EXERCISES

ESSAY QUESTIONS

1. Draw DNA double helix. Describe its main features. Add a note on DNA functions.
2. Define RNA. Classify. Write structure and functions of each one.
3. Briefly describe nucleic acids.

SHORT QUESTIONS

1. Name different types of RNAs. Write main features and functions of mRNA.
2. Name differences between DNA and RNA.
3. Draw clover leaf structure of tRNA. Label its different parts. Mention functions of tRNA.
4. How eukaryotic DNA is organized?
5. Explain the following

(*a*) DNA as gene

(*b*) Denaturation of DNA

6. Write about functions of nucleic acids.
7. Write a note on DNA polymorphism.
8. How bacterial DNA is organized.
9. Write differences between prokaryotic and eukaryotic DNA.
10. Define plasmid. Give example. Write its importance.
11. Write a note on nucleosome.
12. Explain Ribosomal RNA. How it differs from other RNAs?
13. Write a note on unusual bases of RNAs.

MULTIPLE CHOICE QUESTIONS

1. Each polynucleotide chain

(*a*) Has direction. (*b*) Has 5′ and 3′ end.

(*c*) Has direction and two ends. (*d*) Has phosphodiester linkages.

2. ATTATA is sequence of a DNA segment. Each letter stands for

(*a*) Bases. (*b*) Nucleosides.

(*c*) Nucleotides. (*d*) Purine and pyrimidine bases.

3. Shine-Dalgarno sequence is present in

(*a*) Eukaryotic mRNA. (*b*) Prokaryotic mRNA.

(*c*) At 5′ end of prokaryotic mRNA. (*d*) At 3′ end of eukaryotic mRNA.

4. Ribosomes are

(*a*) Nucleic acids. (*b*) Proteins.

(*c*) Ribonucleo proteins. (*d*) Nucleosomes.

5. Loops in RNA molecules are

(*a*) Due to intra strand base pairing.

(*b*) Due to inter strand base pairing.

(*c*) Due to intra strand base pairing between complementary bases.

(*d*) Involved in transfer of genetic information.

FILL IN THE BLANKS

1. In polynucleotides phosphodiester linkage joins 3′-OH and 5′-OH belonging to ..... sugars.
2. ACGCATA is sequence of one DNA strand. Then ..... is sequence of opposite strand.
3. DNAs from different tissues of same species have ..... base composition.
4. When DNA is dehydrated it acquires ..... form.
5. An extra arm in tRNA is found between ..... and ..... arm.

REFERENCES

1. Doolittle, R. Proteins. Sci. Am. **253(4)**, 88-96, 1985.
2. Blake, C.C.F. and Johnson, L.N. Protein structure. Trends Biochem. Science **9**, 147-151, 1984.
3. Rose, G.D. Geselowitz, A.R. Lesser, G.J. Lee, R.H. and Zehfus, M.H. Hydrophobicity of amino acid residues in globular proteins. Science **229**, 834-838, 1985.
4. Brekke, O.H. Michaelson, T.E. and Sendie, I. Immunology Today **16**, 85-90, 1995.
5. Tonegawa, S. The molecules of immune system. Sci. Am. **254(4)**, 104-113, 1985.
6. Lichtenstein, L.M. Allergy and the immune system. Sci. Am. **269(6)**, 84-93, 1993.
7. Creighton, T.E. Proteins: structure and molecular properties. Freeman, Sanfrancisco, 1983.
8. Lerner, R.A. Benkovic, S.J. and Schultz, P.G. At the cross roads of chemistry and immunology: catalytic antibodies. Science **252**, 659-667, 1991.
9. Gregor. *et al*. Coordinated action of HSP 70 Chaperones. Science **303**, 98-101, 2004.
10. Chang, H-C. and Chang, G-G. Involvement of single residue tryptophan 548 in the quarternary structure stability of pigeon cytosolic malic enzyme. J. Biol. Chem. **278**, 23996-24002, 2003.
11. Frantz, S. Protein folding diseases. Raising the bar. Nature Reviews and Drug Discovery **2**, 254, 2003.
12. Fersht, A. Structure and mechanism in protein science. W.H. Freeman and Co., New York, 1999.
13. Timothy, P. Proteomics. Kluwer Academic Press, 2001.
14. Pennington, S.R. and Micheal J.D. Proteomics: from protein sequence to function. BIOS, Oxford, 2001.
15. Branden, C. and Tooze, J. Introduction to protein structure. Garland Publishing Inc., NY, USA, 1999.
16. Reichmann, D. *et al*. The modular architecture of protein-protein binding interfaces. Proc. Nats. Acad. Sci. USA **102**, 57-62, 2005

EXERCISES

ESSAY QUESTIONS

1. Classify proteins based on composition. Give examples for each class.
2. Explain terms primary, secondary, tertiary and quaternary structure of proteins. Write various forces that stabilize protein structure.
3. Describe immunoglobulins with respect to structure, classification and functions.

