

## GRADE 12 CHEMISTRY

### BIOMOLECULES

#### QUESTION BANK

1. Which of the given statements is incorrect about glycogen?

- a. It is straight chain polymer similar to amylose
- b. Only  $\alpha$ -linkages are present in the molecule
- c. It is present in animal cells
- d. It is present in some yeast and fungi

**Ans: a**

2. Which of the following statement is not true about RNA?

- a. It controls the synthesis of protein
- b. It has always double stranded a-helix structure
- c. It usually does not replicate
- d. It is present in the nucleus of the cell

**Ans: b**

3. Number of stereocenters present in linear and cyclic structures of glucose are respectively

- a. 4 and 5
- b. 4 and 4
- c. 5 and 4
- d. 5 and 5

**Ans: a**

4. Amylopectin is composed of

- a.  $\alpha$ -D-glucose, C1 -C4 and C2 -C6 linkages
- b.  $\beta$ -D-glucose, C1 -C4 and C2 -C6 linkages
- c.  $\beta$ -D-glucose, C1 -C4 and C1 -C6 linkages
- d.  $\alpha$ -D-glucose, C1 -C4 and C1 -C6 linkages

**Ans: d**

5. Thiol group is present in

- a. Cysteine
- b. Cysteine
- c. Methionine
- d. Cytosine

**Ans: b**

6. Which of the vitamins given below is water soluble?

- a. Vitamin C
- b. Vitamin D
- c. Vitamin E

**d.** Vitamin K

**Ans: a**

7. Which one of the following bases is not present in DNA?

**a.** Quinoline

**b.** Adenine

**c.** Cytosine

**d.** Thymine

**Ans: a**

8. Synthesis of each molecule of glucose in photosynthesis involves

**a.** 18 molecules of ATP

**b.** 10 molecules of ATP

**c.** 8 molecules of ATP

**d.** 6 molecules of ATP

**Ans: a**

9. Two forms of D-glucopyranose, are called

**a.** Enantiomers

**b.** Anomers

**c.** Epimers

**d.** Diastereomers

**Ans: b**

10. Which of the following pairs give positive Tollen's test ?

**a.** Glucose, sucrose

**b.** Glucose, fructose

**c.** Hexanal, acetophenone

**d.** Fructose, sucrose

**Ans: b**

11. Fructose and glucose can be distinguished by

**a.** Fehling's test

**b.** Barfoed's test

**c.** Benedict's test

**d.** Seliwanoff's test

**Ans: d**

12. Glucose and galactose are having identical configuration in all the positions except position.

**a.** C-3

**b.** C-4

**c.** C-2

**d.** C-5

**Ans: b**

13. Deficiency of vitamin K causes :

**a.** Increase in blood clotting time

**b.** Increase in fragility of RBC's

**c.** Cheilosis

**d.** Decrease in blood clotting time

**Ans: a**

14. Which one of the following reactions is not explained by the open chain Structure of glucose:

- a. Formation of pentaacetate of glucose with acetic anhydride.
- b. formation of addition product with 2,4 DNP reagent
- c. Silver mirror formation with Tollen's reagent
- d. Existence of alpha and beta forms of glucose.

