CHAPTER
14

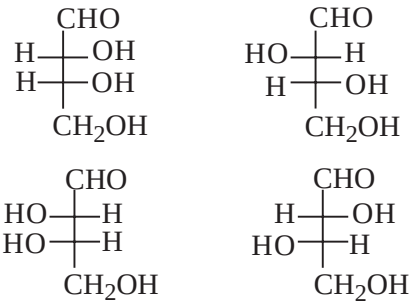
Biomolecules

14.1 Carbohydrates

1. Sucrose on hydrolysis gives
(a) β-*D*-glucose + α-*D*-fructose
(b) α-*D*-glucose + β-*D*-glucose
(c) α-*D*-glucose + β-*D*-fructose
(d) α-*D*-fructose + β-*D*-fructose. *(NEET 2020)*

2. The difference between amylose and amylopectin is
(a) amylopectin have 1 $\rightarrow$ 4 α-linkage and 1 $\rightarrow$ 6 α-linkage
(b) amylose have 1 $\rightarrow$ 4 α-linkage and 1 $\rightarrow$ 6 β-linkage
(c) amylopectin have 1 $\rightarrow$ 4 α-linkage and 1 $\rightarrow$ 6 β-linkage
(d) amylose is made up of glucose and galactose.
(NEET 2018)

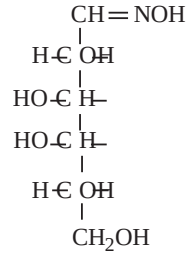
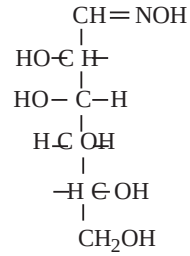
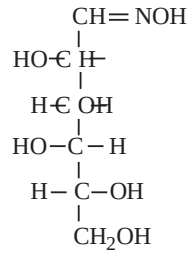
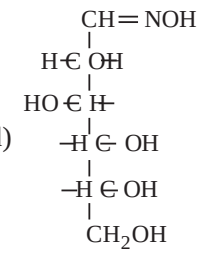
3. The correct corresponding order of names of four aldoses with configuration given below



respectively, is
(a) *L*-erythrose, *L*-threose, *L*-erythrose, *D*-threose
(b) *D*-threose, *D*-erythrose, *L*-threose, *L*-erythrose
(c) *L*-erythrose, *L*-threose, *D*-erythrose, *D*-threose
(d) *D*-erythrose, *D*-threose, *L*-erythrose, *L*-threose.
(NEET-II 2016)

4. Which one given below is a non-reducing sugar?
(a) Glucose (b) Sucrose
(c) Maltose (d) Lactose *(NEET-I 2016)*

5. *D*(+)-glucose reacts with hydroxyl amine and yields an oxime. The structure of the oxime would be

(a) 
(b) 
(c) 
(d) 

(2014)

6. Which one of the following sets of monosaccharides forms sucrose?
(a) α-*D*-galactopyranose and α-*D*-glucopyranose
(b) α-*D*-glucopyranose and β-*D*-fructofuranose
(c) β-*D*-glucopyranose and α-*D*-fructofuranose
(d) α-*D*-glucopyranose and β-*D*-fructopyranose
(2012)

7. Which one of the following statements is not true regarding (+)–lactose?
(a) On hydrolysis (+)–lactose gives equal amount of *D*(+)–glucose and *D*(+)–galactose.
(b) (+)–Lactose is a β-glucoside formed by the union of a molecule of *D*(+)–glucose and a molecule of *D*(+)–galactose.
(c) (+)–Lactose is a reducing sugar and does not exhibit mutarotation.
(d) (+)–Lactose, $C_{12}H_{22}O_{11}$ contains 8 –OH groups.
(2011)

8. Which one of the following does not exhibit the phenomenon of mutarotation?
(a) (+)–Sucrose (b) (+)–Lactose
(c) (+)–Maltose (d) (–)–Fructose *(2010)*

9. Fructose reduces Tollens' reagent due to
(a) asymmetric carbons
(b) primary alcoholic group
(c) secondary alcoholic group
(d) enolisation of fructose followed by conversion to aldehyde by base. *(Mains 2010)*

