CHAPTER

9 Biomolecules

9.1. How to Analyse Chemical Composition?

1. Which of the following is a nucleotide?

(A) Uridine (B) Adenylic acid

(C) Guanine (D) Guanosine

[Re-NEET 2024]

2. Which of the following are not fatty acids?

(I) Glutamic acid (II) Arachidonic acid

(III) Palmitic acid (IV) Lecithin

(V) Aspartic acid

Choose the correct answer from the options given below:

(A) (III), (IV) and (V) only

(B) (I) and (II) only

(C) (I), (IV) and (V) only

(D) (II) and (III) only. **[Re-NEET 2024]**

3. Lecithin, a small molecular weight organic compound found in living tissues, is an example of:

(A) phospholipids (B) glycerides

(C) carbohydrates (D) amino acids **[NEET 2024]**

4. Read the following statements on lipids and find out **correct** set of statements:

(I) Lecithin found in the plasma membrane is a glycolipid.

(II) Saturated fatty acids possess one or more C = C bonds.

(III) Gingelly oil has lower melting point, hence remains as oil in winter.

(IV) Lipids are generally insoluble in water but soluble in some organic solvents.

(V) When fatty acid is esterified with glycerol, monoglycerides are formed.

Choose the **correct answer** from the options given below:

(A) (I), (IV) and (V) only

(B) (III), (IV) and (V) only

(C) (I), (II) and (IV) only

(D) (I), (II) and (III) only **[NEET 2022]**

5. Following are the statements with reference to 'lipids'.

(I) Lipids having only single bonds are called unsaturated fatty acids.

(II) Lecithin is a phospholipid.

(III) Trihydroxy propane is glycerol.

(IV) Palmitic acid has 20 carbon atoms including carboxyl carbon.

(V) Arachidonic acid has 16 carbon atoms.

Choose the correct answer from the options given below.

(A) (I) and (II) only (B) (III) and (IV) only

(C) (II) and (III) only (D) (II) and (V) only

[NEET 2021]

6. Match the items in Column I with those in Column II.

Column I	Column II
(a) Aquaporin	(i) Amide
(b) Asparagine	(ii) Polysaccharide
(c) Abscisic acid	(iii) Polypeptide
(d) Chitin	(iv) Carotenoids

Select the correct option.

	(a)	(b)	(c)	(d)
(A)	(iii)	(i)	(iv)	(ii)
(B)	(ii)	(iii)	(iv)	(i)
(C)	(ii)	(i)	(iv)	(iii)
(D)	(iii)	(i)	(ii)	(iv)

[NEET Oct. 2020]

7. Identify the statement which is incorrect.

(A) Sulphur is an integral part of cysteine.

(B) Glycine is an example of lipids.

(C) Lecithin contains phosphorus atom in its structure.

(D) Tyrosine possesses aromatic ring in its structure.

[NEET Oct. 2020]

8. A typical fat molecule is made up of:

(A) one glycerol and three fatty acid molecules

(B) one glycerol and one fatty acid molecule

(C) three glycerol and three fatty acid molecules

(D) three glycerol molecules and one fatty acid molecule.

[NEET Phase-I 2016]

9. A phosphoglyceride is always made up of:

(A) only a saturated fatty acid esterified to a glycerol molecule to which a phosphate group is also attached.

(B) only an unsaturated fatty acid esterified to a glycerol molecule to which a phosphate group is also attached.

(C) a saturated or unsaturated fatty acid esterified to a glycerol molecule to which a phosphate group is also attached.

(D) a saturated or unsaturated fatty acid esterified to a phosphate group, which is also attached to a glycerol molecule. **[NEET 2013]**

9.2. Primary and Secondary Metabolities

10. Which of the following are not secondary metabolites in plants?

(A) Morphine, codeine (B) Amino acids, glucose

(C) Vinblastin, curcumin (D) Rubber, gums

[NEET 2021]

11. Secondary metabolites such as nicotine, strychnine and caffeine are produced by plants for their:

(A) growth response

(B) defence action

(C) effect on reproduction

(D) nutritive value. **[NEET Sept. 2020]**

12. Concanavalin A is:

(A) an essential oil (B) a lectin

(C) a pigment (D) an alkaloid.

[NEET National 2019]

9.3. Biomacromolecules

13. Match List-I with List-II.

	List-I		List-II
(a)	Protein	(i)	C = C double bonds
(b)	Unsaturated fatty acid	(ii)	Phosphodiester bonds
(c)	Nucleic acid	(iii)	Glycosidic bonds
(d)	Polysaccharide	(iv)	Peptide bonds

Choose the correct answer from the options given below:

	(a)	(b)	(c)	(d)
(A)	(iv)	(i)	(ii)	(iii)
(B)	(i)	(iv)	(iii)	(ii)
(C)	(ii)	(i)	(iv)	(iii)
(D)	(iv)	(iii)	(i)	(ii)

[NEET 2021]

14. Which of the following are not polymeric?

(A) Nucleic acid (B) Proteins

(C) Polysaccharides (D) Lipids **[NEET 2017]**

15. Lipids are insoluble in water because lipid molecules are:

(A) hydrophilic (B) hydrophobic

(C) neutral (D) zwitter ion. **[AIPMT 2002]**

16. Spoilage of oil can be detected by which fatty acid?

(A) Oleic acid (B) Linolenic acid

(C) Linoleic acid (D) Erucic acid

[AIPMT 2001]

17. Most diverse macromolecules, found in the cell both physically and chemically are:

(A) proteins (B) carbohydrates

(C) nucleic acids (D) lipids. **[AIPMT 1996]**

18. Living cell contains 60-75% water. Water present in human body is:

(A) 60 – 65% (B) 50 – 55%

(C) 75 – 80% (D) 65 – 70%. **[AIPMT 1992]**

9.4. Proteins

19. Match List I with List II:

List I	List II
(a) GLUT-4	(i) Hormone
(b) Insulin	(ii) Enzyme
(c) Trypsin	(iii) Intercellular ground substance
(d) Collagen	(iv) Enables glucose transport into cells

Choose the correct answer from the options given below:

	(a)	(b)	(c)	(d)
(A)	(i)	(ii)	(iii)	(iv)
(B)	(ii)	(iii)	(iv)	(i)
(C)	(iii)	(iv)	(i)	(ii)
(D)	(iv)	(i)	(ii)	(iii)

[NEET 2024]

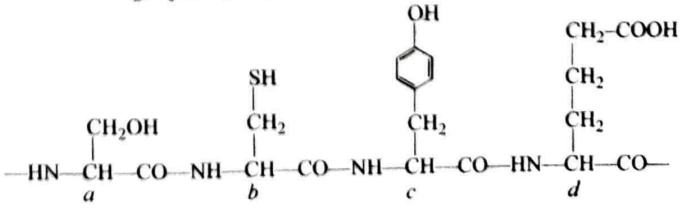
20. Identify the basic amino acid from the following.

(A) Glutamic acid (B) Lysine

(C) Valine (D) Tyrosine

[NEET Sept. 2020]

21. The figure shows a hypothetical tetrapeptide portion of a protein with parts labelled *a-d*. Which one of the following option is correct?