4. Describe plasma proteins.
5. Write an essay on functions of proteins with examples.

SHORT QUESTIONS

1. Define denaturation. Name methods of protein denaturation and write importance of this process
in medicine.
2. Write salient features of α-helix.
3. Write methods used for determination of primary structure of protein.
4. Explain primary structure of insulin.
5. Name acute phase proteins. In what conditions, they are elevated in blood ?
6. What is normal plasma protein level? Draw electrophoretic pattern of plasma proteins.
7. Write a note on super secondary structure of proteins.
8. Define abzymes. How they are produced ? Write their clinical importance.
9. Write a note on diseases associated with immunoglobulins.
10. Write briefly on Bence-Jones proteins.
11. Mention five structural features of β-pleated sheet.
12. Define primary structure. Write its importance.
13. Write about forces that stabilizes quaternary structure of protein.
14. Write normal plasma albumin level. Mention its functions.
15. Briefly write on various components of α1-globulins.
16. Write a note on charge properties of protein.
17. Name various components of β-globulins. Mention their functions.
18. Write short note on immunoglobulin structure.
19. Define isoelectric point of protein. Give an example. Write about properties of protein at isoelectric
point.
20. Write briefly about structure of albumin and collagen.
21. Name Edman's reagent. Write its importance.
22. Write about changes that occurs in protein properties on denaturation.
23. Define renaturation. Give an example.
24. Define derived proteins. Give examples.
25. Write a note on conjugated protein

MULTIPLE CHOICE QUESTIONS

1. All the following statements are correct regarding protein except:
(*a*) Proteins are involved in transport of gases.
(*b*) Proteins are involved in defence.
(*c*) Proteins act as buffers.
(*d*) Proteins are not found in all cells.
2. In fibrous proteins, polypeptide chains are
(*a*) Extended (*b*) Folded

(*c*) Twisted (*d*) Coiled
3. Hair pin turn of polypeptide chain is called as
(*a*) β-Turn (*b*) α-Turn
(*c*) γ-Turn (*d*) β-pleated turn
4. In the body, one gram of albumin holds
(*a*) 10 ml of fluid (*b*) 18 ml of fluid
(*c*) 25 ml of fluid (*d*) 20 fatty acids
5. Tumour marker present in liver cancer patient blood is
(*a*) Haptoglobulin (*b*) Acid protein
(*c*) α-Feto protein (*d*) Thyroxine
6. The concentration of Ig E class of immunoglobulin increases in blood in
(*a*) Allergic reactions (*b*) Cancers
(*c*) Cold conditions (*d*) Neonatal life

FILL IN THE BLANKS

1. ----------and ---------- are connective tissues proteins.
2. The isoelectric point of casein is ----------.
3. Gliadin of wheat is an example for ----------.
4. β-pleated sheet is stabilized by ---------- hydrogen bonds.
5. Quaternary structure of hemoglobin consists of ----------.
6. Emphysema is due to deficiency of ----------.
7. Plasma and urine of multiple myeloma patients contains ----------.
8. Immunoglobulins bearing catalytic activity are called as ---------

ESSAY QUESTIONS

1. Draw an animal cell diagram and label different cell organelle. Write functions of mitochondria,
golgi apparatus and lysosomes.
2. Describe structure and function of each cell organelle.
3. Write about cell cycle and cell death. Mention clinical importance of each one.

SHORT QUESTIONS

1. Name organic substances present in cell.
2. Define cytoskeletons of a cell. Name them. Write their functions.
3. Define cell cycle. Name stages of cell cycle. Explain any one stage.
4. Explain apoptosis.
5. Write a note on structure and function of mitochondria.
6. Draw mitochondria. Label its various parts.
7. Name different types of cell death. Explain each one.
8. Write a note on cytomembranes.

9. Name different types of endoplasmic reticulum of cell. Write structure and function of any one.
10. Write a note on intracellular membranous network.
11. Mention functions of nucleus, nucleolus and cytosol.
12. Write a note on lysosomol role in diseases.

MULTIPLE CHOICE QUESTIONS

1. In the cell cycle check points exist
(*a*) at G1/S boundary (*b*) at G1/G2 boundary
(*c*) at S/G2 boundary (*d*) at G1/M boundary
2. Lysosomes contain mainly
(*a*) Hydrolases (*b*) Proteases
(*c*) Lipases (*d*) Cathepsins
3. Cell death due to lack of oxygen is called as
(*a*) Necrosis (*b*) Atrophy
(*c*) Hypertrophy (*d*) Apoptosis
4. Peroxisomes are involved in
(*a*) Protein synthesis (*b*) Cell death
(*c*) Phospholipid synthesis (*d*) Triglyceride synthesis

FILL IN THE BLANKS

1. A well defined ---------- is absent in prokaryotes.
2. ---------- separates cell from its surroundings.
3. An important inner mitochondrial membrane phospholipid is ----------.
4. ---------- are called as suicide bags of cells.
5. A cytoskeleton filament present in the axons of nerve and sperm cell ----------.

