BIOLOGY

NEET

CRASH COURSE

BIOMOLECULES

SMART ACHIEVERS

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Biomolecules

1. Although there is a bewildering diversity of living organisms, their chemical composition and metabolic reactions appear to be remarkably similar.
2. The elemental composition of living tissues and non-living matter appears to be similar when analysed qualitatively.
3. However, a closer examination reveals that the relative abundance of carbon, hydrogen and oxygen is higher in living systems when compared to inanimate matter.
4. The most abundant chemical in living organisms is water.
5. There are thousands of small molecular weight (< 1000Da) biomolecules.
6. Amino acids, monosaccharide and disaccharide sugars, fatty acids, glycerol, nucleotides, nucleosides and nitrogen bases are some of the organic compounds present in living organisms.
7. There are 20 types of amino acids and 5 types of nucleotides.
8. Fats and oils are glycerides in which fatty acids are esterified to glycerol.
9. Phospholipids contain, in addition, a phosphorylated nitrogenous compound.
10. They are found in cell membrane.
11. Lecithin is one example of a phospholipid.
12. Living organisms have a number of carbon compounds in which heterocyclic rings can be found.
13. Some of these are nitrogenous bases -Adenine, guanine, cytosine, uracil and thymine.
14. When found attached to a sugar, they are called nucleosides (Pentose sugar + Nitrogen base).
15. If a phosphate group is also found esterified to the sugar they are called nucleotides.
16. Adenosine, guanosine, thymidine, uridine and cytidine are nucleosides.
17. Adenylic acid, thymidylic acid, guanylic acid, uridylic acid and cytidylic acid are nucleotides.
18. Only three types of macromolecules, i.e., proteins, nucleic acids and polysaccharides are found in living systems.
19. Lipids, because of their association with membranes separate in the macromolecular fraction. Biomacromolecules are polymers.
20. They are made of building blocks which are different.
21. Proteins are heteropolymers made of amino acids. Nucleic acids (RNA and DNA) are composed of nucleotides.
22. Biomacromolecules have a hierarchy of structures primary, secondary, tertiary and quaternary.
23. Nucleic acids serve as genetic material.
24. Polysaccharides are components of cell wall in plants, fungi and also of the exoskeleton of arthropods.
25. They also are storageforms of energy (e.g., starch and glycogen).
26. Proteins serve a variety of cellular functions.
27. Many of them are enzymes, some are antibodies, some are receptors, some are hormones and some others are structural proteins.

28. Collagen is the most abundant protein in animal world and Ribulose bisphosphate Carboxylase-Oxygenase (RuBisCO) is the most abundant protein in the whole of the biosphere (about 16%).
29. Enzymes are proteins which catalyse biochemical reactions in the cells.
30. Ribozymes are nucleic acids with catalytic power.
31. Proteinaceous enzymes exhibit substrate specificity, require optimum temperature and pH for maximal activity.
32. They are denatured at high temperatures.
33. Enzymes lower activation energy of reactions and enhance the rate of the reactions greatly.
34. Nucleic acids carry hereditary information and are passed on from parental generation to progeny.
35. In some cases non-protein constituents called cofactors are bound to the enzyme to make the enzyme catalytically active.
36. In these instances, the protein portion of the enzymes is called the apoenzyme.
37. Three kinds of cofactors may be identified; prosthetic groups, coenzymes and metal ions.
38. Prosthetic groups are organic compounds and are distinguished from other cofactors in that they are tightly bound to the apoenzyme.
39. For examples, in peroxidase and catalase, which catalyse the breakdown of hydrogen peroxide to water and oxygen, haem is the prosthetic group and it is a part of the active site of the enzyme.
40. Co-enzymes are also organic compounds but their association with apoenzyme is only transient, usually occurring during the course of catalysis.
41. NAD, NADP are co-enzymes and contain niacin vitamin.
42. A number of enzymes require metal ions for their activity which form coordination bonds with side chains at the active site e.g. zinc is a cofactor for the proteolytic enzyme carboxypeptidase.

EXERCISE

Q.1 Ca^{2+} is necessary in -
(1) Muscle Contraction (2) Blood clotting (3) Bone formation (4) All the above

Q.2 Which element is common in haemoglobin and myoglobin-
(1) Fe (2) Cu (3) Mn (4) Mg

Q.3 Hormones, enzymes and vitamins are included in same group of biochemicals because these all -
(1) Composed of proteins (2) Regulate oxidative metabolism
(3) Synthesized in animal body (4) Help to regulate the metabolism.

