sources, RDA, biochemical functions and deficiency manifestation of Vit D.
3. Give an account of urces, chemistry, functions, RDA and deficiency manifestations of ascorbic acid (Vit C)/Vit B<sub>12</sub>/Thiamine/Riboflavin

### SAQ

1. Wald's Visual Cycle
2. Vitamin K
3. Vitamin E
4. Antioxidant Vitamins
5. Erythropoietic Vitamins
6. Folate Trap
7. Niacin
8. Deficiency manifestations of antimetabolites
9. Coenzyme role of pyridoxine
10. Pellagra
11. BeriBeri
12. Scurvy

## 8. Nucleoprotein Metabolism

### LAQ

1. Explain denovo synthesis of pyrimidine nucleotides along with its regulation.

2. Explain purine catabolism and its disorders
3. Describe pyrimidine catabolism and its disorders.

#### SAQ

1. Lesch- Nyhan Syndrome
2. Gout
3. Orotic aciduria
4. Salvage pathways for Purine and Pyrimidine synthesis.
5. Synthesis of Purine nucleotides from IMP.
6. Synthesis of Purine nucleotides from IMP and its regulation.
7. De-novo Synthesis of Purine nucleotides (sources of ring and regulatory steps only).

### **9. Recombinant DNA Technology**

#### LAQ.

- 1 Explain regulation of gene expression with suitable model (lac operon)
- 2 Explain recombinant DNA technology in detail.

#### SAQ

1. Mutations
2. Restriction endonucleases and DNA ligases
3. Vectors
4. Applications of recombinant DNA technology in medicine
5. DNA repair mechanisms

### **10. Hb Chemistry**

**(SAQ)**

1. Structure of Hemoglobin.
2. Structural changes during oxygen binding to hemoglobin.
3. Thalassemias.
4. Sickle Cell Anemia.
5. Hb derivatives

**(LAQ)**

1. Describe in detail the normal hemoglobins.
2. Describe in detail abnormal. Hemoglobins

**11. Biological Oxidation**

**LAQ**

1. Explain the electron transport chain. Mention the sites of ATP synthesis. Add a note on inhibitors and uncouplers of oxidative phosphorylation.
2. Explain various enzymes, coenzymes and electron carriers involved in biological oxidation.

**SAQ**

1. Chemiosmotic theory.
2. Inhibitors and uncouplers of oxidative phosphorylation.
3. Oxidative phosphorylation

4. Malate-Aspartate shuttle and Glycerol– phosphate shuttle and their significance.
5. Substrate level phosphorylation.
6. Diagrammatic representation of ETC and sites of ATP production.
7. Complexes of ETC.
8. Role of Cytochromes in ETC.
9. Physiological uncouplers.

## **12. Carbohydrate Metabolism**

### **LAQ :**

1. Describe in detail EM Pathway along with its energetics and regulation.
2. Describe TCA cycle along with regulation and its energetic. Add a note on its Amphibolic role.
3. Explain the HMP shunt pathway and its significance.
4. Describe glycogen metabolism along with its regulation.
5. Explain the digestion and absorption of carbohydrates.
6. Describe various mechanisms for regulation of blood glucose.
7. Enumerate the gluconeogenic substrates and describe the reactions of gluconeogenesis.

### **SAQ :**

1. Glycogen storage diseases.
2. Explain Rapaport Lubering Cycle along with its significance.
3. Describe Cori's Cycle along with its significance.



4. Explain the amphibolic role of TCA cycle.
5. Glucose Tolerance Tests (GTT).
6. Significance of Uronic acid pathway.
7. Explain the pyruvate dehydrogenase complex.
8. Name the irreversible enzymes of glycolysis and key enzymes of gluconeogenesis.
9. Significance of HMP shunt pathway.
10. Laboratory tests for diagnosis of diabetes mellitus.
11. Anaplerotic reactions of TCA cycle.
12. Essential Pentosuria and Lactose Intolerance.
13. Galactosemia
14. Metabolic changes in Diabetes Mellitus.

### **13. Lipid Metabolism**

#### **LAQ**

1. Describe the digestion and absorption of dietary lipids.
2. Give an account of  $\beta$  – oxidation of saturated even carbon fatty acid (Palmitic acid) along with its energetics and regulation.
3. Describe denovo synthesis of saturated long chain fatty acid and its regulation.
4. .Enumerate the ketone bodies. Describe the formation and fate of ketone bodies. Add a note on ketosis.
5. Give an account of synthesis, transport and functions of HDL, LDL and chylomicrons.
6. Explain denovo synthesis of cholesterol and its regulation. Add a note on cholesterol lowering drugs.

## **SAQ**

1. Atherosclerosis
2. Fatty liver and lipotropic factors
3. Fatty acid synthase – multienzyme complex and its regulatory role.
4. Adipose tissue metabolism
5. Carnitine shuttle.