**Ans: Existence of alpha and beta forms of glucose**

15. Which of the following is a polysaccharide?

- (a)glucose (b)maltose (c)glycogen (d)lactose

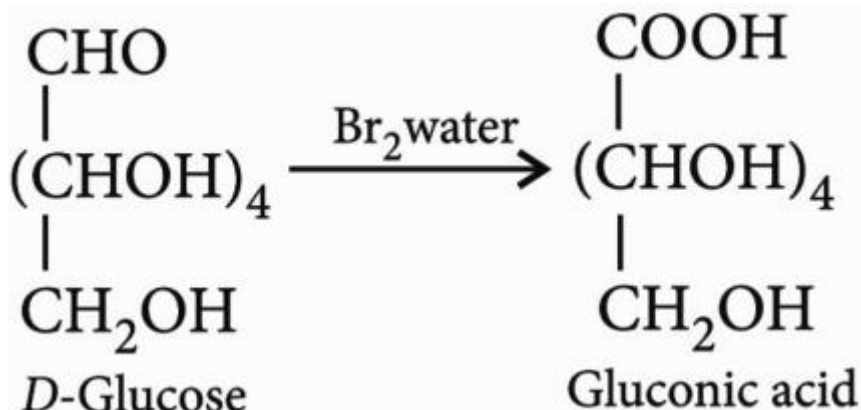
**Ans: c**

16. Which one of the following statement is correct about sucrose :

- (a) It can reduce tollen's reagent however cannot reduce fehling's reagent
- (b) It undergoes mutarotation like glucose and fructose
- (c) It undergoes inversion in the configuration on hydrolysis
- (d) It is laevorotatory in nature .

**Ans: c**

17. Write the product formed on reaction of D-glucose with Br<sub>2</sub> water.

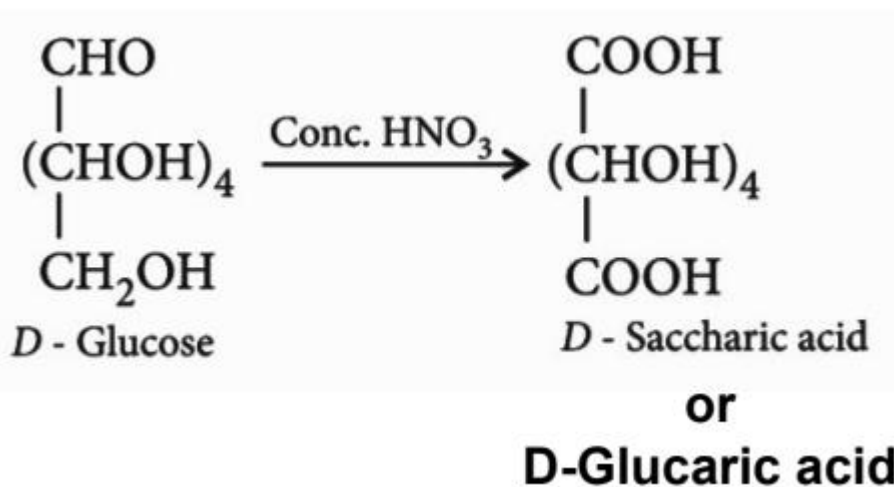


**Ans:**

18. What is a glycosidic linkage?

**Ans:** Two monomers joined by loss of water is called Glycosidic Linkage

19. Write the structure of the product obtained when glucose is oxidized with nitric acid.



20. Give one example each for Fibrous protein and globular protein.

**Ans:** Globular protein – Insulin  
 Fibrous protein – Keratin

21. What is difference between a nucleoside and nucleotide?

**Nucleoside = Base + Sugar**

**Nucleotide = Base + Sugar + Phosphate.**

22. Match the following:

I	II
(i) Amino acids	(A) protein
(ii) Thymine	(B) Nucleic acid
(iii) Insulin	(C) DNA
(iv) phosphodiester linkage	(D) Zwitter ion
(v) Uracil	

Which of the following are the best matched options?