Q.4 Inside of cell as compared to outside have -
(1) More sodium (2) More potassium (3) More Na and K (4) None

Q.5 Decreasing order of organic compound in protoplasm is:-
(1) Protein, lipid, Nucleic acid, Vitamin
(2) Protein, Lipid, carbohydrate, Nucleic acid
(3) Carbohydrate, Lipid, Nucleic acid and vitamin
(4) None of these

Q.6 Which theory is most acceptable for physical structure of protoplasm -
(1) Granular theory (2) Reticular theory (3) Alveolar theory (4) Colloidal theory

Q.7 Saline solution is given to patients of Cholera because-
(1) Na^+ prevents water loss from body (2) NaCl functions as regulatory material
(3) NaCl produces energy (4) NaCl is antibacterial

Q.8 The major role of minor elements inside living organisms is to act as :-
(1) co-factors of enzymes (2) Building blocks of important amino acids
(3) Constituent of hormones (4) Binder of cell structure

Q.9 Which is odd -
(1) Chitin Carbohydrates (2) Pectin - Protein
(3) Steroid - Lipid (4) Wax - Lipid

Q.10 Glycogen is stored in -
(1) Liver and muscles (2) Liver only (3) Muscles only (4) Pancreas

Q.11 Which substance is not carbohydrate -
(1) Starch (2) Glycogen (3) Wax (4) Glucose

Q.12 Decreasing order of amount of organic compound in animal body -
(1) Carbohydrate, Protein, fat, and nucleic acid
(2) Protein, fats, nucleic acid and carbohydrate
(3) Protein, fats, carbohydrates and nucleic acid.
(4) Carbohydrate, fats, Proteins and nucleic acid

Q.13 Characteristic feature of haemoglobin-
(1) Reversible union with oxygen (2) Red Colour
(3) Presence of Cu (4) Presence of Globulin protein

Q.14 Monosaccharide is -
(1) Pentose Sugar (2) Hexose Sugar (3) Only Glucose (4) all the above

Q.15 Which substance is most abundant in cell-
(1) Carbohydrates (2) Proteins (3) Water (4) Fats

Q.16 Proteins which present in protoplasm are very important because-
(1) They provide definite shape to cell (2) They function as biocatalyst
(3) They yield energy (4) They are stored food

Q.17 Dipeptide is -
(1) Structure of two peptide bonds
(2) Two amino acids linked by one peptide bond
(3) bond between one amino acid and one peptide
(4) None

Q.18 Which amino acids is non essential for human body -
(1) Glycine (2) Phenyl alanine (3) Arginine (4) Methionine

Q.19 Essential component of all living organisms
(1) Hemoglobulin (2) Protein (3) Chlorophyll (4) Carbohydrate

Q.20 Products of proteins catabolism
(1) NH_3, CO_2 and Urea (2) Urea, CO_2 and NH
(3) Urea, NH_3 and uric acid (4) Urea, NH_3, alanine and creatine

Q.21 Glycogen is -
(1) Polymer of amino acids (2) Polymer of fatty acids
(3) Unsaturated fats (4) Polymer of glucose

Q.22 Carbohydrate is -
(1) Polymers of fatty acid (2) Polymer of amino acids
(3) Poly hydroxy aldehyde or ketone (4) None

Q.23 What is the normal percentase of sugar in human blood.
(1) .01 % (2) 0.1% (3) 1 % (4) 0.18%

Q.24 Which one of the following is polysaccharide-
(1) Sucrose (2) Lactose (3) Glycogen (4) Glucose

Q.25 Chemically enzymes are :-
(1) Fats (2) Carbohydrates (3) Hydrocarbons (4) Proteins

Q.26 Most simple amino acid is -
(1) Tyrosine (2) Lysine (3) Glycine (4) Aspartic acids

Q.27 Gaucher's disease is concerned with which of the following :-
(1) Abnormal fat metabolism (2) Abnormal protein metabolism
(3) Abnormal carbohydrate metabolism (4) None of them

Q.28 In India the best source for proteins in herbivorous persons is-
(1) Pulses (2) Potato (3) Egg (4) Meat

Q.29 Which is sweet in taste, but is not sugar-
(1) Starch (2) Saccharine (3) Lactose (4) Protein

Q.30 Which is very most structural part of the body -
(1) Protein (2) Carbohydrates (3) Lipid (4) Nucleic acid

Q.31 Deficiency of protein leads to -
(1) Rickets (2) Scurvy (3) Kwashiorkor (4) Carotenemia

Q.32 Contractile protein is -
(1) Actin (2) Myosin (3) Troponin (4) Tropomyosin

Q.33 Carotenoids composed of units -
(1) Fatty acids (2) Amino acids (3) Isoprene (4) Pyran

Q.34 Amylose and Amylopectin chains occur in -
(1) Glycogen (2) Starch (3) Cellulose (4) Chitin

AIIMS Special

Instructions for following questions (Q.35 to Q.91).

