

BIO-MOLECULES

Short Answer Questions:

***1. Give the sources of the following vitamins and name the diseases caused by their deficiency

a) A b) D c) E d) K

Ans. Sources and deficiency of fat soluble vitamins

Vitamins	Source	Deficiency disease
A (Retinol)	Fish oils, liver, rice polishing, Kidney	i. Night blindness ii). Redness in eye (xerophthalmia) iii. Degeneration of lacrymal glands
D (Calciferol)	Fish oils, butter, milk, egg	i. Rickets in children(bow legs) ii. Osteo-malacia i.e. soft bones and joint pain in adults
E (Tocopherol)	Wheat germ oil, vegetable oils, Derivative egg yolk, green leafy vegetables	i). Sterility ii). Nutritional nuclear dystrophy iii. Neurosis of heart muscles
K (Anti haemorrhagic)	Green leafy vegetables, Intestinal flora	i. increase the blood clotting time.

*2. What are enzymes? Give examples?

A: Enzymes are the important group of globular proteins which acts as biological catalysts in Living systems. Enzymes increase the rate of biochemical reactions by providing alternative path of lower activation energy.

E.g.: Activation energy of acid hydrolysis of sucrose is $6.22 \text{ KJ.mole}^{-1}$. While the activation energy is only $2.15 \text{ KJ.mole}^{-1}$ when hydrolysed by enzyme, sucrase.

Enzymes are highly specific in their action. Each enzyme can catalyse only a specific type of reaction enzymes which catalyse the oxidation of one substrate with reduction of another substrate are named as 'oxidoreductase' enzymes. Enzymes are needed only in small quantities for the progress of a reaction.

E.g.: maltase, Zymase, invertase etc.

***3. Write notes on vitamins?**

A: Vitamins:

- i) Vitamins are naturally occurring carbon compounds with low molecular weight
- ii) These are essential dietary factors
- iii) These are required in minute quantities for the maintenance of normal health of organisms
- iv) Their deficiency in human body causes diseases (or) disorders
- v) They participate in the production of co-enzymes and also in the regulation of biochemical process
- vi) Plant can synthesise all vitamins. Animals can synthesise few but not all vitamins
- vii) Human body can synthesis vitamin A, some members of vitamin B complex and vitamin K is synthesised by micro-organisms present in the intestinal tract of human beings

***4. What are hormones? Give one example for each**

i) Steroid hormones ii) Poly peptide hormones iii). Amino acid derivatives

A: Hormones: Hormones are the biomolecules of plant and animal origin that transfer biological information from one group of cells to distant tissues (or) organs

Animal hormones are produced by specialised tissues called endocrine (or) ductless glands but no such specialized glands are present in plants

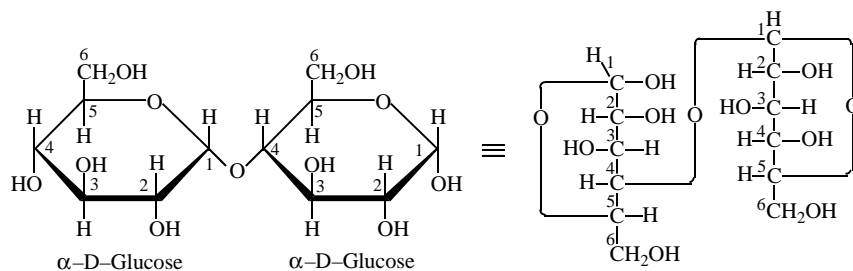
On the basis of chemical structure, animal hormones are classified as

- 1) Steroid hormones **Ex:** Estrogen and androgen
- 2) Poly peptide hormones **Ex:** Insulin
- 3) Amino acid derivatives **Ex:** Epinephrine and norepinephrine.