(A) *d* is the acidic amino acid-glutamic acid.
(B) *c* is an aromatic amino acid-tryptophan.
(C) *a* is the C-terminal amino acid and *b* is N-terminal amino acid.
(D) *a* is a sulphur containing amino acid methionine.
[NEET Karnataka 2013]

22. Which one of the following biomolecules is correctly characterised?
(A) Lecithin — A phosphorylated glyceride found in cell membrane
(B) Palmitic acid — An unsaturated fatty acid with 18 carbon atoms
(C) Adenylic acid — Adenosine with a glucose phosphate molecule
(D) Alanine amino acid — Contains an amino group and an acidic group anywhere in the molecule
[AIPMT Mains 2012]

23. Which of the following is the simplest amino acid?
(A) Alanine (B) Asparagine
(C) Glycine (D) Tyrosine **[AIPMT 2005]**

24. Collagen is a:
(A) fibrous protein (B) globular protein
(C) lipid (D) carbohydrate.
[AIPMT 2002]

9.5. Polysaccharides

25. Cellulose does not form blue colour with iodine because:
(A) it does not contain complex helices and hence, cannot hold iodine molecules.
(B) it breaks down when iodine reacts with it.
(C) it is a disaccharide.
(D) it is a helical molecule. **[NEET 2023]**

26. Which two functional groups are characteristic of sugars?
(A) Carbonyl and phosphate
(B) Carbonyl and methyl
(C) Hydroxyl and methyl
(D) Carbonyl and hydroxyl **[NEET 2018]**

27. Which one of the following statement is wrong?
(A) Cellulose is a polysaccharide.
(B) Uracil is a pyrimidine.
(C) Glycine is a sulphur containing amino acid.
(D) Sucrose is a disaccharide. **[NEET Phase-I 2016]**

28. The chitinous exoskeleton of arthropods is formed by the polymerisation of:
(A) keratin sulphate and chondroitin sulphate
(B) D-glucosamine
(C) N-acetyl glucosamine
(D) lipoglycans. **[AIPMT Latest July 2015]**

29. Which one of the following is a non-reducing carbohydrate?
(A) Maltose (B) Sucrose
(C) Lactose (D) Ribose 5-phosphate
[AIPMT 2014]

30. Macromolecule chitin is:
(A) nitrogen containing polysaccharide
(B) phosphorus containing polysaccharide
(C) sulphur containing polysaccharide
(D) simple polysaccharide. **[NEET 2013]**

31. Carbohydrates are commonly found as starch in plant storage organs. Which of the following five properties of starch (I-V) make it useful as a storage material?
(I) Easily translocated
(II) Chemically non-reactive
(III) Easily digested by animals
(IV) Osmotically inactive
(V) Synthesised during photosynthesis.
The useful properties are:
(A) (II) and (III) (B) (II) and (IV)
(C) (I), (III) and (V) (D) (I) and (V)
[AIPMT Screening 2008]

32. Carbohydrates, the most abundant biomolecules on earth, are produced by:
(A) some bacteria, algae and green plant cells
(B) fungi, algae and green plant cells
(C) all bacteria, fungi and algae
(D) viruses, fungi and bacteria. **[AIPMT 2005]**

33. Which one is a reducing sugar?
(A) Galactose (B) Gluconic acid
(C) β-methyl galactoside (D) Sucrose **[AIPMT 2002]**

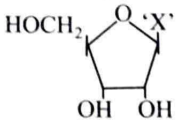
34. In which one of the following groups, all the three are examples of polysaccharides?
(A) Starch, glycogen, cellulose
(B) Sucrose, maltose, glucose
(C) Glucose, fructose, lactose
(D) Galactose, starch, sucrose **[AIPMT 1996]**

35. Glycogen is a polymer of:
(A) galactose (B) glucose
(C) fructose (D) sucrose **[AIPMT 1992]**

9.6. Nucleic Acids

36. Uridine, present only in RNA is a:
(A) nucleoside (B) nucleotide
(C) purine (D) pyrimidine.
[NEET Karnataka 2013]

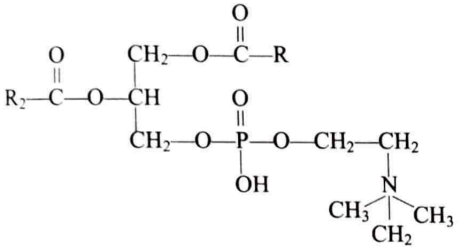
37. Given along side is the diagrammatic representation of one of the categories of small molecular weight organic compounds in the living tissues. Identify the category shown and the one blank component X in it.



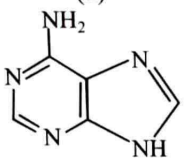
	Category	Component
(A)	Cholesterol	Guanine
(B)	Amino acid	NH_2
(C)	Nucleotide	Adenine
(D)	Nucleoside	Uracil

[AIPMT Screening 2012]

38. Which one of the following structural formulae of two organic compounds is correctly identified along with its related function?



(a)



(b)

(A) a — Triglyceride — Source of major energy
(B) b — Uracil — A component of DNA
(C) a — Lecithin — A component of cell membrane
(D) b — Adenine — A nucleotide that makes up nucleic acids **[AIPMT Screening 2011]**

39. Which one of the following pair of nitrogenous bases of nucleic acids, is wrongly matched with the category mentioned against it?
(A) Thymine, Uracil – Pyrimidines
(B) Uracil, Cytosine – Pyrimidines
(C) Guanine, Adenine – Purines
(D) Adenine, Thymine – Purines
[AIPMT Screening 2008]

40. Nucleotides are building blocks of nucleic acids. Each nucleotide is a composite molecule formed by:
(A) base-sugar-phosphate
(B) base-sugar-OH
(C) (base-sugar-phosphate)*n*
(D) sugar-phosphate. **[AIPMT 2005, 1991]**

9.7. Structure of Proteins

41. Match List-I with List-II:

List-I	List-II
(a) Primary structure of protein	(i) Human haemoglobin
(b) Secondary structure of protein	(ii) Disulphide bonds
(c) Tertiary structure of protein	(iii)Polypeptide chain
(d) Quaternary structure of protein	(iv)Alpha helix and β sheet

Choose the correct answer from the options given below:

	(a)	(b)	(c)	(d)
(A)	(iii)	(iv)	(ii)	(i)
(B)	(iii)	(ii)	(i)	(iv)
(C)	(i)	(iii)	(ii)	(iv)
(D)	(iv)	(iii)	(ii)	(i)

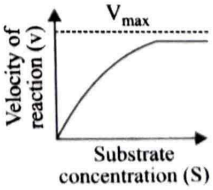
[Re-NEET 2024]

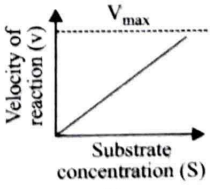
42. Given below are two statements:
Statement I: A protein is imagined as a line, the left end represented by first amino acid (C-terminal) and the right end represented by last amino acid (N-terminal).
Statement II: Adult human haemoglobin, consists of 4 subunits (two subunits of α type and two subunits of β type.)
In the light of the above statements, choose the correct answer from the options given below:
(A) Statement I is true but Statement II is false.
(B) Statement I is false but Statement II is true.
(C) Both Statement I and Statement II are true
(D) Both Statement I and Statement II are false.
[NEET 2023]

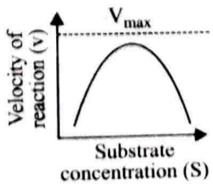
9.8. Enzymes

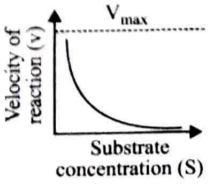
43. Ligases is class of enzymes responsible for catalysing the linking together of two compounds. Which of the following bonds is not catalysed by it?
(A) C – C (B) P – O
(C) C – O (D) C – N **[Re-NEET 2024]**

44. Which of the following graphs depicts the effect of substrate concentration on velocity of enzyme catalysed reaction?