(a) i-A, v- D, iii- C, iv-B

(b) i-D, ii-C, iii- A, iv-B

(c) i-D, v- D, iii- A, iv-B

(d) i-A, ii- C, iii- D, iv-B

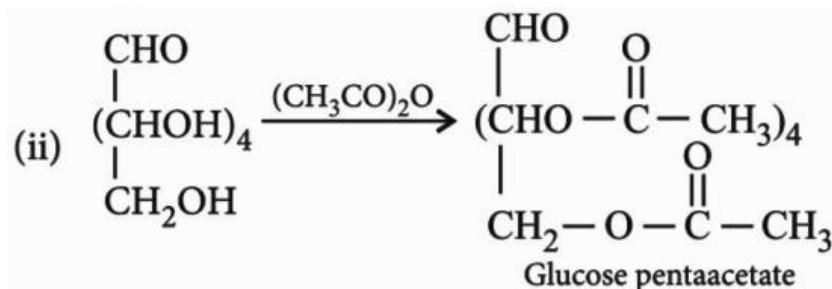
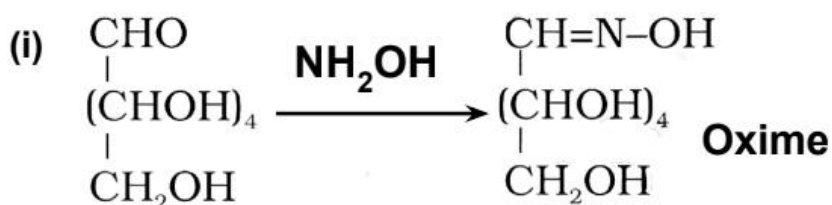
**Ans: (b) i-D, ii-C, iii- A, iv-B**

Amino acids form proteins and exist as zwitter ion , Thymine is a nitrogenous base in DNA, Insulin is a protein , phosphodiester linkage is found in nucleic acids so also in DNA and Uracil is nitrogenous base found in RNA which is a nucleic acid.

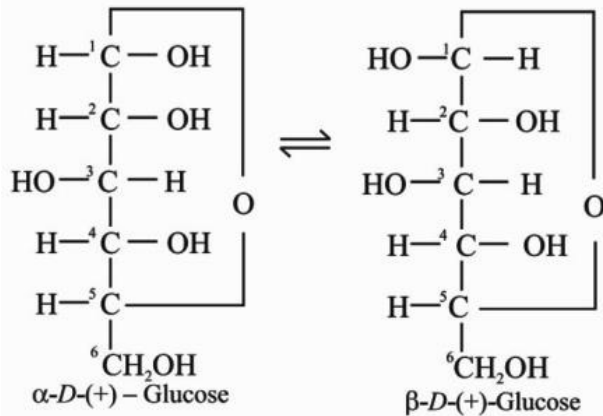
23. Write down the structures and names of the products formed when D-glucose is treated with

(i) Hydroxylamine

(ii) Acetic anhydride



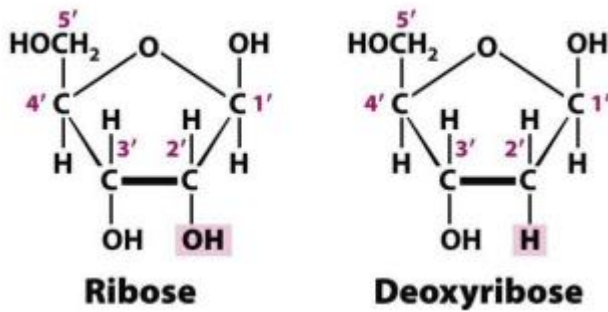
24. What is essentially the difference between  $\alpha$ -form and  $\beta$ -form of glucose? Explain.



25. Write the structural and functional difference between DNA and RNA.

**Ans:** Difference are:

- (i) DNA only H-atom at 2' position whereas OH is present in RNA
- (ii) DNA is Double strand but RNA is Single Strand



26. Name the three major classes of carbohydrates & give an example of each of these classes.

**Ans:** There are three major classes of carbohydrates:

- (i) Monosaccharides - Ex: Glucose, Fructose
  - (ii) Oligosaccharides - Ex: Sucrose, Maltose
  - (iii) Polysaccharides - Ex: Starch, Cellulose
27. (i) What are essential and non-essential amino acids? Give one example of each type  
(ii) What type of linkage is responsible for the formation of proteins?

