Biochemistry (RBT-303)

Short-answer type Question Bank

Unit 1

1. 'The control of a virtually constant pH in biological systems is achieved by the action of efficient buffering systems'. Justify the statement with an example.
2. What are carbohydrates and how are they classified?
3. What cellular functions do carbohydrates perform?
4. Define pH.
5. What is a buffer?
6. Briefly describe the significance of a buffer in biological systems.
7. Enlist some unusual properties of water.
8. Draw the structure of water and discuss the reason of its unusual properties.
9. What is the role of water in biology?
10. Define acid and base.
11. Discuss pH scale.
12. Write the Henderson-Hasslebasch equation for a weak acid HA.
13. What is hemoglobin buffer?
14. Explain phosphate buffer.
15. What is the significance of bicarbonate buffer?
16. Describe role of protein buffer in biological system.
17. What is amino acid buffer system?
18. Define pKa and describe its significance in a buffer solution.
19. Explain an acidic buffer with example.
20. Differentiate between covalent and hydrogen bond.
21. What is the concentration of H^+ in a solution of 0.1 M NaOH?
22. What is the concentration of OH^- in a solution with an H^+ concentration of 1.3×10^{-4} M?
23. Calculate the p*K*a of lactic acid, given that when the concentration of lactic acid is 0.010 M and the concentration of lactate is 0.087 M, the pH is 4.80.
24. Calculate the pH of a mixture of 0.10 M acetic acid and 0.20 M sodium acetate. The p*K*a of acetic acid is 4.76.

Unit 2

1. Draw the structure of F_0-F_1 particles.
2. How is glycogen breakdown linked to ATP production?
3. How any NADH will be produced by input of 5 pyruvates to a mitochondria that has been poisoned with malomate?
4. Draw the structure of table sugar and animal sugar. Write the bonds present in them.
5. What is energy coupling?
6. Differentiate reducing and non-reducing sugars with the help of an example.
7. What are epimers? Give example and draw their structure.
8. Discuss the effect of cyanide, rotenone, antimycin and oligomycin in ETC.

9. What is a stereoisomer? Define with example.
10. Explain structural isomers with the help of examples.
11. What are epimers? Give examples.
12. What is a glycosidic bond?
13. Draw the open and ring structure of glucose.
14. What is a disaccharide? Name two disaccharides and draw their structures.
15. What are diastereoisomers? Give example.
16. What are conformational isomers? Draw structures.
17. What are amylases? Explain their role.
18. What is the site of ETC? Draw its well labeled diagram.
19. Differentiate between substrate level phosphorylation and oxidative phosphorylation.
20. Name various complexes of ETC.

Unit 3

1. Define zwitter ions.
2. Illustrate the deamination reaction in protein metabolism.
3. What are proteins and what general features do they share?
4. How amino acids are grouped or classified?
5. What is isoelectric point?
6. What is transamination? Give an example.
7. Name and draw the structure of any two aromatic amino acids.
8. Draw the structure of any two aliphatic amino acids. Also name them.
9. What are essential and non-essential amino acids?
10. What is a peptide bond? Explain.
11. Name two disorders of amino acid metabolism and mention the cause.
12. What is meant by D and L system of classifying amino acids?
13. Give two examples of each positively and negatively charged amino acids.
14. Are protein and polypeptides same? Justify your answer.
15. What are conjugated proteins? Give examples.
16. What is meant by cofactor and prosthetic group with reference to a protein? Give examples.
17. Define primary, secondary, tertiary and quaternary structure of a protein.
18. What is a β-pleated sheet?
19. Describe α-helix configuration of a protein.
20. Differentiate between fibrous and globular proteins. Also give two examples of each type.

Unit 4

1. Give two examples of polyunsaturated fatty acids.
2. What distinguishes lipids from carbohydrates, proteins and nucleic acids?
3. Draw the structures of two saturated and two unsaturated fatty acids.
4. What is ω oxidation and its significance?

5. Distinguish between triglycerides and glycerophospholipids.
6. What are phospholipids? What are their basic constituents?
7. What are fatty acids? What are their types?
8. Define glycolipids. Briefly mention their types.
9. What are terpenes?
10. Give a brief account of acyl CoA carboxylase.
11. What is β-oxidation of fatty acids?
12. 'Oxidation of fatty acids gives more energy than carbohydrates'. Comment.
13. Describe α-oxidation of fatty acids.
14. What is ketogenesis?
15. Describe the function of fatty acid synthase enzyme.
16. What are sterols?
17. Explain sphingolipids.
18. What are the functions of fatty acids and lipids in biological system?
19. Discuss any one disorder of lipid metabolism.
20. What do you understand by complex lipids? Give examples.

Unit 5

1. Give examples of disorders of nucleotide metabolism.
2. Define purines and pyrimidines with examples.
3. What is a nucleoside?
4. What is a nucleotide?
5. What bases are found in nucleic acids? How are the bases classified?
6. Draw the basic structure of a nucleotide. What are the various types of nucleotides present in DNA?
7. What are the precursors in de novo synthesis of purine nucleotides?
8. Draw the structure of ATP.
9. What is the importance of salvage pathway in nucleotide metabolism?
10. Write the reactions involved in conversion of IMP to GMP.
11. What is the first committed step in purine metabolism?
12. Write the first committed step in pyrimidine metabolism.
13. Draw the flowchart for biosynthesis of dTMP from UDP.
14. What is gout?
15. Describe Lesch Nyhan Syndrome.
16. Differentiate between RNA and DNA.
17. What is the impact of adenosine deaminase (ADA) deficiency?
18. What is the role of amino acids in nucleotides metabolism?
19. Draw the differentiating structures of nucleotide and nucleoside.
20. Give two examples of feedback regulation in nucleotide metabolism.