10. Number of chiral carbons in β-*D*-(+) glucose is
(a) five (b) six
(c) three (d) four. *(2004)*

11. Glycolysis is
(a) oxidation of glucose to glutamate
(b) conversion of pyruvate to citrate
(c) oxidation of glucose to pyruvate
(d) conversion of glucose to haem. *(2003)*

12. Cellulose is polymer of
(a) glucose (b) fructose
(c) ribose (d) sucrose. *(2002)*

13. Which of the following gives positive Fehling solution test?
(a) Sucrose (b) Glucose
(c) Fats (d) Protein *(2001)*

14. α-*D*-glucose and β-*D*-glucose are
(a) epimers (b) anomers
(c) enantiomers (d) diastereomers. *(2000)*

15. Which of the following is the sweetest sugar?
(a) Fructose (b) Glucose
(c) Sucrose (d) Maltose *(1999)*

16. Glucose molecule reacts with *X* number of molecules of phenyl hydrazine to yield osazone. The value of *X* is
(a) two (b) one
(c) four (d) three. *(1998)*

17. The oxidation of glucose is one of the most important reactions in a living cell. What is the number of ATP molecules generated in cells from one molecule of glucose?
(a) 28 (b) 38
(c) 12 (d) 18 *(1995)*

18. The α-*D*-glucose and β-*D*-glucose differ from each other due to difference in carbon atom with respect to its
(a) number of OH groups
(b) size of hemiacetal ring
(c) conformation
(d) configuration. *(1995)*

19. Chemically considering digestion is basically
(a) anabolism
(b) hydrogenation
(c) hydrolysis
(d) dehydrogenation. *(1994)*

20. On hydrolysis of starch, we finally get
(a) glucose (b) fructose
(c) both (a) and (b) (d) sucrose. *(1991)*

14.2 Proteins

21. Which of the following is a basic amino acid?
(a) Serine (b) Alanine
(c) Tyrosine (d) Lysine *(NEET 2020)*

22. The non-essential amino acid among the following is
(a) lysine (b) valine
(c) leucine (d) alanine.
(NEET 2019)

23. Which structure(s) of proteins remain(s) intact during denaturation process?
(a) Both secondary and tertiary structures
(b) Primary structure only
(c) Secondary structure only
(d) Tertiary structure only *(Odisha NEET 2019)*

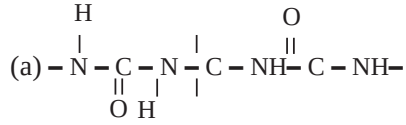
24. Which of the following compounds can form a zwitter ion?
(a) Aniline (b) Acetanilide
(c) Benzoic acid (d) Glycine
(NEET 2018)

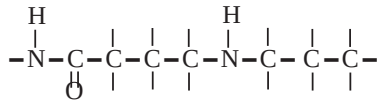
25. In a protein molecule various amino acids are linked together by
(a) peptide bond
(b) dative bond
(c) α-glycosidic bond
(d) β-glycosidic bond. *(NEET-I 2016)*

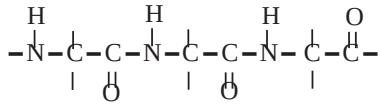
26. Which of the statements about "Denaturation" given below are correct?
(1) Denaturation of proteins causes loss of secondary and tertiary structures of the protein.
(2) Denaturation leads to the conversion of double strand of DNA into single strand.
(3) Denaturation affects primary structure which gets distorted.
(a) (2) and (3) (b) (1) and (3)
(c) (1) and (2) (d) (1), (2) and (3)
(Mains 2011)

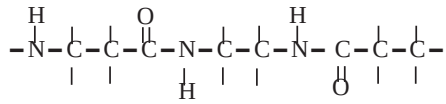
27. Which functional group participates in disulphide bond formation in proteins?
(a) Thioester (b) Thioether
(c) Thiol (d) Thiolactone *(2005)*

28. Which of the following structures represents the peptide chain?

(a) 

(b) 

(c) 