(A)


(B)


(C)


(D)


[Re-NEET 2024]

45. Enzymes that catalyse the removal of groups from substrates by mechanisms other than hydrolysis leaving double bonds, are known as:

(A) Transferases (B) Oxidoreductases

(C) Dehydrogenases (D) Lyases **[Re-NEET 2024]**

46. The cofactor of the enzyme carboxypeptidase is:

(A) Niacin (B) Flavin

(C) Haem (D) Zinc **[NEET 2024]**

47. Inhibition of succinic dehydrogenase enzyme by malonate is a classical example of:

(A) feedback inhibition (B) competitive inhibition

(C) enzyme activation (D) cofactor inhibition

[NEET 2024]

48. Regarding catalytic cycle of an enzyme action, select the correct sequential steps:

(I) Substrate enzyme complex formation.

(II) Free enzyme ready to bind with another substrate.

(III) Release of products.

(IV) Chemical bonds of the substrate broken.

(V) Substrate binding to active site.

Choose the correct answer from the options given below:

(A) (I)-(V)-(II)-(IV)-(III)

(B) (II)-(I)-(III)-(IV)-(V)

(C) (V)-(IV)-(III)-(II)-(I)

(D) (V)-(I)-(IV)-(III)-(II) **[NEET 2024]**

49. Given below are two statements:

Statement I: Low temperature preserves the enzyme in a temporarily inactive state whereas high temperature destroys enzymatic activity because proteins are denatured by heat.

Statement II: When the inhibitor closely resembles the substrate in its molecular structure and inhibits the activity of the enzyme, it is known as competitive inhibitor.

In the light of the given statements, choose the correct answer from the options given below:

(A) Statement I is true but Statement II is false.

(B) Statement I is false but Statement II is true.

(C) Both Statement I and Statement II are true.

(D) Both Statement I and Statement II are false.

[NEET 2023]

50. Match the following columns.

Column I	Column II
(a) Inhibitor of catalytic activity	(i) Ricin
(b) Possess peptide bonds	(ii) Malonate
(c) Cell wall material in fungi	(iii) Chitin
(d) Secondary metabolite	(iv) Collagen

Select the correct option.

	(a)	(b)	(c)	(d)
(A)	(iii)	(i)	(iv)	(ii)
(B)	(iii)	(iv)	(i)	(ii)
(C)	(ii)	(iii)	(i)	(iv)
(D)	(ii)	(iv)	(iii)	(i)

[NEET Sept. 2020]

51. Prosthetic groups differ from coenzymes in that:

(A) they require metal ions for their activity.

(B) they (prosthetic groups) are tightly bound to apoenzymes.

(C) their association with apoenzymes is transient.

(D) they can serve as cofactors in a number of enzyme catalysed reactions. **[NEET Odisha 2019]**

52. Which one of the following statements is correct, with reference to enzymes?

(A) Apoenzyme = Holoenzyme + Coenzyme

(B) Holoenzyme = Apoenzyme + Coenzyme

(C) Coenzyme = Apoenzyme + Holoenzyme

(D) Holoenzyme = Coenzyme + Cofactor

[NEET 2017]

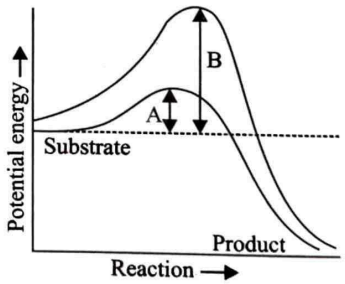
53. A non-proteinaceous enzyme is:

(A) lysozyme (B) ribozyme

(C) ligase (D) deoxyribonuclease.

[NEET Phase-II 2016]

54. Which of the following describes the given graph correctly?



(A) Endothermic reaction with energy A in the presence of enzyme and B in the absence of enzyme.

(B) Exothermic reaction with energy A in the presence of enzyme and B in the absence of enzyme.

(C) Endothermic reaction with energy A in the absence of enzyme and B in the presence of enzyme.

(D) Exothermic reaction with energy A in the absence of enzyme and B In the presence of enzyme.

[NEET Phase-II 2016]

55. Which one of the following statement is incorrect?

(A) A competitive inhibitor reacts reversibly with the enzyme to form an enzyme-inhibitor.

(B) In competitive inhibition the inhibitor molecule is not chemically changed by the enzyme.

(C) The competitive inhibitor does not affect the rate of breakdown of the enzyme-substrate complex.

(D) The presence of the competitive inhibitor decreases the K_m of the enzyme for the substrate.

[AIPMT Cancelled 2015]

56. Select the option which is not correct with respect to enzyme action.

(A) Substrate binds with enzyme at its active site.

(B) Addition of lot of succinate does not reverse the inhibition of succinic dehydrogenase by malonate.

(C) A non-competitive inhibitor binds the enzyme at a site distinct from that which binds the substrate.

(D) Malonate is a competitive inhibitor of succinic dehydrogenase. **[AIPMT 2014]**

57. Transition state structure of the substrate formed during an enzymatic reaction is:

(A) transient but stable

(B) permanent but unstable

(C) transient and unstable

(D) permanent and stable. **[NEET 2013]**

58. Which of the following best illustrates "feedback" in development?

(A) Tissue X secretes RNA which changes the development of tissue Y.

(B) As tissue X develops, it secretes enzymes that inhibit the development of tissue Y.

(C) As tissue X develops, it secretes something that induces tissue Y to develop.

(D) As tissue X develops, it secretes something that slows down the growth of tissue Y.

[NEET Karnataka 2013]

59. The essential chemical components of many coenzymes are:

(A) proteins (B) nucleic acids

(C) carbohydrates (D) vitamins. **[NEET 2013]**

60. Which of the following statement about enzymes is wrong?

(A) Enzymes are denatured at high temperatures.

(B) Enzymes are mostly proteins but some are lipids also.

(C) Enzymes are highly specific.

(D) Enzymes require optimum pH and temperature for maximum activity.

[NEET Karnataka 2013, Mains 2010]

61. An organic substance bound to an enzyme and essential for its activity is called:

(A) isoenzyme (B) coenzyme

(C) holoenzyme (D) apoenzyme.

[AIPMT 2006]

62. Which one of the following statements regarding enzyme inhibition is correct?

(A) Competitive inhibition is seen when a substrate competes with an enzyme for binding to an inhibitor protein.

(B) Competitive inhibition is seen when the substrate and the inhibitor compete for the active site on the enzyme.

(C) Non-competitive inhibition of an enzyme can be overcome by adding large amount of substrate.