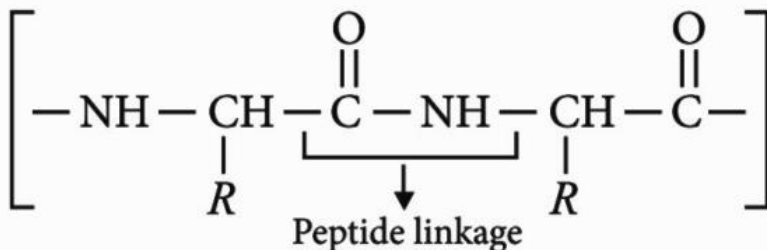
**Ans:** (i) Amino acids which cannot be synthesized by body is **Essential amino acid**

**Ex: Valine and Leucine**

Amino acids synthesized in our body are called **Non-essential Amino acids**

**Ex: Alanine and Glutamic acid**

- (ii) Proteins are formed by peptide link of amino acids

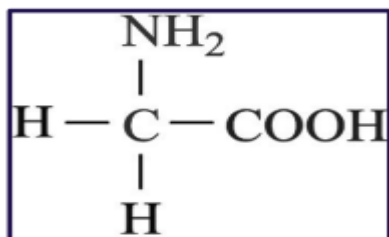


28. Amino acids may be acidic, alkaline or neutral, How does this happen? What are essential and non-essential amino acids? Name one of each type.

**Ans:** Amino acids are classified as acidic, basic or neutral depending upon the relative number of amino and carboxyl groups in their molecules.

(i) Neutral Amino acid: No. of -COOH groups = No. of -NH<sub>2</sub> groups

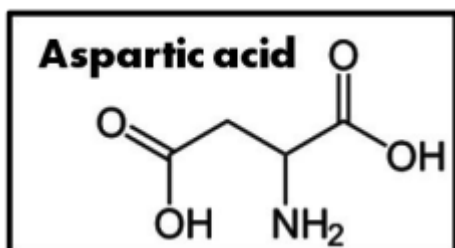
E.g., Glycine, Alanine, Valine



### Glycine

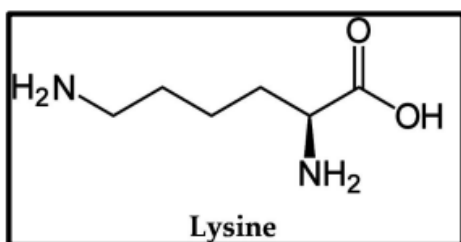
(ii) Acidic Amino acid: No. of -COOH groups > No. of -NH<sub>2</sub> groups

E.g., Aspartic acid, Asparagine, Glutamic acid



(iii) Basic Amino acid: No. of -NH<sub>2</sub> groups > No. of -COOH groups

E.g., Lysine, Arginine, Histidine



Essential amino acids	Non essential amino acids
Cannot be synthesised in the body and must be obtained through diet.	Can be synthesised in the body
E.g.: valine, leucine, lysine	E.g.: glycine, alanine, glutamic acid

29. What happens when D-glucose is treated with the following reagents :

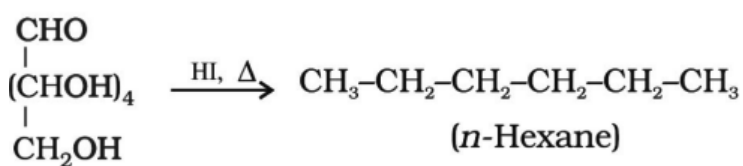
(i) HI

(ii) Bromine water

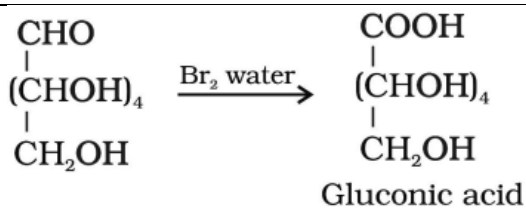
(iii) HNO<sub>3</sub>

**Ans:**

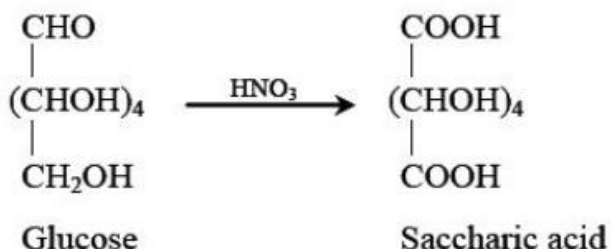
(i)



(ii)



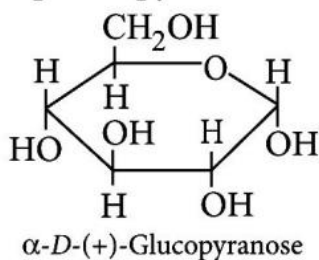
(iii)



30. What is meant by pyranose structure of glucose? What is essentially the difference between  $\alpha$ -glucose and  $\beta$ -glucose?

