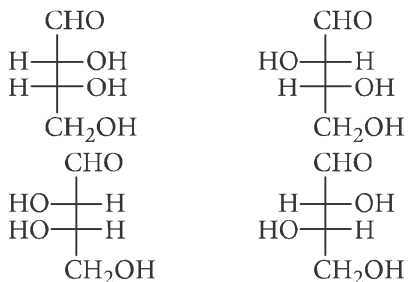


# Chapter 28. Biomolecules

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

2. The central dogma of molecular genetics states that the genetic information flows from
- Amino acids → Proteins → DNA
  - DNA → Carbohydrates → Proteins
  - DNA → RNA → Proteins
  - DNA → RNA → Carbohydrates (NEET-II 2016)

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



respectively, is

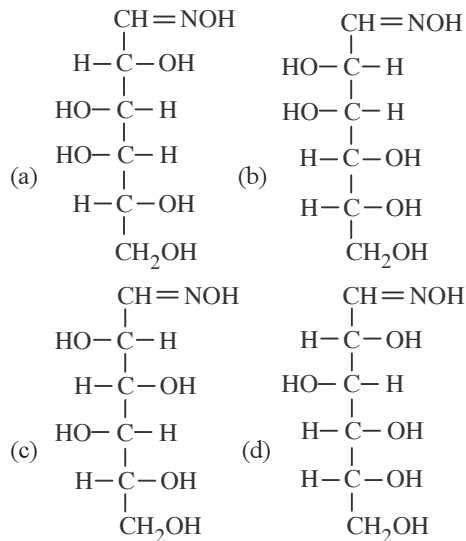
- L*-erythrose, *L*-threose, *L*-erythrose, *D*-threose
  - D*-threose, *D*-erythrose, *L*-threose, *L*-erythrose
  - L*-erythrose, *L*-threose, *D*-erythrose, *D*-threose
  - D*-erythrose, *D*-threose, *L*-erythrose, *L*-threose. (NEET-II 2016)
4. The correct statement regarding RNA and DNA, respectively is
- the sugar component in RNA is a arabinose and the sugar component in DNA is ribose

- the sugar component in RNA is 2'-deoxyribose and the sugar component in DNA is arabinose
- the sugar component in RNA is arabinose and the sugar component in DNA is 2'-deoxyribose
- the sugar component in RNA is ribose and the sugar component in DNA is 2'-deoxyribose. (NEET-I 2016)

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

6. Which one given below is a non-reducing sugar?
- Glucose
  - Sucrose
  - Maltose
  - Lactose (NEET-I 2016)

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



(2014)

8. 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)
9. In DNA, the linkages between different nitrogenous bases are  
 (a) phosphate linkage (b) H-bonding  
 (c) glycosidic linkage (d) peptide linkage  
 (Karnataka NEET 2013)
10. Deficiency of vitamin B<sub>1</sub> causes the disease  
 (a) convulsions (b) beri-beri  
 (c) cheilosis (d) sterility (2012)
11. Which one of the following sets of monosaccharides forms sucrose?  
 (a)  $\alpha$ -D-galactopyranose and  $\alpha$ -D-glucopyranose  
 (b)  $\alpha$ -D-glucopyranose and  $\beta$ -D-fructofuranose  
 (c)  $\beta$ -D-glucopyranose and  $\alpha$ -D-fructofuranose  
 (d)  $\alpha$ -D-glucopyranose and  $\beta$ -D-fructopyranose. (2012)
12. 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  $\beta$ -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<sub>12</sub>H<sub>22</sub>O<sub>11</sub> contains 8-OH groups (2011)
13. 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)
14. 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)
15. Which one of the following does not exhibit the phenomenon of mutarotation?  
 (a) (+) Sucrose (b) (+) Lactose  
 (c) (+) Maltose (d) (-) Fructose (2010)
16. Fructose reduces Tollen's 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)
17. 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)
18. Which of the following hormones contains iodine?  
 (a) Testosterone (b) Adrenaline  
 (c) Thyroxine (d) Insulin (2009)
19. 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)
20. Which of the following is an amine hormone?  
 (a) Insulin (b) Progesterone  
 (c) Thyroxine (d) Oxypurin (2008)



21. 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)

22. Which of the following vitamins is water-soluble?

- (a) Vitamin E (b) Vitamin K  
 (c) Vitamin A (d) Vitamin B

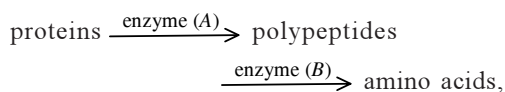
(2007)

23. The human body does not produce

- (a) enzymes (b) DNA  
 (c) vitamins (d) hormones.