(1) If both Assertion & Reason are true and the reason is the correct explanation of the assertion, then mark (1).
(2) If both Assertion & Reason are true but the reason is not the correct explanation of the assertion, then mark (2).
(3) If Assertion is true statement but Reason is false, then mark (3).
(4) If both Assertion and Reason are false statements, then mark (4).

Q.35 **Assertion :** Cofactor of an enzyme may be a prosthetic group.
Reason : NAD derived from niacin is a co-enzyme.

Q.36 **Assertion :** Linolenic acid is an essential fatty acid.
Reason : Linolenic acid cannot be synthesised in human beings.

Q.37 **Assertion :** Hormones are not enzymes, but they can stimulate the release of enzymes.
Reason : Hormones are used up in metabolism, but enzymes can act over and over again.

Q.38 **Assertion :** Tertiary structure of protein molecules makes them biologically active.
Reason : It is native configuration of protein molecules maintained by multiple covalent bonds only.

Q.39 **Assertion :** Dextrins are intermediate polysaccharides formed during hydrolysis of starch into sugar.
Reason : Ascorbic acid is a sugar derivative.

Q.40 **Assertion :** Protoplasm show conductivity.
Reason : Ions are responsible for transmission of stimulus.

Q.41 **Assertion :** Valine is a protein amino acid.
Reason : It participates in protein synthesis.

Q.42 **Assertion :** Nerve cells are more active as compared to bone cells.
Reason : In nerve cells protoplasm occurs in gel stage.

Q.43 **Assertion :** Heparin is a natural anticoagulant inside the blood vessels.
Reason : It is an example of homopolysaccharide.

Q.44 **Assertion :** Cellulose is a macromolecule.
Reason : It is formed by union of repeated units of fructose.

Q.45 **Assertion :** Haemoglobin is a monomeric protein
Reason : It is madeup of by two polypeptide chains.

Q.46 **Assertion :** Saturated fatty acids are non essential fatty acids.
Reason : They can be synthesized in animal body.

Q.47 **Assertion :** Lipids provides more energy as compared to carbohydrates on oxidation.
Reason : Lipid is first respiratory substance.

Q.48 **Assertion :** Serine amino acid is an alkaline amino acid.
Reason : It contain one -COOH group and two -NH2 groups.

Q.49 **Assertion :** In protoplasm protein functions as a buffer.
Reason : Protein molecule is amphoteric.

Q.50 **Assertion :** Lipid require less space for storage as compared to carbohydrate.
Reason : Lipid is polymer of amino acid.

Q.51 **Assertion :** Phospholipid form bimolecular layer in aqueous medium.
Reason : Phospholipid molecules are amphipothic.

Q.52 **Assertion :** In unit area glycogen stores more energy as compared to starch.
Reason : Molecule of glycogen is more branched as compared to starch.

Q.53 **Assertion :** Linolenic acid is essential Fatty acid for human being.
Reason : Human being lack the mechanism to synthesize linolenic acid.

Q.54 **Assertion :** Alanine-glycine- tryptophan and tryptophan - glycine-alanin are two different tripeptide.
Reason : A polypeptide chain has direction.

Q.55 **Assertion :** Silk fibre protein are made up of glycine, alanine and serine amino acids.
Reason : This fibrous protein consists of parallel ? pleated sheet.

Q.56 **Assertion :** Starch is the storage polysaccharide in plants.
Reason : Starch is a polymer of ?-glucose.

Q.57 **Assertion :** Glucose 6- phosphate dehydrogenase deficiency in red cells seems to protect a person from falciparum malaria.
Reason : The parasites that causes this disease require the pentose phosphate pathway and reduced glutathione for optimal growth.

Q.58 **Assertion :** Milk forms interfacial boundry.
Reason : Milk is a coloidal solution.

Q.59 **Assertion :** Lecithin is important in membranes.
Reason : Amphiatic nature.

Q.60 **Assertion :** Glucose is dextrose.
Reason : Glucose open chain have 4 assymmetrical carbon.

Q.61 **Assertion :** Histones are acidic proteins.
Reason : These joins to all nucleic acids.

Q.62 **Assertion :** Water do not radially forms $-OH^-$ & $-H^+$.
Reason : Dissociation constant of water is very high.

Q.63 **Assertion :** Disaccharides show optical activity.
Reason : Cellobiose is an example of disaccharide.

Q.64 **Assertion :** Sucrose is a reducing sugar.
Reason : All disaccharides are reducing sugar.

Q.65 **Assertion :** Whales can live in extremely cold regions.
Reason : They contain blubber.

Q.66 **Assertion :** Hibernating animals store fat prior to onset of winter.
Reason : Migratory birds also store fat before migration.

Q.67 **Assertion :** Souring of milk occurs due to condensation of glucose and galactose.
Reason : Condensation of glucose and galactose form lactic acid.

Q.68 **Assertion :** Bacterial cell wall are not like the plant cell.
Reason : Bacterial cell wall is not made up of cellulose.