(D) Non-competitive inhibitors often bind to the enzyme irreversibly. **[AIPMT 2005]**

63. The catalytic efficiency of two different enzymes can be compared by the:

(A) formation of the product

(B) the pH of optimum value

(C) the K_m value

(D) molecular size of the enzyme. **[AIPMT 2005]**

64. Enzymes, vitamins and hormones can be classified into a single category of biological chemicals, because all of these:

(A) help in regulating metabolism

(B) are exclusively synthesised in the body of a living organism as at present

(C) are conjugated proteins

(D) enhance oxidative metabolism. **[AIPMT 2005]**

65. In which one of the following enzymes, is copper necessarily associated as an activator?

(A) Carbonic anhydrase

(B) Tryptophanase

(C) Lactic dehydrogenase

(D) Tyrosinase **[AIPMT 2004]**

66. Hydrolytic enzymes that act on low pH are called as:

(A) protease (B) α-amylase

(C) hydrolases (D) peroxidase.

[AIPMT 2002]

67. Cofactor (coenzyme) is a part of holenzyme. It is:

(A) loosely attached inorganic part

(B) accessory non-protein substance attached firmly

(C) loosely attached organic part

(D) none of the above **[AIPMT 1997]**

68. An enzyme brings about:

(A) decrease in reaction time

(B) increase in reaction time

(C) increase in activation energy

(D) reduction in activation energy **[AIPMT 1993]**

69. Enzymes having slightly different molecular structure but performing identical activity are:

(A) homoenzymes (B) isoenzymes

(C) apoenzymes (D) coenzymes

[AIPMT 1991]

70. Which of the following is not a part of enzyme but it activates the enzyme?

(A) K (B) C

(C) N (D) Si **[AIPMT 1989]**

SOLUTIONS

1. (B) Adenylic acid is a nucleotide as it is composed of nitrogenous base adenine, ribose sugar group and phosphoric acid. Uridine is a nucleoside as it consists of uracil and ribose sugar. Guanosine is a purine nucleoside as it composed of guanine attached to ribose sugar. Guanine is a nitrogenous base.

2. (C) Glutamic acid, lecithin, and aspartic acid are not fatty acids as Glutamic acid and aspartic acid are amino acids are and lecithin is a phospholipid.

3. (A) Lecithin is a type of phospholipid, a class of lipids that includes a phosphate group in their molecules. It is commonly found in cell membranes and is essential for proper biological functions.

4. (B) Lecithin found in the plasma membrane is a phospholipid. Saturated fatty acids contain no carbon-to-carbon double bonds (C = C).

5. (C) Saturated fatty acids lack double bonds between the individual carbon atoms, while in unsaturated fatty acids there is at least one double bond in the fatty acid chain. Glycerol is a simple lipid, which is trihydroxy propane. The chemical formula of glycerol is $C_3H_8O_3$.

Palmitic acid is a saturated long-chain fatty acid with a 16-carbon backbone. Palmitic acid is found naturally in palm oil and palm kernel oil, as well as in butter, cheese, milk and meat.

Arachidonic acid is a polyunsaturated omega-6 fatty acid with 20-carbon backbone. It is structurally related to the saturated arachidic acid found in cupuacu butter.

Related Theory

Lecithin is the principal phospholipid in animals; it is particularly abundant in egg yolks, and is extracted commercially from soy. It is a major constituent of cell membranes, and is commonly used as a food additive (as an emulsifier).

6. (A) Aquaporins or water channels are major intrinsic channel-proteins that form pores in the membrane of biological cells, mainly facilitating transport of water between cells. Aquaporins have four subunits arranged in parallel, forming a fifth pore in the centre of the tetramer. Asparagine is a β-amide derivative of aspartic acid (amino acid). It is a non-toxic carrier of residual ammonia to be eliminated from the body. Abscisic acid (ABA), an apocarotenoid is a plant hormone. It functions in many plant developmental processes, including seed and bud dormancy, the control of organ size and stomatal closure. Chitin is a heteropolysaccharide composed of N-acetyl-d-glucosamine groups linked by β (1→4). It is mainly produced by fungi, arthropods and nematodes.

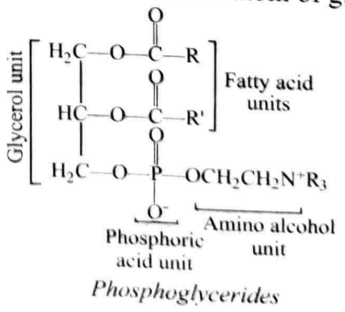
7. (B) Glycine (NH_2–CH_2–COOH) is an example of neutral amino acid. Cysteine [NH_2–$CH(CH_2SH)$–COOH] is a non-essential sulphur-containing amino acid. Tyrosine is an aromatic amino acid, synthesised from phenylalanine. Lecithin (phosphatidyl choline) is a phospholipid, found in the cell membrane.

Related Theory

Amino acids are basic units of protein and made up of C, H, O, N and sometimes S. Amino acids are organic acids with a carboxyl group (–COOH) and one amino group ($–NH_2$) on the α-carbon atom. Carboxyl group attributes acidic properties and amino group gives basic ones. In solution, they serve as buffers and help to maintain pH. General formula is $R–CHNH_2$. COOH. Amino acids are amphoteric as they form zwitterions.

8. (A) A fat molecule consists of two kinds of parts: a glycerol backbone and three fatty acid tails. Glycerol is a small organic molecule with three hydroxyl (–OH) groups, while a fatty acid consists of a long hydrocarbon chain attached to a carboxyl group.

9. (C) Phosphoglycerides (also known as glycerophospholipids) are the most abundant phospholipids in cell membranes. They consist of a glycerol unit with fatty acids (saturated or unsaturated) attached to the first two carbon atoms, while a phosphoric acid unit, esterified with an alcohol molecule (usually an amino alcohol) is attached to the third carbon atom of glycerol.



Phosphoglycerides

Related Theory

Phosphoglycerides containing ethanolamine as the amino alcohol are called phosphatidylethanolamines or cephalins. Cephalins are found in brain tissue and nerves, and have a

role in blood clotting. Phosphoglycerides containing choline as the amino alcohol unit are called phosphatidylcholines or lecithins. Lecithins occur in all living organisms. Egg yolks are especially rich in lecithins.

Caution

Students must remember that the phosphoglyceride molecule is identical to a triglyceride up to the phosphoric acid unit.

10. (B) Secondary metabolites are generally defined as small organic molecules produced by an organism that are not essential for their growth, development and reproduction. They include antibiotics, pigments and scents, rubbers, gums, morphine, codeine, vinblastin and curcumin. Amino acids and glucose are primary metabolites.

Related Theory

Secondary metabolites serve:

(1) as agents of symbiosis between microbes and plants, nematodes, insects, and higher animals;

(2) as sexual hormones;

(3) as metal transporting agents;

(4) as competitive weapons used against other bacteria, fungi, amoebae, plants, insects, and large animals, etc.

11. (B) Secondary metabolites, also called specialised metabolites, toxins, secondary products, or natural products, are organic compounds produced by bacteria, fungi, or plants, which are not directly involved in the normal growth, development, or reproduction of the organism. Plant secondary metabolites, like caffeine, nicotine and strychnine are used by plants for protection against active grazers and browsers.