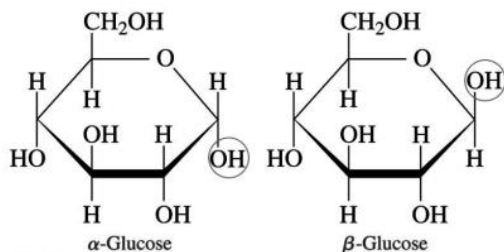
**Ans:**

The six membered cyclic structure of glucose is called pyranose structure ( $\alpha$ - or  $\beta$ -), in analogy with heterocyclic compound pyran.



The main difference is in the position of -OH group at C1

- In the structure of  $\alpha$ -glucose, the hydroxyl group present on the first carbon atom is down whereas in the structure of  $\beta$ -glucose, the hydroxyl group present on the first carbon atom is up.
- These two forms are called as anomers.



31. Mention the type of linkage responsible for the formation of the following :

- Primary structure of proteins
- $\alpha$ -helix formation
- $\beta$ -sheet structure

**Ans: (i) Primary structure of proteins : Peptide bond**

**(ii)  $\alpha$ -helix formation : Intramolecular Hydrogen bond**

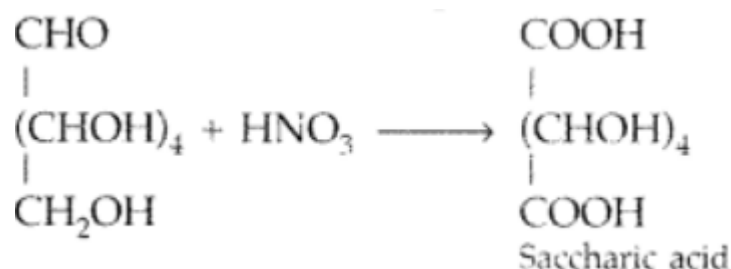
**(iii)  $\beta$ -sheet structure: Intermolecular hydrogen bonds**

32. What is meant by 'reducing sugars'?

**Ans:** Reducing sugar contains aldehydic or ketonic group and can reduce Tollen's reagent or Fehling's solution.

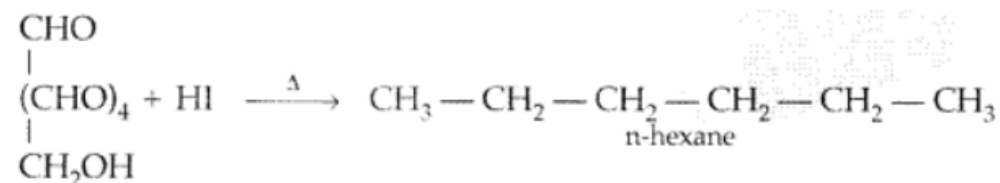
33. Write the structure of the product obtained when glucose is oxidised with nitric acid.

**Ans:**



34. Write a reaction which shows that all the carbon atoms in glucose are linked in a straight chain.

**Ans:** On prolonged heating with HI, it forms n-hexane, shows that all the six carbon atoms are linked in a straight chain.



35. What are the expected products of hydrolysis of lactose ?

**Ans:** On hydrolysis, lactose gives  $\alpha$ -D-galactose and  $\beta$ -D-glucose.

36. Where does the water present in the egg go after boiling the egg?

**Ans:** Denaturation of proteins is a process that changes the physical and biological properties of proteins without affecting the chemical composition of protein. In an egg, denaturation of protein is the coagulation of albumin present in the white of an egg. When an egg is boiled in water, the globular proteins present in it change to a rubber like insoluble mass which absorbs all the water present in the egg by making hydrogen bond with it.