(d) 

(2004)

29. The correct statement in respect of protein haemoglobin is that it
(a) functions as a catalyst for biological reactions
(b) maintains blood sugar level
(c) acts as an oxygen carrier in the blood
(d) forms antibodies and offers resistance to diseases. *(2004)*

30. The helical structure of protein is stabilised by
(a) dipeptide bonds (b) hydrogen bonds
(c) ether bonds (d) peptide bonds. *(2004)*

31. Which is not true statement?
(a) α-Carbon of α-amino acid is asymmetric.
(b) All proteins are found in *L*-form.
(c) Human body can synthesise all proteins they need.
(d) At pH = 7 both amino and carboxylic groups exist in ionised form. *(2002)*

32. $-\overset{\overset{O}{\|}}{C}-\ddot{N}H-$(peptide bond).

Which statement is incorrect about peptide bond?
(a) C – N bond length in proteins is longer than usual bond length of N – C bond.
(b) Spectroscopic analysis shows planar structure of $-\overset{\overset{O}{\|}}{C}-NH-$ group.
(c) C – N bond length in proteins is smaller than usual bond length of C – N bond.
(d) None of the above. *(2001)*

33. Which is the correct statement?
(a) Starch is a polymer of α-glucose.
(b) Amylose is a component of cellulose.
(c) Proteins are composed of only one type of amino acid.
(d) In cyclic structure of fructose, there are four carbons and one oxygen atom. *(2001)*

34. Haemoglobin is
(a) a vitamin (b) a carbohydrate
(c) an enzyme (d) a globular protein. *(1997)*

35. The secondary structure of a protein refers to
(a) regular folding patterns of continuous portions of the polypeptide chain
(b) three-dimensional structure, specially the bond between amino acid residues that are distant from each other in the polypeptide chain
(c) mainly denatured proteins and structures of prosthetic groups
(d) linear sequence of amino acid residues in the polypeptide chain. *(1995)*

14.3 Enzymes

36. During the process of digestion, the proteins present in food materials are hydrolysed to amino acids. The two enzymes involved in the process

$$\text{proteins} \xrightarrow{\text{enzyme } (A)} \text{polypeptides} \xrightarrow{\text{enzyme } (B)} \text{amino acids,}$$

are respectively
(a) invertase and zymase
(b) amylase and maltase
(c) diastase and lipase
(d) pepsin and trypsin. *(2006)*

37. Enzymes are made up of
(a) edible proteins
(b) proteins with specific structure
(c) nitrogen containing carbohydrates
(d) carbohydrates. *(2002)*

38. Which of the following is correct?
(a) Cycloheptane is an aromatic compound.
(b) Diastase is an enzyme.
(c) Acetophenone is an ether.
(d) All of these. *(2001)*

39. The function of enzymes in the living system is to
(a) catalyse biochemical reactions
(b) provide energy
(c) transport oxygen
(d) provide immunity. *(1997)*

40. Which of the following statements about enzymes is true?
(a) Enzymes catalyse chemical reactions by increasing the activation energy.
(b) Enzymes are highly specific both in binding chiral substrates and in catalysing their reactions.
(c) Enzymes lack in nucleophilic groups.
(d) Pepsin is proteolytic enzyme. *(1995)*

41. Enzymes take part in a reaction and
(a) decrease the rate of a chemical reaction
(b) increase the rate of a chemical reaction
(c) both (a) and (b)
(d) none of these. *(1993)*

14.4 Vitamins

42. Deficiency of vitamin B_1 causes the disease
(a) convulsions (b) beri-beri
(c) cheilosis (d) sterility. *(2012)*

43. Which of the following is not a fat soluble vitamin?
(a) Vitamin B complex
(b) Vitamin D
(c) Vitamin E
(d) Vitamin A *(Mains 2011)*

