

BIOCHEMISTRY

MULTIPLE CHOICE QUESTIONS

Q.No.1 Encircle the correct option from the given multiple choices.

Carbohydrates

- (1) The general formula for carbohydrates is
 (a) $C_n(HO)_n$ (b) CHO_n (c) $C_n(H_2O)_n$ (d) CH_2O
- (2) Plants synthesized carbohydrates through photosynthesis process which requires the following except
 (a) O_2 (b) Sunlight (c) Chlorophyll (d) CO_2 and H_2O

Monosaccharides

- (3) Which of the following is simplest carbohydrates
 (a) Monosaccharide (b) Disaccharides (c) Polysaccharide (d) Raffinose
- (4) The number of carbon atoms in monosaccharide are
 (a) 3 - 5 (b) 3 - 6 (c) 3 - 9 (d) 5 - 9
- (5) The functional group present in fructose is
 (a) Aldehydic (b) Ketonic (c) Ether linkage (d) Ester
- (6) Which of the following are dextrose sugar
 (a) Glucose (b) Monose (c) Galactose (d) All of these
- (7) Which of the following is characteristic of monosaccharide
 (a) They cannot be hydrolyzed (b) They are soluble in H_2O
 (c) They are reducing in nature (d) All of these

Oligosaccharides

- (8) The carbohydrates which upon hydrolysis form 2 - 9 unit of monosaccharides are
 (a) Monosaccharide (b) Oligosaccharide (c) Hexoses (d) Polysaccharides
- (9) Glucose polymerizes to form
 (a) Starch (b) Cellulose (c) Sucrose (d) Both (a) and (b)
- (10) Raffinose belong to which class of oligosaccharide
 (a) Disaccharide (b) Trisaccharides (c) Tetrasaccharide (d) Pentasaccharide
- (11) Maltose decomposed to form two molecule of
 (a) Monose (b) Fructose (c) Glucose (d) Galactose

Polysaccharides

- (12) Which of the following is polysaccharides
 (a) Sucrose (b) Lactose (c) Raffinose (d) Cellulose
- (13) Which of the following carbohydrate is non reducing in nature
 (a) Monosaccharides (b) Polysaccharides (c) Oligosaccharide (d) Both B & C

Sources and uses of carbohydrates

- (14) The sugar present in milk and dairy product is
 (a) Lactose (b) Galactose (c) Sucrose (d) Starch
- (15) Plant convert glucose into
 (a) Starch (b) Protein (c) Lipid (d) Amino acid
- (16) Which of the following is not source of starch
 (a) Wheat (b) Rice (c) Cotton (d) Potato
- (17) One gram of glucose provide energy
 (a) 15kJ (b) 16.5kJ (c) 15.6kJ (d) 18.2kJ
- (18) Which of the following in diet reformed as fiber
 (a) Cotton (b) Sucrose (c) Starch (d) Cellulose
- (19) Which of the following is Common table sugar
 (a) Lactose (b) Mattose (c) Manose (d) Sucrose
- (20) Glucose stored in animals in the form of glycogen in
 (a) Liver cells (b) Pancreases and Muscles
 (c) Liver and muscles cells (d) All of these
- (21) Which of the following is used to make rectified spirit by fermentation process
 (a) Glucose (b) Sucrose (c) Starch (d) Cellulose

Proteins and amino acid

- (22) Which of the following is function of protein
 (a) They transport and store oxygen and nutrients
 (b) They act as catalyst for the thousands of reactions that make life possible
 (c) They regulate many important systems in our body
 (d) All of these
- (23) The functional group present in amino acid is
 (a) Amine group (b) Carboxylic group (c) Ketonic group (d) Both (a) and (b)
- (24) These amino acids which are not synthesized by our body are called
 (a) Essential amino acid (b) Non-essential amino acid
 (c) Both A & B (d) None of these

- (25) The linkage $\text{—}\overset{\text{O}}{\parallel}{\text{C}}\text{—NH—}$ which Joins two amino acid unit is called
 (a) Co-ordinate covalent (b) Ionic
 (c) Peptide linkage (d) Both (b) and (c)

Uses of protein

- (26) Which of the following protein is obtained by heating bones and tendons in water
 (a) Haemoglobin (b) Globulin (c) Albumen (d) Gelatin

TOPICAL SHORT QUESTIONS

Carbohydrates

Q. 1 What do you know about carbohydrates?

Ans: Carbohydrates are the most abundant class of organic component compounds. Carbohydrates have the general formula $C_x(H_2O)_y$. This formula suggests that they are hydrates of carbon with few exceptions. Plants synthesize carbohydrates through photosynthesis.