(2006)

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



are respectively

- (a) invertase and zymase  
 (b) amylase and maltase  
 (c) diastase and lipase  
 (d) pepsin and trypsin.

(2006)

25. Which one of the following is a peptide hormone?

- (a) Adrenaline (b) Glucagon  
 (c) Testosterone (d) Thyroxine

(2006)

26. Which functional group participates in disulphide bond formation in proteins?

- (a) Thioester (b) Thioether  
 (c) Thiol (d) Thiolactone

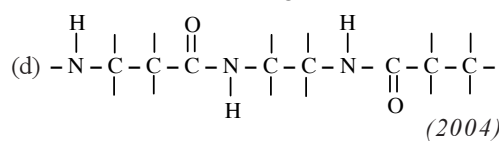
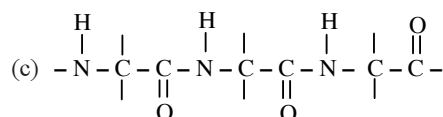
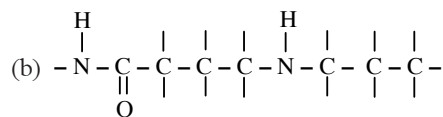
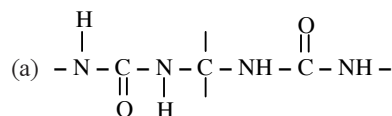
(2005)

27. The cell membranes are mainly composed of

- (a) fats (b) proteins  
 (c) phospholipids (d) carbohydrates.

(2005)

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



(2004)

29. 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)

30. The hormone that helps in the conversion of glucose to glycogen is

- (a) cortisone (b) bile acids  
 (c) adrenaline (d) insulin. (2004)

31. 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)

32. Number of chiral carbons in  $\beta$ -*D*-(+) glucose is

- (a) five (b) six  
 (c) three (d) four (2004)

33. The helical structure of protein is stabilised by

- (a) dipeptide bonds (b) hydrogen bonds  
 (c) ether bonds (d) peptide bonds. (2004)

34. Vitamin B<sub>12</sub> contains

- (a) Fe (II) (b) Co (III)  
 (c) Zn (II) (d) Ca (II) (2003)



35. 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)
36. 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)
37. 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)
38. Enzymes are made up of  
 (a) edible proteins  
 (b) proteins with specific structure  
 (c) nitrogen containing carbohydrates  
 (d) carbohydrates. (2002)
39. Which is not true statement?  
 (a)  $\alpha$ -carbon of  $\alpha$ -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)
40. 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)
41. Which is the correct statement?  
 (a) Starch is a polymer of  $\alpha$ -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)
42.  $\begin{array}{c} \text{O} \\ \parallel \\ -\text{C}-\text{NH}- \end{array}$  (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  $\begin{array}{c} -\text{C}-\text{NH}- \\ \parallel \\ \text{O} \end{array}$  group.  
 (c) C - N bond length in proteins is smaller than usual bond length of C - N bond.  
 (d) None of the above. (2001)
43. 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)
44.  $\alpha$ -D-glucose and  $\beta$ -D-glucose are  
 (a) epimers (b) anomers  
 (c) enantiomers (d) diastereomers.  
 (2000)
45. Which one is responsible for production of energy in bio-reaction?  
 (a) Thyroxine (b) Adrenaline  
 (c) Oestrogen (d) Progesterone  
 (2000)
46. Mg is present in  
 (a) chlorophyll (b) haemoglobin  
 (c) vitamin-D (d) vitamin-B.  
 (2000)
47. Which of the following is the sweetest sugar?  
 (a) Fructose (b) Glucose  
 (c) Sucrose (d) Maltose (1999)
48. 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)
49. 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)
50. Haemoglobin is  
 (a) a vitamin (b) a carbohydrate  
 (c) an enzyme (d) a globular protein.  
 (1997)