****5). Write the structures of maltose and Lactose. What are the hydrolysis products of maltose and lactose?**

Ans. Maltose is a disaccharide of α -D-glucose. The two units are linked by α -1, 4-glycosidic

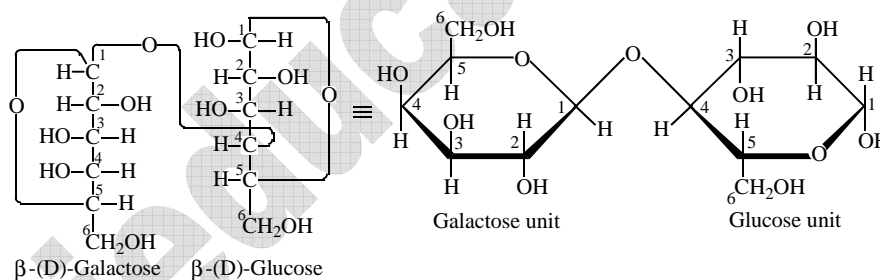
linkage. On hydrolysis one mole of maltose yields 2 moles of D-Glucose. Its structure is



Lactose is a disaccharide of β -D-glucose and β -D-galactose. The two units are linked by

β -glycosidic linkage with C-1 of galactose and C-4 of glucose molecule. Hydrolysis of Lactose with

dilute acid yields equi molar mixture of β -D-glucose and β -D-galactose



5. Write the importance of carbohydrates?

A: Carbohydrates are essential for the life of both plants and animals.

Some of the important uses of carbohydrates are

- i) Honey is an instant source of energy
- ii) Carbohydrates are used as storage molecules, as starch in plants, as glycogen in animals
- iii) Cell walls of bacteria and plants are made of cellulose
- iv) Wood and cotton fibre contain cellulose
- v) D-ribose and 2-deoxy-D-ribose are present in nucleic acids
- vi) Carbohydrates are present in bio system in combination with many proteins and lipids.
- vii) The carbohydrates antibiotic that disrupts bacterial protein synthesis is 'Streptomycin'

***6. Explain the classification of carbohydrates?**

A: 1) **Classification into saccharides:** Carbohydrates are classified into saccharides on the basis of the products obtained during their hydrolysis. They are -

i. **Mono saccharides:** If a given saccharide does not cleave during hydrolysis to give still smaller saccharides, it is termed as monosaccharide.

E.g.: Glucose ($C_6H_{12}O_6$)

ii. **Oligosaccharides:** Those saccharides which on hydrolysis give 3 to 10 simple monosaccharides are termed as oligosaccharides

If the given saccharide on hydrolysis gives two simple mono saccharide, it is termed as 'Disaccharide'.

E.g.: sucrose on hydrolysis gives two monosaccharide products

If a given saccharide on hydrolysis gives three mono saccharides, it is termed as 'trisaccharides'.

E.g.: Raffinose on hydrolysis gives glucose, fructose and galactose.

iii. **Poly saccharides:** Those saccharides which on hydrolysis give more than 10 monosaccharide units are termed as 'poly saccharides'

E.g.: cellulose on hydrolysis gives thousands of glucose molecules

II) Classification into reducing and non-reducing sugars:

a) **Reducing sugars:** The saccharides that reduce Fehling's reagent, Tollen's reagent is called reducing sugars.

E.g.: Glucose, fructose, maltose, etc

b) **Non reducing sugars:** The saccharides which do not reduce Fehling's reagent and Tollen's reagent are called non- reducing sugars.

E.g.: Sucrose, cellulose.

***7. Write notes on the functions of different hormones in the body?**

A: Hormones have several functions in the body, they help to maintain the balance of biological activity in the body.