Plants convert this glucose into starch and cellulose. Carbohydrates are monomers and polymers of aldehydes and ketones that have numerous hydroxyl groups attached.

Q. 2 What is the use of dextrose in a drip?

Ans: 5% m/v aqueous solution of dextrose is used in drips. 5% m/v aqueous solution means 5 grams of dextrose dissolved in water to form 100cm³ of solution. It is intravenously given to patient who is severely dehydrated or is unable to eat or is not allowed to eat.

Q. 3 What are oligosaccharides? Give example

Ans: The carbohydrates which on hydrolysis form 2-9 molecules of monosaccharide or simple sugars are called oligosaccharide they are white crystalline solids. They have sweet taste and soluble in water. e.g Sucrose, lactose, maltose, raffinose etc.

Q. 4 Write three uses of carbohydrates?

Ans: The three uses of carbohydrates are

- (i) carbohydrates store and transport energy in both plants and animals. e.g. 1g of glucose provide us 15.6 kj of energy
- (ii) Starch is used to make rectified spirit by fermentation process.
- (iii) We use cellulose (carbohydrate) in the form of wood for heat, Housing and furniture.

Proteins

Q. 5 What are proteins?

Ans: Proteins are complex nitrogenous substances that produce amino acids on complete hydrolysis. Proteins are high molecular weight polymers. The building blocks of all proteins are the amino acids therefore, all proteins produce amino acids on hydrolysis.

Q. 6 What is the function of protein in human body?

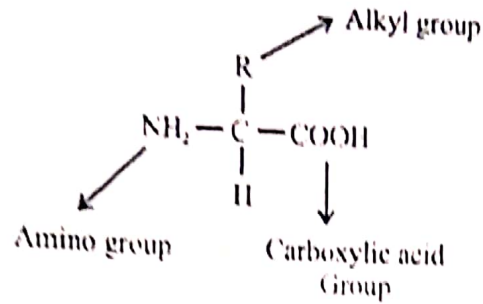
Ans: The functions of protein in human body are

- (i) They store and transport oxygen and nutrients.
- (ii) They act as catalyst for thousands of reactions that make life possible.
- (iii) They regulate many important systems in our body.

Q. 7 What are amino acids? Also write general formula?

Ans: Amino acids are building block of protein. It consists of two functional group one is carboxylic acid ($-COOH$) and other is amine group ($-NH_2$). Both attached with each other by a central carbon

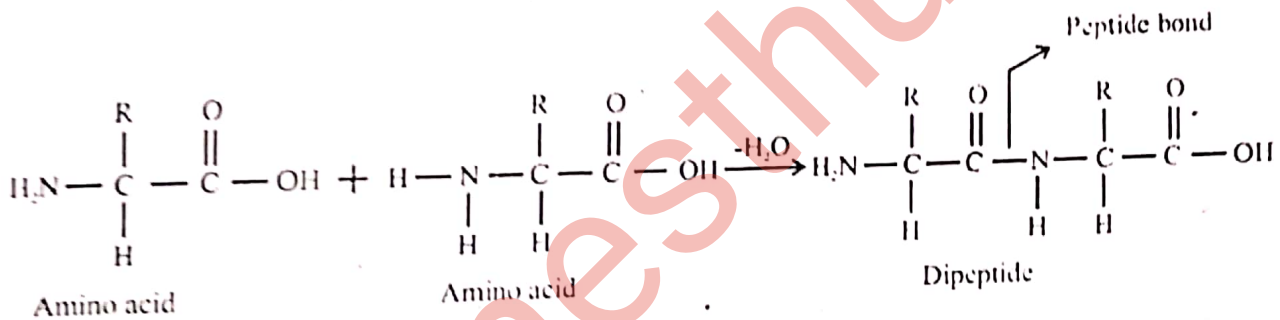
The general formula of amino acid is



Q. 8 What is peptide bond and how it is formed?

Ans: The linkage $\begin{array}{c} \text{O} \\ || \\ -\text{C}-\text{NH}- \end{array}$ Which is formed between two amino acid units by the removal of water from them is called a peptide bond.

Peptide bond is formed when two molecules of amino acids are joined together through amino group (-NH₂) of one molecule and carboxylic group (-COOH) of another molecule by eliminating a molecule of water as shown



Q. 9 What is the effect of protein deficiency in children?

Ans: Most of the growth occurs in the first 2 year of life. The human brain reaches nearly full size by this age. Protein deficiency leads to both physical and mental retardation.