44. Which of the following vitamins is water soluble?
(a) Vitamin E (b) Vitamin K
(c) Vitamin A (d) Vitamin B *(2007)*

45. The human body does not produce
(a) enzymes (b) DNA
(c) vitamins (d) hormones. *(2006)*

46. Vitamin B_{12} contains
(a) Fe (II) (b) Co (III)
(c) Zn (II) (d) Ca (II) *(2003)*

14.5 Nucleic Acids

47. The central dogma of molecular genetics states that the genetic information flows from
(a) Amino acids $\rightarrow$ Proteins $\rightarrow$ DNA
(b) DNA $\rightarrow$ Carbohydrates $\rightarrow$ Proteins
(c) DNA $\rightarrow$ RNA $\rightarrow$ Proteins
(d) DNA $\rightarrow$ RNA $\rightarrow$ Carbohydrates
(NEET-II 2016)

48. The correct statement regarding RNA and DNA, respectively is
(a) the sugar component in RNA is a arabinose and the sugar component in DNA is ribose
(b) the sugar component in RNA is 2′-deoxyribose and the sugar component in DNA is arabinose
(c) the sugar component in RNA is arabinose and the sugar component in DNA is 2′-deoxyribose
(d) the sugar component in RNA is ribose and the sugar component in DNA is 2′-deoxyribose.
(NEET-I 2016)

49. In DNA, the linkages between different nitrogenous bases are
(a) phosphate linkage
(b) H-bonding
(c) glycosidic linkage
(d) peptide linkage. *(Karnataka NEET 2013)*

50. The segment of DNA which acts as the instrumental manual for the synthesis of the protein is
(a) ribose (b) gene
(c) nucleoside (d) nucleotide. *(2009)*

51. In DNA, the complimentary bases are
(a) adenine and guanine; thymine and cytosine
(b) uracil and adenine; cytosine and guanine
(c) adenine and thymine; guanine and cytosine
(d) adenine and thymine; guanine and uracil.
(2008, 1998)

52. RNA and DNA are chiral molecules, their chirality is due to
(a) chiral bases
(b) chiral phosphate ester units
(c) *D*-sugar component
(d) *L*-sugar component. *(2007)*

53. A sequence of how many nucleotides in messenger RNA makes a codon for an amino acid?
(a) Three (b) Four
(c) One (d) Two *(2004)*

54. Chargaff's rule states that in an organism
(a) amount of adenine (A) is equal to that of thymine (T) and the amount of guanine (G) is equal to that of cytosine (C)
(b) amount of adenine (A) is equal to that of guanine (G) and the amount of thymine (T) is equal to that of cytosine (C)
(c) amount of adenine (A) is equal to that of cytosine (C) and the amount of thymine (T) is equal to that of guanine (G)
(d) amounts of all bases are equal. *(2003)*

55. Which of the following is correct about H-bonding in nucleotide?
(a) A – T, G – C (b) A – G , T – C
(c) G – T, A – C (d) A – A, T – T
(2001)

56. An example of biopolymer is
(a) teflon (b) neoprene
(c) nylon-6, 6 (d) DNA. *(1994)*

57. The couplings between base units of DNA is through
(a) hydrogen bonding
(b) electrostatic bonding
(c) covalent bonding
(d) van der Waals' forces. *(1992)*

14.6 Hormones

58. Which of the following statements is not correct?
(a) Ovalbumin is a simple food reserve in egg-white.
(b) Blood proteins thrombin and fibrinogen are involved in blood clotting.
(c) Denaturation makes the proteins more active.
(d) Insulin maintains sugar level in the blood of a human body. *(NEET 2017)*

59. Which of the following hormones is produced under the conditions of stress which stimulate glycogenolysis in the liver of human beings?
(a) Thyroxin (b) Insulin
(c) Adrenaline (d) Estradiol *(2014)*

60. Which of the following hormones contains iodine?
(a) Testosterone (b) Adrenaline
(c) Thyroxine (d) Insulin *(2009)*

61. Which of the following is an amine hormone?
(a) Insulin (b) Progesterone
(c) Thyroxine (d) Oxypurin *(2008)*

62. Which one of the following is a peptide hormone?
(a) Adrenaline (b) Glucagon
(c) Testosterone (d) Thyroxine *(2006)*

63. The hormone that helps in the conversion of glucose to glycogen is
(a) cortisone (b) bile acids
(c) adrenaline (d) insulin. *(2004)*