Hormone

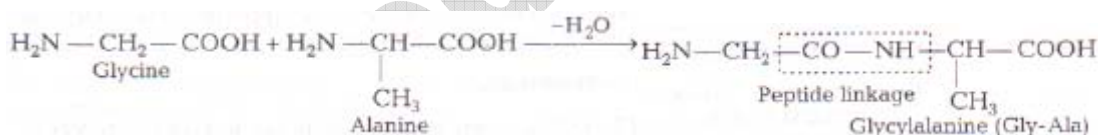
its function in the body

- | | |
|--|---|
| 1) Insulin | Decreases glucose level in the blood |
| 2) Glucagon | Increases glucose level in the blood |
| 3) Thyroxine | i. Low level of thyroxine leads to hypothyroidism
(Letharginess and obesity)
ii. High level of thyroxine causes hyperthyroidism |
| 4) Gluco corticoids | i) Controls the carbohydrate metabolism,
modulate inflammatory Reactions |
| 5) Mineralo corticoids | i) Control the level of excretion of water and salt by the kidney. |
| 6) Testosterones
(Male sex Hormone) | i) Secondary sexual characters in male (deep voice, facial hair) |
| 7) Estradiol
(Female sex Hormone) | i) Secondary sexual characters in female, controls menstrual cycle |

*8. Define the following as related to proteins.

(i) Peptide linkage (ii) Primary structure (iii) Denaturation.

Ans. (i) Peptide linkage: Peptide linkage is an amide linkage formed between COOH group and NH₂ group.



Peptide linkage is formed due to loss of one water molecule when carboxyl group of one amino acid reacts with the amino group of the other.

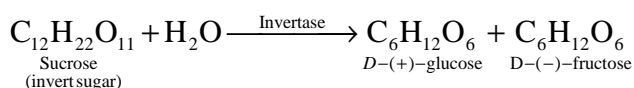
(ii) Primary Structure: Each polypeptide in a protein has amino acids linked with each other in a specific sequence and this sequence of amino acids is called primary structure of that particular protein. Any change in the primary structure creates different protein.

(iii) Denaturation: When a protein in its native form is subjected to physical change or change in temperature or chemical change like change in pH, the hydrogen bonds are disturbed. The protein globules unfold, helix gets uncoiled and protein loses its biological activity. This is called denaturation of protein. Secondary and tertiary structures are destroyed but the primary structure remains as such.

E.g.: coagulation of egg white on boiling, curdling of milk etc.

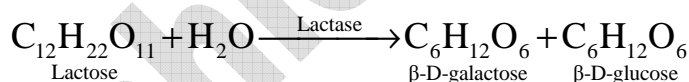
***9. What are the hydrolysis products of (i) sucrose (ii) lactose?**

Ans. (i) Sucrose is dextrorotatory but after hydrolysis produces dextrorotatory glucose and laevorotatory fructose.



Since, the laevorotation of fructose (92.4°) is more than dextro rotation of glucose (+52.5°), the mixture is laevorotatory and it is known as invert sugar.

(ii) Lactose on hydrolysis produces β-D-galactose and β-D-glucose.



****10. What are nucleic acids? Mention their two important functions?**

Ans. Nucleic Acids: The biomolecules which are found in the nuclei of living organisms in the form of nucleoproteins or chromosomes are called nucleic acids. Nucleic acids are of two types, DNA (deoxyribonucleic acid) and RNA (ribonucleic acid).

Functions of Nucleic Acids:

- i. DNA, due to its replication property, transmits hereditary characteristics from one generation to another.
- ii. RNA and DNA help in the protein synthesis in the cell. RNA synthesizes the protein and DNA has the message for this synthesis.

11. What is the difference between a nucleoside and a nucleotide?

Ans.

Nucleoside

1. It is a combination of base and sugar
2. Examples:
Adenosine(Adenine + Ribose),

Nucleotide

1. It is a combination of nucleoside and Phosphoric acid.
2. Examples:
Adenylic acid (Adenosine + Phosphoric acid)

12. What is the effect of denaturation on the structure of proteins?

Ans. During the denaturation of a protein, its secondary and tertiary structures are destroyed but primary structure remains intact. During this process globular protein convert into fibrous proteins and the biological activity of the protein is lost.

For Example: Coagulation of egg white on boiling, curdling of milk due to bacterial action.

13. What are the essential and non-essential amino acids? Give two examples of each type?

Ans. Essential amino acids: Amino acids which cannot be synthesized in the body and must be taken in diet are called essential amino acids

E.g. valine, leucine, phenylalanine etc.

Non-essential amino acids: Amino acids which can be synthesized in the body are known as non-essential amino acids.

E.g., glycine, alanine, glutamic acid etc.