37. Name a water soluble vitamin which is a powerful antioxidant. Give its one natural source.

**Ans:** Water soluble Vitamin – Vitamin C

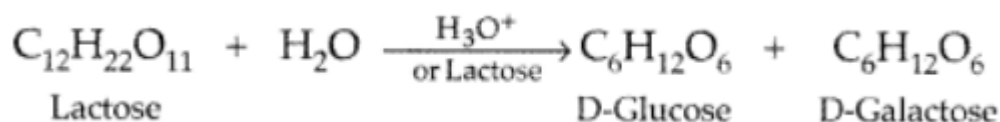
Natural source – Amla

38. What are the products of hydrolysis of sucrose?

**Ans: Invert sugar.** An equimolar mixture of glucose and fructose is obtained by hydrolysis of sucrose in presence of an acid such as dil. HCl or the enzyme invertase or sucrase and is called invert sugar.

39. Name the products of hydrolysis of lactose

**Ans:** Lactose on hydrolysis with dilute acids gives an equimolar mixture of D-glucose and D-galactose.



40. Mention one important function of nucleic acids in our body.

**Ans:** Function of nucleic acid : Nucleic acids control the transmission of hereditary characters from one generation to another.

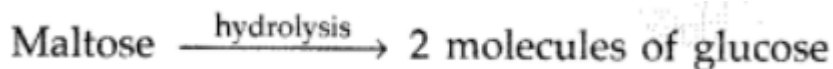
41. Which of the two components of starch is water soluble?



**Ans:** Amylose is water soluble component of starch.

42. What are the products of hydrolysis of maltose?

**Ans:**



43. What are enzymes?

**Ans:** Enzymes are protein molecules which act as catalyst in biochemical reaction

44. Name the four bases present in DNA. Which one of these is not present in RNA?

**Ans: The four bases present in DNA are**

- I. Adenine (A)
- II. Thymine (T)
- III. Guanine (G)
- IV. Cytosine (C)

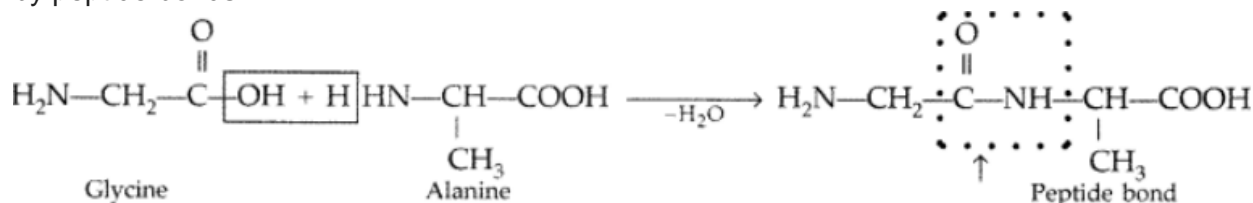
In RNA, Thymine (T) is absent. It has **Uracil (U)** in place of Thymine.

45. Explain the following terms:

- a. Invert sugar
- b. Polypeptide

**Ans: a. Invert sugar :** An equimolar mixture of glucose and fructose obtained by hydrolysis of sucrose in presence of an acid such as dil. HCl or the enzyme invertase or sucrase is called invert sugar.

**b. Polypeptides :** They are formed when several molecules of  $\alpha$ -amino acids are joined together by peptide bonds.



46. Write any two reactions of glucose which cannot be explained by the open chain structure of glucose molecule.

**Ans:**

1. Despite having the aldehyde group, glucose does not give 2, 4-DNP test or Schiff's test.
2. It does not form the hydrogen sulphite addition product with  $\text{NaHSO}_3$ .
3. The pentaacetate of glucose does not react with hydroxylamine indicating the absence of free  $-\text{CHO}$  group.

47. Differentiate between fibrous proteins and globular proteins.

**Ans:**

Globular Proteins	Fibrous Proteins
Globular proteins have almost spheroidal shape due to folding of the polypeptide chain.	Polypeptide chains of fibrous proteins consist of thread like molecules which tend to lie side by side to form fibres.
Globular proteins are soluble in water.	Fibrous proteins are insoluble in water.
Globular proteins are sensitive to small changes of temperature and pH. Therefore they	Fibrous proteins are stable to moderate changes of temperature and pH.

undergo denaturation on heating or on treatment with acids/bases

Example: Maltase, invertase etc., hormones (insulin) antibodies, transport agents (haemoglobin), etc.