12. (B) Concanavalin A (ConA) is a plant lectin that is purified from jack beans. ConA binds to the mannose residues of various glycoproteins and activates lymphocytes. When ConA is administered to mice, liver injury occurs that depends on the activation of T-lymphocytes by macrophages. It is cytotoxic or inhibitory to hepatoma cells, which is mediated by the autophagic pathway through mitochondria.

Related Theory

Concanavalin A interacts with diverse receptors containing mannose carbohydrates, notably rhodopsin, blood group markers, insulin-receptor, the immunoglobulins and the carcinoembryonic antigen (CEA). It also interacts with lipoproteins. ConA strongly agglutinates erythrocytes irrespective of blood-group, and various cancerous cells. It was demonstrated that transformed cells and trypsin-treated normal cells do not agglutinate at 4°C, thereby suggesting that there is a temperature-sensitive step involved in ConA-mediated agglutination. ConA is a lymphocyte mitogen. It is a selective T-cell mitogen relative to its effects on B-cells.

13. (A) Protein forms peptide bond.

Unsaturated fatty acid forms C=C double bonds.

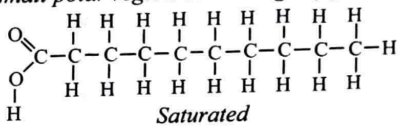
Nucleic acid forms phosphodiester bond.

Polysaccharide forms glycosidic bond.

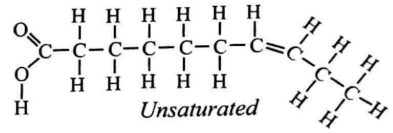
14. (D) Lipids are not polymer. The basic unit of lipids are glycerol and fatty acid, however, they do not form repetitive chains. Instead, they form triglycerides from three fatty acid and a single glycerol molecule. Lipids have a starter molecule, like a fatty acid, and build long chains through a chemical reaction, like dehydration. However, nucleic acids, protein and polysaccharides are polymers. Nucleic acid is a chain of nucleotides, protein are made up of amino acids and polysaccharides are long chains of monosaccharides linked by glycosidic bonds.

Related Theory

Lipids are non-polar molecules, which are soluble only in non-polar solvents and insoluble in water. In the human body, these molecules can be synthesised in the liver and are found in oil, butter, whole milk, cheese, fried foods and also in some red meats. Lipids contain a long, non-polar hydrocarbon chain with a small polar region containing oxygen.



Saturated



Unsaturated

15. (B) Lipids have long non-polar chains of carbon atoms, which adversely affect their solubility in water. Thus, they are insoluble in water because they are hydrophobic.

Related Theory

All of the lipid molecules in cell membranes are amphipathic that is, they have a hydrophilic or polar end and a hydrophobic or non-polar end. The most abundant membrane lipids are the phospholipids. These have a polar head group and two hydrophobic hydrocarbon tails.

16. (D) Erucic acid can be used to identify fat deterioration. A monosaturated omega-9 fatty acid is erucic acid. It is more prevalent in oils, quickly broken down by bacteria, and has a bad taste and smell, which indicates the spoilage of oil.

17. (A) Among the four major classes of macromolecules (proteins, polysaccharides, lipids, and nucleic acids), proteins are the most diverse among organic compounds. The relative amount of these macromolecules in the cell are 9-12% proteins, 1-3% fats, 1-2% carbohydrates, 1-3% minerals, 2% nucleic acids and 60-75% water. Out of all macromolecules found in the cell, the proteins are most chemically and physically diverse.

Related Theory

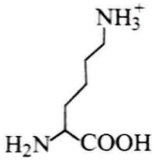
Proteins are polymers of amino acids. There are total 20 amino acids, which are arranged in different orders in a polypeptide chain to form a wide array of proteins.

18. (D) Water is extremely essential for survival of every cell. It is a good solvent and hence, involved in various metabolic activities of the cell. About 65-70% of the human body is composed of water, which amounts to two-third of our body.

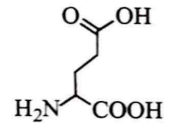
19. (B)

List I	List II
Collagen	Enables glucose transport into cells
Trypsin	Hormone
Insulin	Enzyme
GLUT-4	Intercellular ground substance

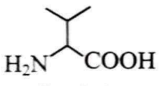
20. (B) Lysine is a basic amino acid, while valine is neutral, glutamic acid is acidic and tyrosine is an aromatic amino acid.



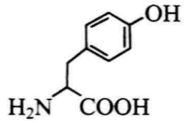
Lysine (Lys, K)
MW:146.2



Glutamic acid (Glu, E)
MW:147.1



Valine (Val, V)
MW: 117.1



Tyrosine (Tyr, Y)
MW: 181.2

21. (None of the option is correct.)

a– Serine (Neutral, polar amino acid)

b– Cysteine (Neutral, polar amino acid)

c– Tyrosine (Neutral, polar amino acid)

d– not an amino acid

22. (A) Alanine is a neutral amino acid with non-cyclic hydrocarbon chain, one amino group and one carboxyl group. Palmitic acid is saturated fatty acid with 16 carbon atoms. Adenylic acid has pentose sugar in it not glucose.

23. (C) Amino acids are the monomers that make up proteins. Each amino acid has the same fundamental structure, which consists of a central carbon atom, also known as the alpha (α) carbon, bonded to an amino group (—NH_2), a carboxyl group (–COOH), and to a side chain (R-group). Glycine is the simplest of all amino acids, as R-group is hydrogen.

24. (A) Collagen is the major insoluble fibrous protein in the extracellular matrix and in connective tissue. In fact, it is the single most abundant protein in the animal kingdom.

Related Theory

Collagen is protein molecules made up of amino acids (glycine, proline, and hydroxyproline). It provides structural support to the extracellular space of connective tissues. Due to its rigidity and resistance to stretching, it is the perfect matrix for skin, tendons, bones, and ligaments.

25. (A) When iodine is added to a sample containing starch, which has a helical structure, it forms a blue-black color due to the formation of a complex between the iodine molecules and the helices in the starch. However, cellulose has a linear structure and does not form helices, which means that it cannot form a complex with iodine and therefore, does not produce a blue color.

26. (D) Sugars are chemically carbohydrates, containing polyhydroxy aldoses and ketoses. Aldoses bear a terminal aldehyde group (–CHO) and ketoses consists of ketone group (–CO–). These two functional groups consists of carbonyl (–CO–) and hydroxyl (–OH) bonds. DNA consist of carbonyl and phosphates in their structure.

Related Theory

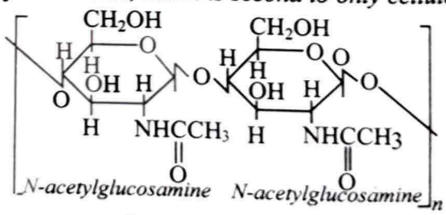
Glucose, galactose, and fructose are common monosaccharides, whereas common disaccharides include lactose, maltose, and sucrose. Starch and glycogen are polysaccharides, the storage forms of glucose in plants and animals, respectively.

27. (C) Glycine is the simplest amino acid. Methionine and cysteine are two sulphur containing amino acids. Cellulose is the most abundant polysaccharide on earth, composed of a linear chain of β-1, 4 linked D-glucose units. Uracil is a pyrimidine, found in RNA only. Sucrose is a disaccharide made up of glucose and fructose. Lactose and maltose are also disaccharides.