## **14. Protein Metabolism**

### **LAQ**

1. Describe digestion and absorption of proteins.
2. Describe the detoxication of ammonia by urea cycle. Explain its regulation and disorders.
3. Explain the metabolism, biochemical importance and inborn errors of
  - Glycine
  - Phenylalanine, tyrosine
  - Tryptophan
  - Sulphur containing amino acids

### **SAQ**

1. Transamination and its significance.
2. Deamination and transdeamination.
3. Biogenic Amines.

4. Give the important biochemical functions of glycine.
5. Give the important biochemical functions of tyrosine.
6. Give the important biochemical functions of tryptophan.
7. Transmethylation and its significance.
8. Short note on transport and storage of ammonia.
9. Phenylketonuria
10. Alkaptonuria
11. Explain the important biochemical functions of methionine and cysteine.

## **15. Hb Metabolism**

### **LAQ**

1. Describe biosynthesis of heme with its disorders.
2. Describe formation and fate of bilirubin with its clinical conditions.

### **SAQ**

1. Porphyrrias.
2. Differential diagnosis of Jaundice.
3. Neonatal jaundice.
4. Regulation of Heme Synthesis

## **16. Integration and Starvation Metabolism**

### **LAQ**

1. Explain integration of metabolism.

## **SAQ**

1. Metabolic changes during starvation.

## **17. Mineral Metabolism**

### **LAQ**

1. Dietary Sources, RDA factors affecting absorption, functions and deficiency manifestations of calcium.
2. Dietary Sources, RDA factors affecting absorption, function and deficiency manifestations of Iron. Add a note on its regulation.

### **SAQ**

1. Regulation of Calcium and Phosphorus .
2. Biochemical functions of Zn andCu
3. Absorption of Iron.
4. Fluoride
5. Selenium
6. Disorders related to copper metabolism
7. Iodine (Protein Bound Iodine)
8. Magnesium
9. Iron Toxicity
10. Manganese
11. Wilson's disease

## 18. Detoxification

(SAQ)

1. Define biotransformation . Explain the mechanism of biotransformation.
2. Phase I reactions of detoxification.
3. Detoxification by conjugation.
4. Cytochrome P<sub>450</sub> in detoxification.

## 19. Environmental Biochemistry

SAQ

1. Biochemical changes during heat and cold.
2. Air/H<sub>2</sub>O pollution.
3. Green House effect

## 20. Free radicals and antioxidants:

1. Free radicals
2. Reactive oxygen species and its formation
3. Oxidative stress and its effects.
4. Antioxidants

## 21. Organ function tests

**(LAQ)**

1. Enzymes for assessment of Liver Function.
2. Define Clearance. Describe creatinine /urea / Inulin clearance.

**(SAQ)**

1. Classify liver function tests (LFT). Describe tests based on excretory and synthetic function of liver.
2. Describe thyroid function tests along with its clinical interpretation.
3. Enumerate kidney function tests. Discuss tests to assess Glomerular filtration rate.
4. Define and classify jaundice .Describe laboratory tests for jaundice along with its clinical interpretation.

**22. Immunochemistry**

**(SAQ)**

1. Describe the structure, types and functions of Immunoglobulins

**23. Radioisotopes in Medicine**

1. Define Radioisotopes. Give their therapeutic / Diagnostic Applications.

**24. Biochemistry of cancer**

1. Tumor Markers
2. Mechanism of Carcinogenesis

**25. Nutrition**

1. Define BMR. Describe the factors affecting BMR
2. Nutritional Indices of proteins
3. Balanced Diet
4. SDA
5. Nitrogen Balance
- 6 Kwashiorkar and Marasmus

## **26. Mechanism of Hormone Action**

1. Describe mechanism of action of steroid Hormones
2. Second messengers in hormone action
3. Define hormones. Classify them with examples.
4. Describe mechanism of group I hormones

## **27. Water and Electrolyte Balance and Imbalance**

### **(LAQ)**

- 1) Write a detailed account on water and electrolyte balance in the human body.
- 2) Explain the regulation of electrolyte balance in the human body. Add a note on clinical abnormalities associated with electrolyte imbalance.

### **(SAQ)**

- 1) Dehydration
- 2) Plasma osmolality

- 3) Renin-Angiotensin system
- 4) Hyponatremia
- 5) Hypokalemia
- 6) Water distribution in the human body

## **28. Acid-Base Balance**

### **(LAQ)**

- 1) What is normal blood pH? Describe various mechanisms for maintenance of blood pH.
- 2) Describe in detail the role of kidneys in acid-base regulation.
- 3) Describe the role of blood buffers in acid-base balance.
- 4) Classify acid-base disorders and explain them along with compensatory mechanisms.

### **(SAQ)**

- 1) Metabolic acidosis
- 2) Chloride shift
- 3) Anion gap
- 4) Respiratory acidosis
- 5) Metabolic alkalosis
- 6) Respiratory alkalosis
- 7) Alkali reserve
- 8) pH regulation by respiratory mechanism.