Example: Keratin in skin, hair, nails and wool, collagen in tendons, fibroin in silk etc.

48.

**Directions:** These questions consist of two statements, each printed as Assertion and Reason. While answering these questions, you are required to choose any one of the following four responses.

- (a) If both Assertion and Reason are correct and the Reason is a correct explanation of the Assertion.
- (b) If both Assertion and Reason are correct but Reason is not a correct explanation of the Assertion
- (c) If the Assertion is correct but Reason is incorrect.
- (d) If both the Assertion and Reason are incorrect.

**Assertion :** D(+)- Glucose is dextrorotatory in nature.

**Reason :** 'D' represents its dextrorotatory nature.

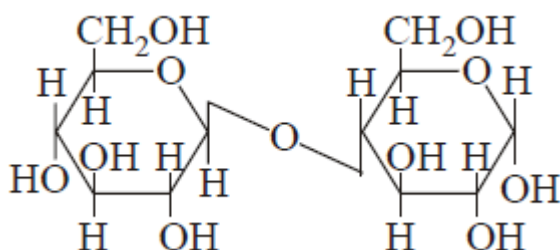
**Ans:** (c)

49. **Assertion :** Sucrose is called an invert sugar.

**Reason :** On hydrolysis, sucrose brings the change in the sign of rotation from dextro (+) to laevo(-).

**Ans:** (a)

50. **Assertion :**  $\beta$ -glycosidic linkage is present in maltose



**Reason :** Maltose is composed of two glucose units in which C-1 of one glucose unit is linked to C-4 of another glucose unit.

**Ans:** (d)

51. **Assertion** : At isoelectric point, the amino group does not migrate under the influence of electric field.

**Reason** : At isoelectric point, amino acid exists as a zwitterion.

**Ans:** (a)

52. **Assertion** : Vitamin D cannot be stored in our body

**Reason** : Vitamin D is fat soluble vitamin and is excreted from the body in urine

**Ans:** (d)

53. **Read the passage given below and answer the following questions:**

When a protein in its native form, is subjected to physical changes like change in temperature or chemical changes like change in pH, the hydrogen bonds are disturbed. Due to this, globules unfold and helix get uncoiled and protein loses its biological activity. This is called denaturation of protein.

The denaturation causes change in secondary and tertiary structures but primary structures remains intact. Examples of denaturation of protein are coagulation of egg white on boiling, curding of milk, formation of cheese when an acid is added to milk.

**The following questions are multiple choice question. Choose the most appropriate answer:**

**(i) Mark the wrong statement about denaturation of proteins.**

- (a) The primary structure of the protein does not change.
- (b) Globular proteins are converted into fibrous proteins.
- (c) Fibrous proteins are converted into globular proteins.
- (d) The biological activity of the protein is destroyed.

**(ii) Which statement(s) of protein remain(s) intact during denaturation process?**

- (a) Both secondary and tertiary structures
- (b) primary structure only
- (c) secondary structure only
- (d) tertiary structure

**(iii)  $\alpha$ -helix and  $\beta$ -pleated structures of proteins are classified as**

- (a) primary structure
- (b) secondary structures
- (c) tertiary structure

(d) quaternary structure

(iv) **Cheese is a**

(a) globular protein

(b) conjugated protein

(c) denatured protein

(d) derived protein

(v) **Secondary structure of protein refers to**

(a) mainly denatured of proteins and structures of prosthetic groups

(b) three-dimensional structure, especially the bond between amino acid residues that are distant from each other in the polypeptide chain

(c) linear sequence of amino acid residues in the polypeptide chain

(d) regular folding patterns of continuous portions of the polypeptide chain.

**Answers:**

(i)c (ii) b (iii) b (iv)c (v) d

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