64. Which one is responsible for production of energy in biochemical reaction?
(a) Thyroxine (b) Adrenaline
(c) Oestrogen (d) Progesterone *(2000)*

14.A Lipids

65. The cell membranes are mainly composed of
(a) fats (b) proteins
(c) phospholipids
(d) carbohydrates. *(2005)*

66. Phospholipids are esters of glycerol with
(a) three carboxylic acid residues
(b) two carboxylic acid residues and one phosphate group
(c) one carboxylic acid residue and two phosphate groups
(d) three phosphate groups. *(2003)*

67. The number of molecules of ATP produced in the lipid metabolism of a molecule of palmitic acid is
(a) 56 (b) 36
(c) 130 (d) 86 *(1998)*

ANSWER KEY

1.	(c)	**2.**	(a)	**3.**	(d)	**4.**	(b)	**5.**	(d)	**6.**	(b)	**7.**	(c)	**8.**	(a)	**9.**	(d)	**10.**	(d)
11.	(c)	**12.**	(a)	**13.**	(b)	**14.**	(b)	**15.**	(a)	**16.**	(d)	**17.**	(b)	**18.**	(d)	**19.**	(c)	**20.**	(a)
21.	(d)	**22.**	(d)	**23.**	(b)	**24.**	(d)	**25.**	(a)	**26.**	(c)	**27.**	(c)	**28.**	(c)	**29.**	(c)	**30.**	(b)
31.	(b)	**32.**	(a)	**33.**	(a)	**34.**	(d)	**35.**	(a)	**36.**	(d)	**37.**	(b)	**38.**	(b)	**39.**	(a)	**40.**	(b)
41.	(b)	**42.**	(b)	**43.**	(a)	**44.**	(d)	**45.**	(c)	**46.**	(b)	**47.**	(c)	**48.**	(d)	**49.**	(b)	**50.**	(b)
51.	(c)	**52.**	(c)	**53.**	(a)	**54.**	(a)	**55.**	(a)	**56.**	(d)	**57.**	(a)	**58.**	(c)	**59.**	(c)	**60.**	(c)
61.	(c)	**62.**	(b)	**63.**	(d)	**64.**	(a)	**65.**	(c)	**66.**	(b)	**67.**	(c)						

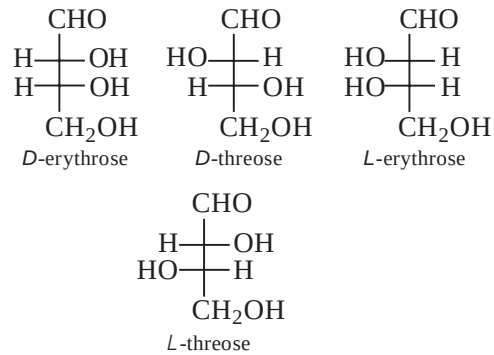
Hints & Explanations

1. (c) : In sucrose, two monosaccharides are held together by a glycosidic linkage between C-1 of *α-D*-glucose and C-2 of *β-D*-fructose.

Sucrose $\xrightarrow{\text{Hydrolysis}}$ *α-D*-glucose + *β-D*-fructose

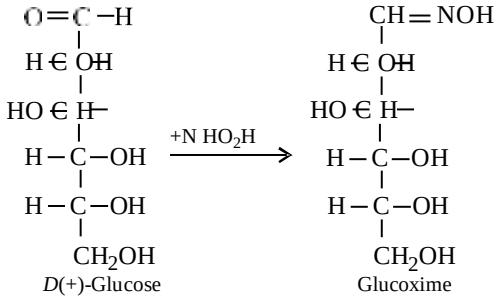
2. (a) : Amylose is a linear polymer of *α-D*-glucose held by C_1-C_4 glycosidic linkage whereas amylopectin is branched chain polymer of *α-D*-glucose units in which chain is held by C_1-C_4 glycosidic linkage while branching occurs by C_1-C_6 glycosidic linkage.