- 51.** The function of enzymes in the living system is to  
 (a) catalyse biochemical reactions  
 (b) provide energy  
 (c) transport oxygen  
 (d) provide immunity. (1997)
- 52.** 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)
- 53.** 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)
- 54.** The  $\alpha$ -D-glucose and  $\beta$ -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)
- 55.** Which of the following statements about enzymes are 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)
- 56.** Chemically considering digestion is basically  
 (a) anabolism  
 (b) hydrogenation  
 (c) hydrolysis  
 (d) dehydrogenation. (1994)
- 57.** An example of biopolymer is  
 (a) teflon (b) neoprene  
 (c) nylon-66 (d) DNA. (1994)
- 58.** 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)
- 59.** The couplings between base units of DNA is through  
 (a) hydrogen bonding  
 (b) electrostatic bonding  
 (c) covalent bonding  
 (d) van der Waals forces. (1992)
- 60.** On hydrolysis of starch, we finally get  
 (a) glucose (b) fructose  
 (c) both (a) and (b) (d) sucrose. (1991)

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**Answer Key**


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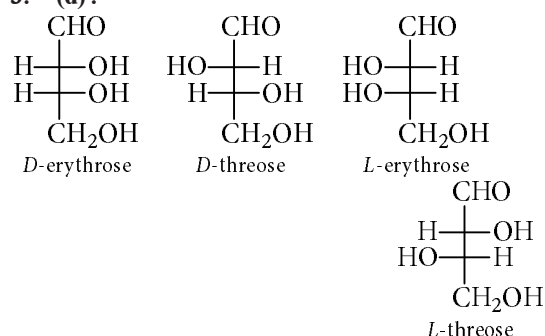


## EXPLANATIONS

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

2. (c): Genetic information flows from  
 DNA  $\xrightarrow{\text{Transcription}}$  RNA  $\xrightarrow{\text{Translation}}$  Proteins

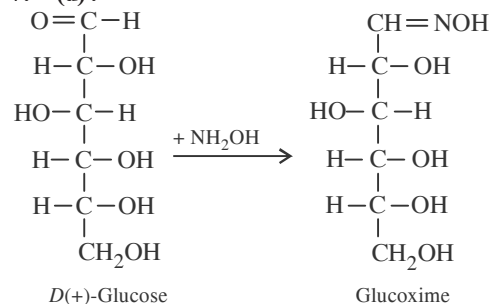
3. (d):



4. (d)      5. (a)

6. (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.

7. (d):



8. (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'.

9. (b): Nitrogenous bases are linked together by hydrogen bonds.

10. (b): Deficiency disease

Convulsions  
 Beri-beri  
 Cheilosis  
 Sterility

Vitamin

B<sub>6</sub>  
 B<sub>1</sub>  
 B<sub>2</sub>  
 E

11. (b): Sucrose is formed by the condensation of  $\alpha$ -D-glucopyranose and  $\beta$ -D-fructofuranose.

12. (c): (+) Lactose is a reducing sugar and all reducing sugar shows mutarotation.

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

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

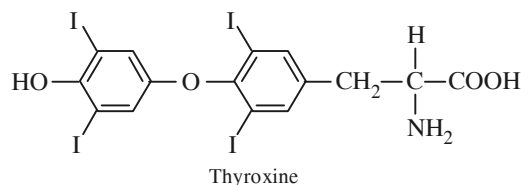
15. (a): Sucrose does not show mutarotation.

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 ( $-\text{CHO}$ ) or ketone ( $>\text{C}=\text{O}$ ) group are capable of showing mutarotation. Sucrose lacks free aldehyde or ketone group and is therefore incapable of showing mutarotation.

16. (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  $-\text{CHO}$  group and hence reduce Tollen's reagent to give silver mirror test.