Biochemistry (RBT-303)

Long-answer type Question Bank

1. What is a buffer? Describe Henderson-Hasselbalch equation. Write a note on biological buffer systems and their significance.
2. Discuss in detail about role of water in biological processes. What is the basis for unique properties of water? How do these properties of water make it of importance to living systems?
3. Classify carbohydrates with examples and describe their function.
4. Describe Embeden Meyerhof Pathway (glycolysis) and its regulation.
5. Write down metabolism of glucose by heterolactic lactobacilli. What will be the net gain of ATP if ethanol or acetic acid is formed.
6. 'TCA cycle is called amphibolic in nature' - Justify. Describe Kreb's cycle giving an account of net energy yield.
7. Give a diagrammatic representation of electron transport in ETC & explain in detail how it is coupled with phosphorylation of ADP.
8. What is chemiosmotic hypothesis? Discuss Peter Mitchell theory.
9. Distinguish between uncouplers and electron transport inhibitors with the help of TWO (2) examples and diagrams. What is the effect of following agents on ETC & energy production: azide, rotenone, DNP, CO
10. Explain why gluconeogenesis is not the simple reversal of glycolysis?
11. Write the reaction steps of PEP pathway and discuss the significance of the pathway.
12. Describe glycolysis. How many moles of ATP is generated under aerobic and anaerobic conditions?
13. Describe Kreb's cycle giving an account of net energy yield.
14. Write a note on diseases and disorders of carbohydrate metabolism.
15. What is the function of lipid? Classify lipids with suitable examples.
16. Describe the reactions involved in fatty acid synthesis and its regulation.
17. Describe β-oxidation of fatty acids.
18. How many moles of ATP will be produced on complete oxidation of C12-acyl Co A? Write down reaction sequence involved in β-oxidation of fatty acid.
19. Enumerate the Ketone bodies. How they are formed?
20. Write a note on diseases and disorders of lipid metabolism.
21. Why amino acids are amphoteric in nature. Name different amino acids involved in protein synthesis. Draw the structure of aromatic amino acids.
22. What is isoelectric point? What is the basis of its calculation for amino acids.
23. Describe primary, secondary, tertiary & quaternary structure of proteins. Differentiate Fibrous & globular proteins.
24. Describe two examples of diseases caused by altered protein conformation.
25. Describe the characteristic properties of peptide bond. Discuss the role of Ramachandran plot in secondary structure of proteins.
26. Describe transamination and deamination with suitable examples.
27. Describe Glucose-Alanine cycle & its significance.
28. Describe Urea cycle & its significance.

29. Write a note on diseases and disorders of amino acid metabolism.
30. Explain de novo and salvage pathway of pyrimidine nucleotides.
31. Describe hemoglobin structure and its role in transport of oxygen.
32. Write the elemental composition of DNA. Explain structure and composition of nucleic acids with their significance.
33. Give the metabolic pathway for the de novo biosynthesis of UMP. Also explain the conversion from UTP to CTP.
34. Explain catabolism of purines.
35. Explain the de novo biosynthesis of purine nucleotides.
36. Discuss the interconversion of adenine nucleotides.
37. Explain in detail the process of metabolism of purines with the help of simple flowchart indicating metabolism of any one nucleotide. Mention the biomolecules involved in the process.
38. Explain the channelization of energy by ATP into other nucleoside triphosphates.
39. Discuss in detail, with the help of flow chart, the processes involved in the amino acid synthesis. What are the regulations involved in it? Mention the role of ATP in this process.
40. Give a diagrammatic representation of ETC and explain in detail how it is coupled with the oxidative phosphorylation of ADP.
41. Electron flow is a source of energy. Explain this with the help of suitable example.
42. What is the site of oxidative transport? Draw its well labeled diagram and discuss the reactions occurring inside it.
43. Give a detailed account of major electron transferring reactions.
44. Discuss the mechanism of oxidative phosphorylation in detail.
45. Discuss Electron transport complexes involved in the electron transport chain in mitochondria.
46. Explain the oxidation of extra mitochondrial NADH and discuss its effect on P:O ratio.
47. What is substrate level and oxidative phosphorylation? Discuss with examples.
48. Illustrate the site of oxidative phosphorylation. Define P:O ratio. What are the factors affecting it?
49. What are the inhibitors of respiratory chain? Mention their mode of action.
50. Give the biosynthesis of one each ketonic and glucogenic amino acid.
51. What is the pH when 100 ml of 0.1 N NaOH is added to 150 ml of 0.2 M Acetic acid, if the pKa for acetic acid is 4.76?
52. Calculate pH dissolving 1.025g anhydrous sodium acetate in 100mL 0.25M acetic acid (pKa 4.75 acetic acid)?
53. Purines and pyrimidines contribute to structure and function of cell machinery. Illustrate the statement with the help of suitable examples.
54. With the help of suitable examples, illustrate the importance of carbohydrates.
55. Summarize the chemiosmotic theory of oxidative phosphorylation.