3. (d) :



4. (b) : All monosaccharides whether aldoses or ketoses are reducing sugars. Disaccharides such as sucrose in which the two monosaccharide units are linked through their reducing centres *i.e.,* aldehydic or ketonic groups are non-reducing.

5. (d) :



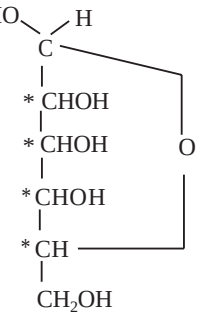
6. (b) : Sucrose is formed by the condensation of α-*D*-glucopyranose and β-*D*-fructofuranose.

7. (c) : (+)-Lactose is a reducing sugar and all reducing sugars show mutarotation.

8. (a) : Sucrose does not show mutarotation. Mutarotation is the phenomenon of change in optical rotation shown by freshly prepared solutions of sugars. However, this property is not exhibited by all sugars. Only those sugars which have a free aldehyde (—CHO) or ketone (>C=O) group are capable of showing mutarotation. Sucrose lacks free aldehyde or ketone group and is therefore, incapable of showing mutarotation.

9. (d) : Under alkaline conditions of the reagent, fructose gets converted into a mixture of glucose and mannose (Lobry de Bruyn van Ekenstein rearrangement) both of which contain the –CHO group and hence, reduce Tollens' reagent to give silver mirror test.

10. (d) :



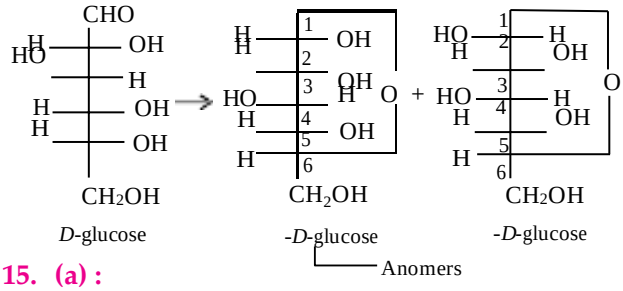
This structure of β-*D*-glucose has four asymmetric carbon atoms.

11. (c) : Glycolysis is the first stage in the oxidation of glucose. It is an anaerobic process and involves the degradation of glucose into two molecules of pyruvate with the generation of two molecules of ATP.

12. (a) : Cellulose is a straight chain polysaccharide composed of β-*D*-glucose units joined by β-glycosidic linkage between C_1 of one glucose unit and C_4 of the next glucose unit.

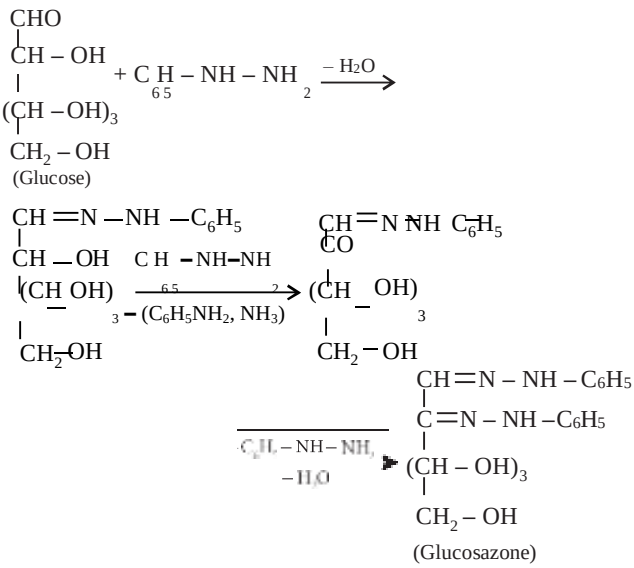
13. (b) : Glucose reduces Fehling solution because glucose has free –CHO group which is readily oxidised.

14. (b) : Glucose forms a stable hemiacetal between the —CHO group and the —OH group on the 5th carbon. In this process, the 1st 'C' atom becomes asymmetric giving two isomers which differ in the configuration of the asymmetric carbon. These two isomers are called as anomers.