28. (C) In arthropods, the exoskeleton is chitinous. Chitin is a polymer formed from monomeric units of N-acetyl glucosamine by polymerisation, which is a derivative of glucose.

Related Theory

Chitin is a homopolymer, made from N-acetylglucosamine. Chitin is found in the exoskeletons of insects, the cell walls of fungi, and certain hard structures in invertebrates and fish. In terms of abundance, chitin is second to only cellulose.



Structure of Chitin

29. (B) Sucrose is a disaccharide consisting of glucose and fructose. It is a non-reducing sugar, as it does not contain any free anomeric carbon. Maltose is a reducing disaccharide of glucose. Lactose is a reducing disaccharide of glucose and galactose. Ribose-5-phosphate is an intermediate of the pentose phosphate pathway.

30. (A) Chitin is a long-chain polymer of a N-acetyl glucosamine. It is a nitrogen containing polysaccharide and a derivative of glucose.

Related Theory

Chitin is a naturally occurring polysaccharide existing in the outer shells of crustaceans, insect exoskeletons, and fungal cell walls. Chemically, chitin is a (1→4) β-linked glycan composed of 2-acetamido-2-deoxy-D-glucose. Due to its highly crystalline structure, chitin is insoluble in common solvents.

31. (B) Carbohydrates are chemically non-reactive and osmotically inactive polysaccharides of much greater molecular weight. Storage of starch does not alter the water potential in cell sap. Starch is the major storage carbohydrate of plants. In most plant species, it is accumulated in the chloroplast of leaves, whereas in storage organ it accumulates in amyloplast as reserve starch. It is not synthesised during photosynthesis, rather glucose is converted to starch as a storage material. Digestion of starch does not help in the storage material.

Related Theory

Glucose is soluble in water, so if it is stored in plant cells to affect the way of water moves into and out of cells. Starch is insoluble so has no effect on the water balance in plant cells.

32. (A) Carbohydrates are the most abundant biomolecule on earth. Carbohydrates are organic compound synthesised in the chlorophyll-containing cells of some bacteria, algae and green plants, during photosynthesis. Certain photoautotrophic bacteria, *e.g.*, green sulphur bacteria and purple sulphur bacteria contain pigments, like chlorophyll and bacteriochlorophyll, respectively that helps them in photosynthesis. During photosynthesis, carbon dioxide is reduced into carbohydrates and water is oxidised to oxygen.

33. (A) All those carbohydrates, which contain a free aldehyde or ketonic group and reduce Fehling's solution and Tollens' reagent are referred as a reducing sugars. All monosaccharides, such as glucose are reducing sugars. Examples of reducing sugar . are galactose, glucose, glyceraldehyde, fructose, ribose, and xylose.

Non-reducing sugars do not have an –OH group attached to the anomeric carbon so they cannot reduce other compounds. Examples of non-reducing suger are sucrose, trehalose, raffinose, stachyose.

Caution

Students must remember that the anomeric carbon is the carbon derived from the carbonyl carbon compound (the ketone or aldehyde functional group) of the open-chain form of the carbohydrate molecule. The anomeric carbon can be determined by the carbon attached to two oxygen atoms joined by single bonds.

34. (A) Poysaccharides are carbohydrate polymers (like starch, cellulose, or glycogen) that are formed by joining more than 10 monosaccharide subunits.

Glucose polysaccharides include starch, glycogen, and cellulose. Fructose and galactose are monosaccharides, whereas maltose, sucrose, and lactose are disaccharides.

35. (B) In vertebrates, glycogen, a branching polymer of D-glucose, stores carbon and energy and is mostly present in the liver and skeletal muscles.

36. (A) Uridine is a nucleoside, while uracil is a nitrogenous base (pyrimidine).

Uracil + Ribose → Uridine

Mnemonics

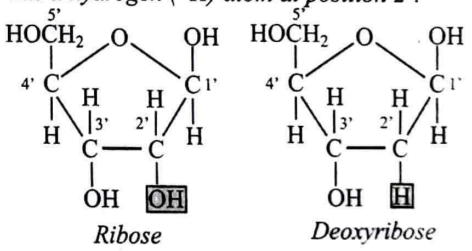
Type of purines and pyrimidines can be memorised as:
Paul Got A Pet Called Upton Today.

Paul — ***Parines***
Got — ***Guanine***
A — ***Adenosine***
Pet — ***Pyrimidines***
Called — ***Cytosine***
Upten — ***Uracil***
Today — ***Thymine***

37. (D) The given structure represent a ribose sugar. Since, no phosphate group is attached, it is not a nucleotide.

Caution

Students usually confuse between ribose sugar and deoxyribose sugar. The primary difference between the two is ribose sugar has a hydroxyl (–OH) group at position 2', while deoxyribose sugar has a hydrogen (–H) atom at position 2'.



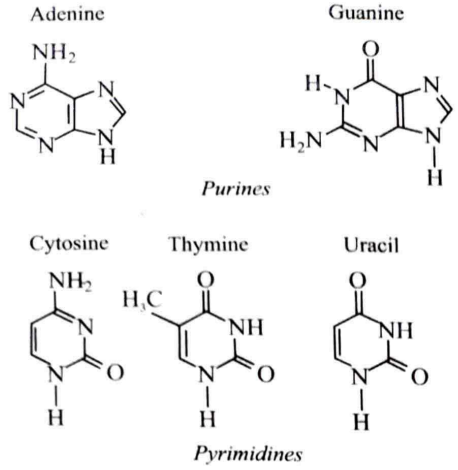
Ribose *Deoxyribose*

Also, if the option contain Nucleoside –Thymine, that would be incorrect, because ribose sugar is found in RNA and it lacks thymine base, instead uracil is present.

38. (C) Lecithin (structure 'a') is a phospholipid composed of choline and inositol, found in all living cells as a major component of cell membrane. Triglycerides are tri-esters consisting of a glycerol bound to three fatty acid molecules. They are made of a glycerol backbone attached to three fatty acid chains. Glycerol is a simple sugar alcohol. Structure 'b' is an adenine base, not nucleotide. Uracil are methyl derivatives of thymine, only found in RNA.

Related Theory

The purines (adenine and guanine) have a two-ringed structure consisting of a nine-membered molecule with four nitrogen atoms, as you can see in the two figures below. The pyrimidines (cytosine, uracil, and thymine) only have one single ring, which has just six members and two nitrogen atoms.



39. (D) The purines in DNA and RNA are adenine and guanine. The pyrimidines in DNA are cytosine and thymine; in RNA, they are cytosine and uracil.

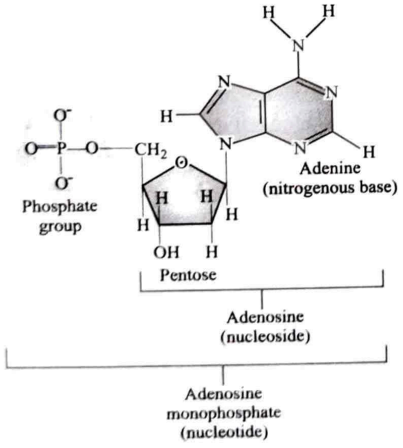
Related Theory

- *Purines are heterocyclic and two ring compounds, while pyrimidines are single ring compound.*

40. (A) Each nucleotide consists of: a nitrogenous heterocyclic base, which may be purine or pyrimidine, a sugar: deoxyribose/ribose and a phosphate group.