Q.69 **Assertion :** Lipoproteins are conjugated proteins.
Reason : Lipoproteins are conjugated lipids.

Q.70 **Assertion :** -helix is the secondary structure of protein.
Reason : The haemoglobin molecule is composed of four polypeptide chains.

Q.71 **Assertion :** Magnesium is involved in chlorophyll formation.
Reason : Magnesium takes part in protein synthesis.

Q.72 **Assertion :** Iron is a minor mineral.
Reason : Iron is a constituent of haemoglobin, myoglobin and cytochromes.

Q.73 **Assertion :** Frozen water requires more space and is lighter than water.
Reason : Ice is solid.

Q.74 **Assertion :** Hydrogen bonding between water molecules occurs not only in liquid water but also in ice and in water vapour.
Reason : Hydrogen bonding exist even at 100 ºC.

Q.75 **Assertion :** Inulin is a storage polysaccharide.
Reason : Inulin is not metabolised in human body and is readily filtered through the kidney.

Q.76 **Assertion :** Isabgol is used as medicine.
Reason : Husk of isabgol contains mucilage.

Q.77 **Assertion :** Monellin is the sweetest chemical.
Reason : Monellin is a protein.

Q.78 **Assertion :** Pectin produces cementing layer between adjacent plant cells.
Reason : Pectin is able to undergo sol = gel interchange.

Q.79 **Assertion :** At high temperature, proteins are liable to denaturation.
Reason : Globular proteins are not coagulated by heat.

Q.80 **Assertion :** Cocoon of silk fibres and spider webs are madeup of cellulose.
Reason : These are structures for their beautification.

Q.81 **Assertion :** Natural silk is made up protein.
Reason : Artificial silk is a polysaccharide.

Q.82 **Assertion :** Co-enzymes are usually proteins
Reason : Co-enzymes are synthesized in mitochondria.

Q.83 **Assertion :** Malonic-Acid is competitive and reversible inhibitor of enzyme Succinic dehydrogenase
Reason : Malonic acid binds to allosteric site of this enzyme.

Q.84 **Assertion :** Enzymes increase the rate of biochemical reactions
Reason : Enzymes function at near neutral pH

Q.85 **Assertion :** Specific substrate binds at active site of thier enzyme.
Reason : Enzymes increase the activation energy of substrate.

Q.86 **Assertion :** Enzymes only increases the rate of biochemical reactions
Reason : Enzymes are proteinaceous biocatalysts

Q.87 **Assertion :** Enzymes are synthesized on ribosomes under the control of genes.
Reason : Enzymes only function inside the ribosome.

Q.88 **Assertion :** Enzymes become denatured at high temperature
Reason : Tertiary structure of proteins damaged at high temperature

Q.89 **Assertion :** All enzymes are proteins.
Reason : Ribozymes are enzymes without proteins.

Q.90 **Assertion :** Allosteric modulators accelerate or retard the rate of catalysis of an allosteric enzyme.
Reason : Allosteric modulators modulates the configuration of active site of enzyme.

Q.91 **Assertion :** Taq polymerase is an example of extremozyme.
Reason : The enzyme is made up of polypeptide chain.

ANSWER KEY

Q.1	4	Q.2	1	Q.3	4	Q.4	2	Q.5	2	Q.6	4	Q.7	1
Q.8	1	Q.9	2	Q.10	1	Q.11	3	Q.12	3	Q.13	1	Q.14	4
Q.15	3	Q.16	2	Q.17	2	Q.18	1	Q.19	2	Q.20	1	Q.21	4
Q.22	3	Q.23	2	Q.24	3	Q.25	4	Q.26	3	Q.27	1	Q.28	1
Q.29	2	Q.30	1	Q.31	3	Q.32	1	Q.33	3	Q.34	2	Q.35	2
Q.36	1	Q.37	2	Q.38	3	Q.39	2	Q.40	1	Q.41	1	Q.42	2
Q.43	3	Q.44	3	Q.45	4	Q.46	1	Q.47	3	Q.48	4	Q.49	1
Q.50	3	Q.51	1	Q.52	1	Q.53	1	Q.54	1	Q.55	2	Q.56	3
Q.57	1	Q.58	1	Q.59	1	Q.60	1	Q.61	4	Q.62	1	Q.63	4
Q.64	4	Q.65	1	Q.66	2	Q.67	1	Q.68	1	Q.69	2	Q.70	2
Q.71	2	Q.72	2	Q.73	1	Q.74	4	Q.75	2	Q.76	1	Q.77	2
Q.78	2	Q.79	3	Q.80	4	Q.81	2	Q.82	4	Q.83	3	Q.84	2
Q.85	3	Q.86	2	Q.87	3	Q.88	1	Q.89	2	Q.90	1	Q.91	2