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

18. (c):



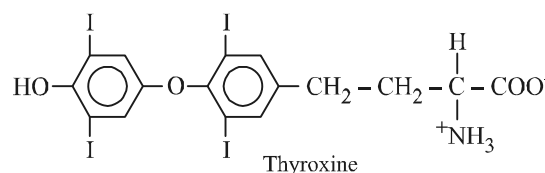
19. (c): DNA contains two types of nitrogenous bases

Purine  $\rightarrow$  Adenine (A) and guanine (G)

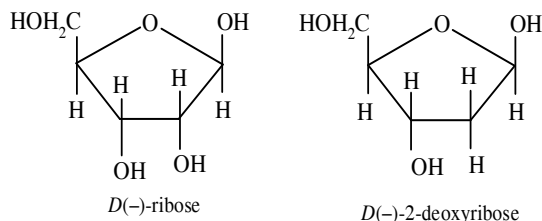
Pyrimidine  $\rightarrow$  Cytosine (C) and thymine (T)

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.

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

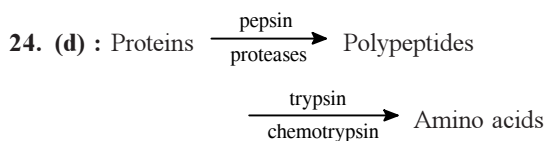


**21. (c) :** The constituents of nucleic acids are nitrogenous bases, sugar and phosphoric acid. The sugar present in DNA is *D*(-)-2-deoxyribose and the sugar present in RNA is *D*(-)-ribose. Due to these *D*(-)-sugar components, DNA and RNA molecules are chiral molecules.



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

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

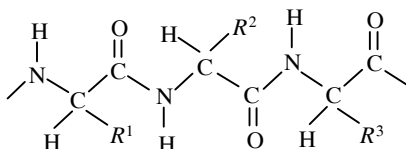


**25. (b) :** Glucagon is a single chain peptide of 29 amino acids, synthesised by the  $\alpha$ -cells in the islets of Langerhans of the pancreas.

**26. (c) :** Disulphide bond may be reduced to thiol by means of reagents *i.e.*,  $\text{NaBH}_4$ , which shows the presence of thiol group in disulphide bond formation.

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

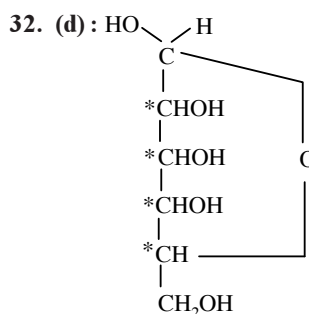
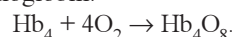
**28. (c) :** In peptide linkage *i.e.*,  $-\text{CONH}-$  group, the carboxyl group of one amino acid molecule forms an amide by combination with the amino group of the next amino acid molecule with the liberation of water molecule.



**29. (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.

**30. (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.

**31. (c) :** Four  $\text{Fe}^{2+}$  ions of each haemoglobin can bind with 4 molecules of  $\text{O}_2$  and it is carried as oxyhaemoglobin.



This structure of  $\beta$ -*D*-glucose has four asymmetric carbon atoms.

**33. (b) :**  $\alpha$ -helix structure is formed when the chain of  $\alpha$ -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 third unit by hydrogen bonding. This H-bonding is responsible for holding helix in a position.

**34. (b) :** Vitamin  $\text{B}_{12}$  is chemically named as cyanocobalamin having molecular formula  $\text{C}_{63}\text{H}_{88}\text{O}_{14}\text{N}_{14}\text{PCo}$ .

**35. (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.

**36. (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.

**37. (a) :** Amount of  $\text{A} = \text{T}$  and that of  $\text{G} = \text{C}$ .

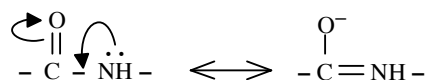
**38. (b) :** Enzymes are proteins that act as catalyst for bio-chemical processes of life. They speed up these reactions enormously and with a high degree of selectivity.