Related Theory

- *Nucleoside = sugar + base (via glycosidic bond)*
- *Nucleotide = Nucleoside + phosphate (via phosphodiester bond)*



41. (A) Primary structure of protein refers to the polypeptide chain, which is the sequence of amino acids. Secondary structure of protein involves alpha helix and beta sheet, stabilised by hydrogen bonds. Tertiary structure of protein is stabilised by various interactions, including disulphide bonds. Quaternary structure of protein refers to the assembly of multiple polypeptide chains, for *e.g.*, human haemoglobin.

42. (B) Proteins are usually imagined as a line with the N-terminal end on the left and the C-terminal end on the right. This is because proteins are synthesised starting from the N-terminal end and ending with the C-terminal end.

Haemoglobin is a protein found in red blood cells (RBCs) that is responsible for carrying oxygen from the lungs to the tissues and carbon dioxide from the tissues to the lungs. Adult human haemoglobin consists of four subunits, two of which are alpha (α) subunits and two of which are beta (β) subunits. The alpha and beta subunits are each composed of a polypeptide chain with a heme group that contains an iron ion, which binds oxygen.

43. (A) Ligase catalyses the joining of P-O, C-O and C-N bonds, not C-C.

44. (A) The graph (A) is correct depiction of effect of substrate concentration on velocity of enzyme catalyzed reaction. When the substrate concentration is increases, the velocity of enzymatic reaction rises at first. The reaction finally reaches maximum velocity, which is not exceeded by any further rise in concentration of the substrate. This is due to the enzyme molecules are fewer than substrate molecules and after saturation of these molecules, there are no free enzyme molecules to bind the additional substrate molecules.

45. (D) Lyases are the enzymes that are responsible for catalysing the removal of groups from substrates by mechanisms other than hydrolysis leaving double bonds. Transferases are the enzymes that catalyse a transfer of a group, except for hydrogen, between a pair of substrates. Oxidoreductases/dehydrogenases are the enzymes responsible for catalysing oxidoreduction between two substrates.

46. (D) Zinc is a cofactor for the proteolytic enzyme carboxypeptidase. Metal ions form coordination bonds with side chains at the active site and at the same time form one or more coordination bonds with the substrate.

47. (B) Inhibition of succinic dehydrogenase by malonate is an example of competitive inhibition in which malonate closely resembles the substrate succinate in structure. Malonate competes with the substrate succinate for the substrate binding site of the enzyme succinic dehydrogenase. Consequently, the substrate cannot bind and as a result, the enzyme action declines.

48. (D) The catalytic cycle of an enzyme action can be described in the following steps:

(1) First, the substrate binds to the active site of the enzyme, fitting into the active site.

(2) The binding of the substrate induces the enzyme to alter its shape, fitting more tightly around the substrate.

(3) The active site of the enzyme, now in close proximity to the substrate, breaks the chemical bonds of the substrate and the new enzyme-product complex is formed.

(4) The enzyme releases the products of the reaction and the free enzyme is ready to bind to another molecule of the substrate and run through the catalytic cycle once again.

49. (C) Enzymatic activity is highly dependent on the three-dimensional structure of proteins, which can be disrupted by temperature changes. At low temperatures, enzymes can be preserved in a temporarily inactive state by slowing down molecular motions that could lead to denaturation. However, at high temperatures, enzymes can be irreversibly denatured, leading to a loss of enzymatic activity.

A competitive inhibitor is a type of enzyme inhibitor that binds to the active site of an enzyme and competes with the substrate for binding. The inhibitor closely resembles the substrate in its molecular structure, which allows it to bind to the active site. This prevents the substrate from binding to the enzyme and inhibits the enzymatic activity.

50. (D) Malonate is a competitive inhibitor of catalytic activity of succinic dehydrogenase. Collagen is proteinaceous in nature and possess peptide bonds. Chitin is a homopolymer present in the cell wall of fungi and exoskeleton of arthropods. Abrin (from *Abrus precatorius*) and ricin (from *Ricinus communis*) are secondary metabolites and are toxins.

51. (B) Enzymes contain a globular protein part called apoenzyme and a non-protein part named cofactor or prosthetic group or metal-ion-activator. Prosthetic group are permanently bound to a protein. Activator group, which are cations (positively charged metal ions) and temporarily bind to the active site of the enzyme. Coenzymes, usually vitamins are not permanently bound to the enzyme molecule, but combine with the enzyme-substrate complex temporarily. Enzymes require the presence of cofactors before their catalytic activity can be exerted. This entire active complex is referred to as the holoenzyme.

52. (B) If coenzymes are tightly bound to the enzyme, they are referred to as a prosthetic group. The apoenzyme is the form that lacks the prosthetic group, and the holoenzyme is the fully functional form.

Conjugate enzymes or holoenzymes consist of a protein as well as non-protein part essential for the activity. The protein part of the holoenzyme is known as apoenzyme, which is inactive. The non-protein part is called a coenzyme and is necessary for the catalytic function of the enzymes. So holoenzyme is an active enzyme-cofactor complex, *i.e.*, an apoenzyme attached to a coenzyme.

53. (B) Ribozyme is the only non-proteinaceous enzyme, while lysozyme, deoxyribonuclease, ligase and all other enzymes are proteinaceous in nature. Ribozyme is a form of ribosomal RNA (23S rRNA), which acts as a catalyst in splicing of RNA during protein synthesis.

54. (B) The graph given in question shows the activation energy required to form products, in the presence and absence of enzymes. Enzymes enhance the rate of reaction by lowering down the activation energy of transition state. Thus, B is the activation energy in absence of enzyme, which is lowered down to A in presence of enzyme.

Caution

Students usually get confused between endothermic and exothermic reaction. This can be cleared easily by the graph. In the graph, the energy of substrate is higher than that of product reflecting the exothermic nature of reaction.

55. (D) Competitive inhibitor resembles the substrates and compete for the active binding sites of the enzyme. It forms a reversible enzyme-inhibitor complex. The presence of competitive inhibitor decreases the affinity of the substrate to binding site of the enzyme, which results in the increase of K_m constant.

Related Theory

The Michaelis-Menten equation for the reaction above is:

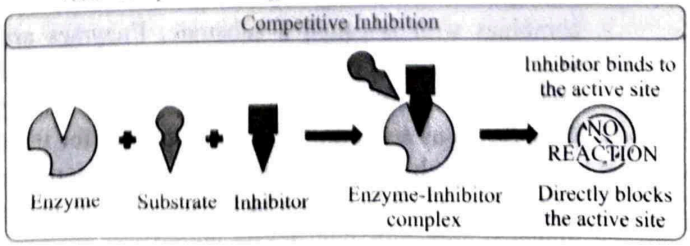
$$V = \frac{V_{max}[S]}{K_m + [S]}$$

This equation describes how the initial rate of reaction (V) is affected by the initial substrate concentration [S]. It assumes that the reaction is in the steady state, where the ES concentration remains constant. This plot of rate of reaction against substrate concentration has the shape of a rectangular hyperbola.