EXERCISES

ESSAY QUESTIONS

1. Classify enzymes. Give examples for each class and write reactions with cofactors they catalyze.
2. Define enzymes. Write the effect of substrate concentration, temperature and pH on enzyme activity.
3. Define active site of an enzyme. Write its characteristics and explain models of active site.
4. Define coenzyme. Name four coenzymes and write reactions with cofactors in which they act as
coenzyme.
5. Define inhibition. Explain competitive and feedback inhibition with examples.
6. Describe enzyme regulation.
7. Write an essay on enzymes of diagnostic (clinical) importance.
8. Define allosteric enzymes. Describe kinetics of an allosteric enzyme with an example and model.

9. Name factors affecting enzyme catalyzed reactions. Explain each one of them with suitable examples.
10. Define cofactors. Explain their importance with suitable examples.
11. Write an essay on enzyme inhibition.

SHORT QUESTIONS

1. Define Km. Write its significance.
2. Define proenzymes. How they are converted to enzymes ?
3. Define non-competitive inhibition. What happens to Km and Vmax in this type of inhibition. Give examples.
4. Explain enzyme regulation by covalent modification.
5. Competitive inhibitors are chemotherapeutic agents. Justify with examples.
6. Define isoenzymes. Write their importance in diagnosis with examples.
7. Explain clinical significance of following serum enzymes.
(*a*) Transaminases
(*b*) Alkaline phosphatase
8. Explain group specificity with examples.
9. Define enzyme induction and repression. Explain with examples.
10. Explain effect of substrate concentration on enzymatic reaction.
11. Explain phenomenon of cooperativity.
12. Write diagnostic importance of lactatedehydrogenase and creatine phosphokinase.
13. Define metalloenzyme. Give examples.
14. Write on coenzymes of oxidation-reduction reactions.
15. How enzymes are named? Write about E.C. number.
16. What are enzyme profiles? How they are useful in diagnosis? Explain with example.
17. Define allosteric inhibition. Explain with an example.
18. Write on enzymes of myocardial infarction.
19. Explain ELISA technique. Write its application.

MULTIPLE CHOICE QUESTIONS

1. All of the following statements are correct for enzymes. Except
(*a*) Enzymes are proteins
(*b*) Enzymes are catalysts
(*c*) Enzymes speed up chemical reactions by lowering energy of activation.
(*d*) Enzymes alters equilibrium constant of the reaction which they catalyze.
2. The pH optimum of pancreatic proteases is
(*a*) 7.6 (*b*) 8.0
(*c*) 6.0 (*d*) 2.5
3. A competitive inhibitor
(*a*) Binds at active site (*b*) Does not bind at active site

(*c*) Alters Vmax only (*d*) Binds at allosteric site
4. A competitive inhibitor used in hypertension is
(*a*) Malonate (*b*) Allopurinol
(*c*) Captopril (*d*) Oxaloacetate
5. A non-competitive inhibitor that is used as nerve gas in World War II is
(*a*) Iodo acetate (*b*) Cyanide
(*c*) Di-isopropyl fluorophosphate (DFP) (*d*) Arsenite
6. In metalloenzymes metals are
(*a*) Attached to enzyme through coordinate bonds.
(*b*) Covalently attached to enzymes.
(*c*) Non-covalently attached to enzymes.
(*d*) Loosely attached to enzymes.
7. An allosteric enzyme
(*a*) Is usually made-up of many subunits. (*b*) Obeys Michaelis Menten kinetics.
(*c*) Undergo covalent modification. (*d*) Exist in pro-enzyme form.
8. γ-glutamyl transpeptidase level in blood increases in
(*a*) Alcoholic cirrhosis (*b*) Cancer
(*c*) Myocardial infarction (*d*) Pancreatitis

FILL IN THE BLANKS

1. In detergent industry enzymes are used as ----------.
2. Enzymes are for more efficient than ---------- catalysts.
3. The ability of enzymes to recognize optical isomers of a substrate is known as ----------.
4. Km of enzymes is important when they are used as ----------.
5. Affinity of enzyme towards substrate ---------- in competitive inhibition.
6. Heavy metals are known as enzyme ----------.
7. Angiotensin converting enzyme is an example for ---------- enzyme and metal ---------- enzyme.
8. An allosteric enzyme exist in ---------- state ---------- state.