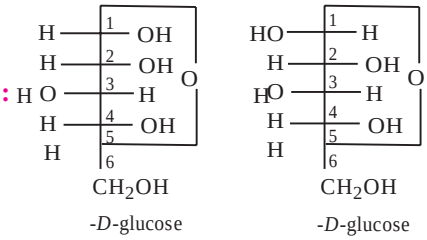
15. (a) : Fructose is the sweetest among all the sugars and is highly soluble in water.

16. (d) : Glucose first reacts with phenyl hydrazine giving phenylhydrazone. Then the adjacent —CHOH group is oxidized by a 2nd phenyl hydrazine molecule and itself is reduced to aniline. The resulting carbonyl group reacts with 3rd phenyl hydrazine molecule giving osazone.



17. (b) : $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O + 38ATP$

18. (d) :



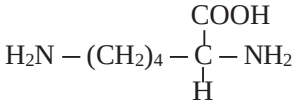
These isomers differ only in the orientation (or configuration) at C1 atom.

19. (c)

20. (a) : Glucose is produced commercially by the hydrolysis of starch by boiling it with dil. H_2SO_4 at 393 K under pressure of 2-3 bar.

$$\underset{\text{Starch}}{(C_6H_{10}O_5)_n} + nH_2O \xrightarrow[393\text{ K, 2-3 bar}]{H^+} \underset{\text{Glucose}}{nC_6H_{12}O_6}$$

21. (d) : Lysine is a basic amino acid.



22. (d)

23. (b) : During denaturation of proteins, 2° and 3° structures are destroyed but 1° structure remains intact.

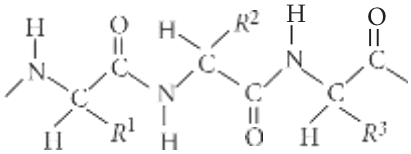
24. (d) : $\underset{\text{Glycine}}{2\,HOOC-CH(NH_2)-CH_2-NH_2} \rightleftharpoons \underset{\text{Zwitter ion}}{2\,OOC-CH_2-NH_3}$

25. (a)

26. (c) : Denaturation does not change the primary structure of protein.

27. (c) : Disulphide bond may be reduced to thiol by means of reagents *i.e.*, $NaBH_4$, which shows the presence of thiol group in disulphide bond formation.

28. (c) : In peptide linkage *i.e.*, – CONH – group, the carboxyl group of one amino acid molecule forms an amide by combination with the amino group of the next amino acid molecule with the liberation of water molecule.

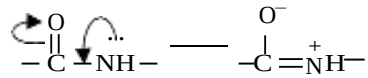


29. (c) : Four Fe^{2+} ions of each haemoglobin can bind with four molecules of O_2 and it is carried as oxyhaemoglobin.

30. (b) : α-Helix structure is formed when the chain of α-amino acids coil as a right handed screw because of the formation of hydrogen bonds between amide groups of the same peptide chain, *i.e.*, NH group in one unit is linked to carbonyl oxygen of the fourth unit by hydrogen bonding. This H-bonding is responsible for holding helix in a stable position.

31. (b) : Some proteins are also found in *D*-form.

32. (a) : Peptide bond is formed by the reaction of — COOH group of one amino acid with the — NH_2 group of another amino acid and represented as



As some double bond character is found between C – N bond, the bond length of C–N in protein should be smaller than the usual C–N bond.

33. (a) : Starch is also known as amylum which occurs in all green plants. A molecule of starch $(C_6H_{10}O_5)_n$ is built of a large number of α-glucose rings joined through oxygen atoms.

34. (d) : Haemoglobin is a globular protein of four subunits, each subunit having a heme moiety and a polypeptide chain (Two α and two β chains).

35. (a)

36. (d) : Proteins $\xrightarrow[\text{proteases}]{\text{pepsin}}$ Polypeptides $\xrightarrow[\text{chemotrypsin}]{\text{trypsin}}$ Amino acids

37. (b)

38. (b) : Diastase is an enzyme that hydrolyses starch into maltose.

39. (a) **40. (b)**

41. (b) : Enzymes being biocatalyst increases the rate of a chemical reaction by providing alternative lower activation energy pathways.