56. (B) Malonate is a competitive inhibitor for succinic dehydrogenase. Hence, addition of succinate in large amount would result in the reversal of the inhibition effect.

Related Theory

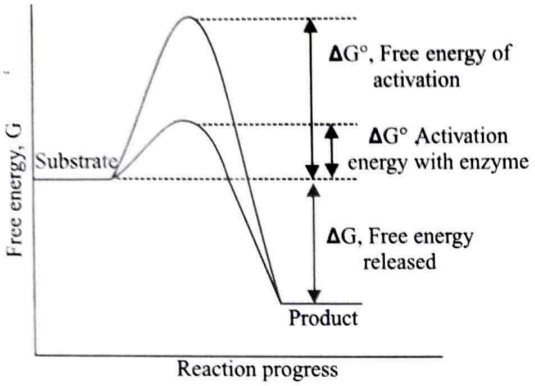
Competitive inhibition involves a molecule, other than the substrate, binding to the enzyme's active site. The inhibitor is structurally and chemically similar to the substrate and hence, able to bind to the active site. The competitive inhibitor blocks the active site and thus, prevents substrate binding. As the inhibitor is in competition with the substrate, its effects can be reduced by increasing substrate concentration.



57. (C) During enzymatic reaction, substrate binds to enzyme at its active site to form transient and unstable substrate-enzyme complex. This complex breaks and product is released from the active site.

Related Theory

The amount of activation energy decreased is equal to the amount of binding energy released during binding of enzyme and substrate.



Activation Energy

58. (C) As tissue X develops, it secretes something that induces tissue Y to develop, indicating a positive feedback mechanism.

A process by which one tissue (inducing in nature) stimulates the development of an adjacent unspecialised tissue is called induction.

Related Theory

Feedback mechanism is the mechanism of the body to maintain the levels of hormones in the body in the desired limits. An increase or decrease in the levels of the hormones triggers the feedback mechanism. Whenever there is a change in the normal state, the messages are sent to increase secretions if there is a fall below normal or to decrease secretions if there is a rise above normal to restore the normal body state. Such a mechanism is called a negative feedback mechanism.

59. (D) The essential chemical components of coenzymes are vitamins. For example, coenzymes NAD and NADP contains vitamin niacin.

60. (B) Chemically, enzymes are generally globular proteins. Enzymes are catalysts that breakdown or synthesise more complex chemical compounds. They speed up the rate of chemical reactions because they lower the energy of activation, the energy that must be supplied in order for molecules to react with one another. Anything that an enzyme normally combines with is called a substrate. Enzymes are very efficient. Enzymes are only present in small amounts in the cell since they are not altered during their reactions and they are highly specific for their substrate. Each enzyme has an optimum temperature and pH at which it works best. However, at much higher temperature, they are denatured.

Related Theory

Enzymes speed up the rate of chemical reactions because they lower the energy of activation, the energy that must be supplied in order for molecules to react with one another. Enzymes lower the energy of activation by forming an enzyme-substrate complex allowing products of the enzyme reaction to be formed and released.

Caution

Students must remember that ribozyme is a form of ribosomal RNA (23S rRNA), which acts as a catalyst in splicing of RNA during protein synthesis. It is the only non-protein enzyme known so far, rest all the enzymes are proteinaceous.

61. (B) Coenzyme is an organic non-protein molecule that associates with an enzyme molecule in catalysing biochemical reactions. It usually participates in the substrate-enzyme interaction by donating or accepting certain chemical groups. Holoenzyme is a complex comprising of enzyme molecule and its cofactor. The enzyme is catalytically active in this state. Apoenzyme is an inactive enzyme that must associate with a specific cofactor molecule in order to function. Isoenzyme or isozyme is one of the several forms of an enzyme that catalyse the same reaction, but differ from each other in such properties as substrate affinity and maximum rates of enzyme-substrate reaction.

62. (B) Competitive inhibition occurs when the binding of the inhibitor to the active site on the enzyme prevents the binding of the substrate and vice versa. The binding of competitive inhibitors to enzymes are reversible. Non-competitive inhibition occurs when the inhibitor binds to the enzyme at a site away from the active site such that even on binding of the substrate, the enzyme functions less effectively. This type of inhibition is reversible and cannot be overcome by adding a large amount of substrate.

63. (C) The catalytic efficiency of two different enzymes can be compared by comparing their K_m value or Michaelis-Menten constant. The Michaelis constant is the substrate concentration at which the reaction rate is at half-maximum. The K_m describes the affinity of enzyme for a substrate molecule. Greater the affinity, lower is the K_m value and sooner the V_{max} can be attained and vice versa.

Related Theory

K_m is the concentration of substrate, which permits the enzyme to achieve half of the V_{max}. An enzyme with a high K_m has a low affinity for its substrate, and requires a greater concentration of substrate to achieve V_{max}. The relationship is defined by the following Michaelis-Menten equation:

$$V = \frac{V_{max}}{\left(1 + \left(\frac{K_m}{[S]}\right)\right)}$$

64. (A) Enzymes, vitamins and hormones are all important for cellular metabolism. Enzymes are biological catalysts, which catalyse biological reactions. Vitamins cannot be synthesised in human body and must be procured from diet. Many vitamins act as coenzymes and are directly required for cellular metabolism.

Related Theory

Enzyme is a proteinaceous catalyst produced by a cell and responsible for the high rate and specificity of one or more intercellular or intracellular biochemical reactions. All enzymes are proteinaceous except ribozyme (a nuclease enzyme).

65. (D) The structure of tyrosinase can be divided into three domains: the central domain, the N-terminal domain, and the C-terminal domain. The central domain, which is composed of six conserved histidine residues, contains the CuA and CuB oxidising ions. In tryosinase, copper is associated as an activator.

Related Theory

Tyrosinase is involved in the biosynthesis of melanin in the melanosomes causing pigmentation of skin, hair and eyes in mammals providing the protection against UV. It converts a protein building block (amino acid) called tyrosine to another compound called dopaquinone.

66. (A) The stomach has low pH due to the secretion of HCl. Protease is an enzyme for digesting the protein and acts in low pH, *i.e.*, in the stomach.

Related Theory

Hydrolases are enzymes that catalyse the cleavage of a covalent bond using water. Types of hydrolases include esterase, such as phosphatases, that act on ester bonds, and proteases or peptidases that act on amide bonds in peptides.

67. (C) An organic or inorganic cofactors are possible. Coenzymes, such as NAD, FAD, and others, are organic cofactors that are loosely connected, whereas prosthetic groups, such as heme and biotin, are securely linked. The conjugate enzyme's protein component is termed the apoenzyme, and the entire enzyme is referred to as the holoenzyme.

68. (D) Enzymes quicken processes by reducing the activation energy. Proteins called enzymes rely on their three-dimensional structure to perform certain tasks. The overall change in free energy for a process is unaffected by enzymes.

69. (B) Isozymes (also known as isoenzymes) are enzymes that differ in amino acid sequence, but catalyse the same chemical reaction. These enzymes usually display different kinetic parameters (*i.e.*, different K_m values), or different regulatory properties.

70. (A) Enzymes requires metal ion as a cofactor, which activates their catalytic activity. Potassium (K) is an essential element, loosely held to the apoenzyme part of the enzyme. Potassium is an inorganic cofactor of enzyme pyruvate kinase.