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

40. (a)

41. (a) : Starch is also known as amyllum which occurs in all green plants. A molecule of starch ( $C_6H_{10}O_5$ )<sub>n</sub> is built of a large number of  $\alpha$ -glucose rings joined through oxygen atoms.

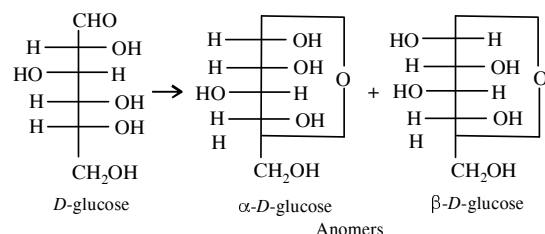
42. (a) : Peptide bond is formed by the reaction of one -COOH group of one amino acid with the -NH<sub>2</sub> group of another amino acid and represented as



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.

43. (b) : Diastase is an enzyme. (The protein produced by living systems which acts as a biological catalyst). Enzymes are characterised by the name ending with -ase.

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



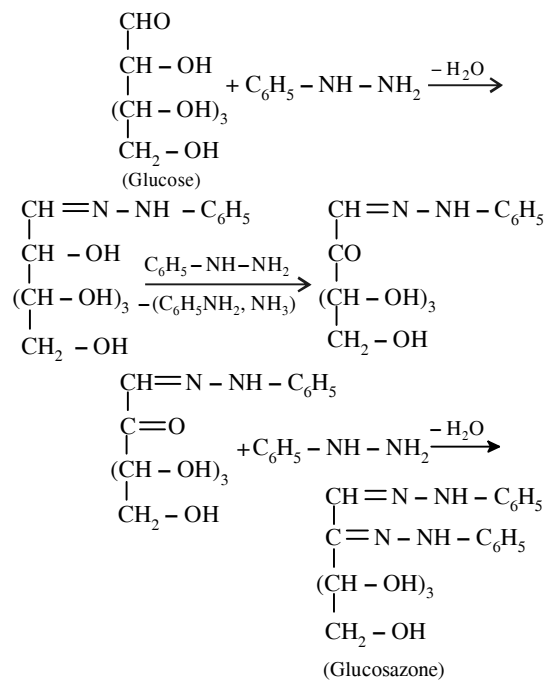
45. (a) : It is a hormone secreted from thyroid gland. It controls various biochemical reactions involving burning of proteins, carbohydrates, fats to release energy.

46. (a) : Chlorophyll is an organometallic complex in which the central atom is 'Mg' just like 'Fe' in haemoglobin. It's formula is found to be  $C_{55}H_{72}MgN_2O_6$ , which is the green colouring matter of leaves and green stems.

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

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

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

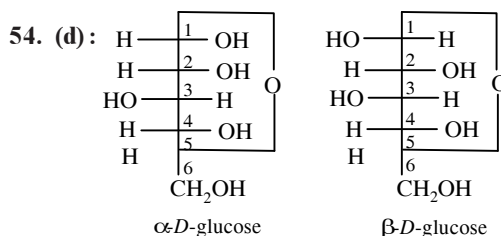


50. (d) : Haemoglobin is a globular protein of four subunits, each subunit having a heme moiety and a polypeptide chain (Two  $\alpha$  and two  $\beta$  chains).

51. (a) : The enzymes are globular proteins which catalyse chemical reactions in the living systems.

52. (a)

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



These isomers differ only in the orientation (or configuration) at C<sub>1</sub> atom.

55. (b)



56. (c) : Hydrolysis

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

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

59. (a) : Hydrogen bonding

**Double helical structure of DNA :** Double helix is composed of two right handed helical polynucleotide chains coiled around the same central axis. The two strands are antiparallel. The

bases are stacked inside the helix in planes perpendicular to the helical axis. The two strands are held together by hydrogen bonds. Two hydrogen bonds between A and T (A=T) and three are formed between C and G (C=G).

60. (a) : Glucose is produced commercially by the hydrolysis of starch by boiling it with dil.  $\text{H}_2\text{SO}_4$  at 393 K under pressure of 2-3 bar.