42. (b) :

Deficiency disease	**Vitamin**
Convulsions	B_6
Beri-beri	B_1
Cheilosis	B_2
Sterility	E

43. (a) : Vitamin B complex is not a fat soluble vitamin. It is a water soluble vitamin.

44. (d) : Vitamin B and C are water soluble whereas vitamin A, D, E and K are fat soluble.

45. (c) : Certain organic substances required for regulating some of the body processes and preventing certain diseases are called vitamins, which cannot be synthesised by human body.

46. (b) : Vitamin B_{12} is chemically named as cyanocobalamine having molecular formula $C_{63}H_{88}O_{14}N_{14}PCo$.

47. (c) : Genetic information flows from

$$DNA \xrightarrow{\text{Transcription}} RNA \xrightarrow{\text{Translation}} \text{Proteins}$$

48. (d)

49. (b) : Nitrogeneous bases are linked together by hydrogen bonds.

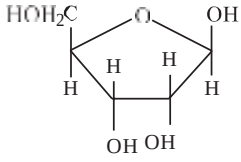
50. (b) : Genes are responsible for protein synthesis.

51. (c) : DNA contains two types of nitrogeneous bases Purine → Adenine (A) and guanine (G)

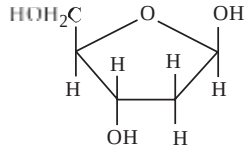
Pyrimidine → Cytosine (C) and thymine (T)

The purine and pyrimidine bases pair only in certain combination. Adenine pairs with thymine (A : T) by two hydrogen bonds and guanine with cytosine (G : C) by three hydrogen bonds.

52. (c) : The constituents of nucleic acids are nitrogenous bases, sugar and phosphoric acid. The sugar present in DNA is *D*(–)-2-deoxyribose and the sugar present in RNA is *D*(–)-ribose. Due to these *D*(–)-sugar components, DNA and RNA molecules are chiral molecules.



-*D*(–)-ribose



-*D*(–)-2-de oxyribose

53. (a) : The four bases in *m*RNA : adenine, cytosine, guanine and uracil have been shown to act in the form of triplets; each triplet behaving as a code for the synthesis of a particular amino acid.

54. (a) : Amount of A = T and that of G = C.

55. (a)

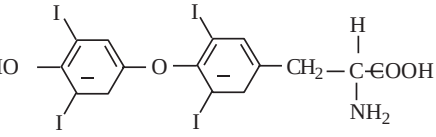
56. (d) : DNA is an example of biopolymer.

57. (a)

58. (c) : Denaturation changes the structure of a protein and protein loses its activity.

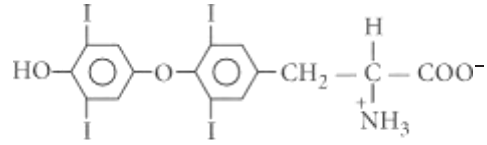
59. (c) : Adrenaline hormone helps to release fatty acids from fat and glucose from liver glycogen under the condition of stress. Hence, it is also called 'flight or fight hormone'.

60. (c) :



Thyroxine

61. (c) : Thyroxine is an amine hormone and water soluble hormone containing amino group.



Thyroxine

62. (b) : Glucagon is a peptide hormone, synthesised by the α-cells of the pancreas.

63. (d) : Insulin is a hormone secreted by the pancreas that lowers blood glucose level by promoting the uptake of glucose by cells and the conversion of glucose to glycogen by the liver and skeletal muscle.

64. (a) : It is a hormone secreted from thyroid gland. It controls various biochemical reactions involving burning of proteins, carbohydrates, fats to release energy.

65. (c) : Cell membranes are mainly composed of phospholipids.

66. (b) : Phospholipids may be regarded as derivatives of glycerol in which two of the hydroxyl groups are esterified with fatty acids while the third is esterified with some derivatives of phosphoric acid.

67. (c) : In the lipid metabolism, a molecule of palmitic acid ($C_{15}H_{31}$ – COOH) produces 130 adenosine triphosphate molecules (ATP).