Q. 10 Define enzymes & write the commercial applications of enzymes?

Ans: Enzymes are large protein molecules. They are biological catalysts. They catalyze chemical reactions in living organisms. Enzymes are commercially v. important. They are used in the production of sweeteners. Chocolate syrup, bakery products, infant foods, detergents to remove food stains. in cheese making, in paper and pulp industries to remove sticky matter, to prepare fabrics for clothes, furniture and other household items.

For example

(a) enzymes like diastase, invertase and zymase are used in the fermentation of molasses and starch to produce ethanol.

(b) Amylase is used in bread making.

(c) Proteases and amylase are used in detergents to remove food stains on the cloths.

(d) Lactase is used in infant foods.

Q. 11 What do you know about insulin? And how it is prepared?

Ans: Insulin is a protein coded by DNA. It is required for the proper use of glucose by cells. People with diabetes formerly had to use insulin from cattle. Now human insulin is made using recombinant DNA technology. Scientists take the human gene for insulin production and paste it into the DNA of E coli, a bacterium commonly found in the human digestive track. The bacterial cell multiply rapidly, making billions of copies of themselves and each new E. Coli cell carries in its DNA, a gene for human insulin.

Q. 12 Write three uses of protein?

Ans: The three uses of protein is as under

- (i) Proteins are essential for formation of protoplasm and component of cells
- (ii) Enzymes are proteins that catalyze specific biological reactions without which life would be impossible.
- (iii) The antibodies that help us to fight against disease are large protein molecules.

Lipids

Q. 13 What are lipids and what they include?

Ans: Lipids are macromolecules made up of fatty acids. These are any components of plants and animals tissue that is insoluble in water, but soluble in the solvent of low polarity such as ether, Hexane, benzene and carbon tetrachloride.

Lipids includes,

- Fats and oil
- Sex hormones
- Cholesterol
- Components of cell membrane called phospholipids.
- Some vitamins (A, D, E and K).

Q. 14 Write three uses of lipids.

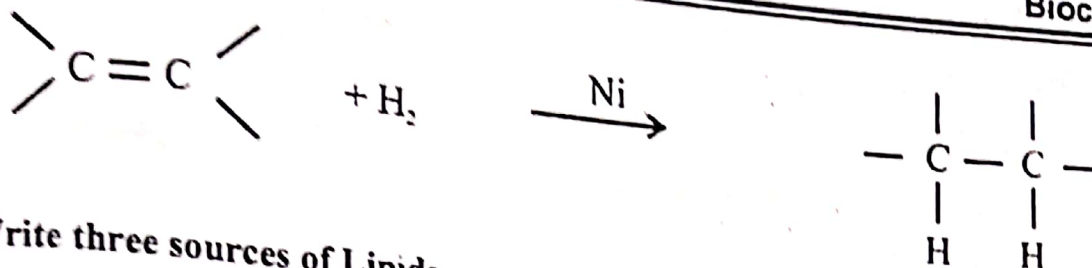
Ans: The three uses of lipids are as under

- (i) Butter, ghee and vegetable oil are used for cooking and frying of food, preparing bakery products and sweets.
- (ii) In mammal a layer of fat is present under the skin. This layer acts as a thermal insulator.
- (iii) Fats protect delicate organs from shocks. A layer of fat around heart and kidneys protect these organs from injury.

Q. 15 How is margarine prepared?

Ans: Margarine is prepared by adding hydrogen to vegetable oil at 200°C in the presence of nickel as a catalyst. Pd or Pt can also used in this reaction as a catalyst at room temperature greater the amount of hydrogen added, the more solid is the margarine produced.

Equation:



Q. 16 Write three sources of Lipids

Ans: Sources of Lipids:

- Salmon, whales are rich source of lipids.
- Milk is source of animal fat from which butter, ghee etc is obtained.
- Seeds of sunflower, con, cotton are source of oil.

Q. 17 Write three uses of lipids

Ans: Uses of Lipids:

- For cooling, preparing bakery goods and sweets.
- In mammals, a layer of fat is present under skin. It acts as thermal insulator.
- Fats protect organs from shocks, e.g. A fat layer around one heat and kidneys prevent injuries.

Nucleic acid

Q. 18 What is the composition of Nucleic acid?

Ans: Composition:

Nucleic acid are long chain molecules made up of large number of nucleotide. Each nucleotide consists of;

- Nitrogenous base
- A pentose sugar
- Phosphate group

Q. 19 What is the function of DNA?

Ans: The functions of DNA are

- DNA has the ability to store genetic information and to pass it form generation of generation.
- In human being the single fertilized egg cell carry all the information of making legs. Hand, heart, kidneys etc.
- DNA synthesize RNA which is responsible for formation of protein

Q. 20 What is the role of RNA?

Ans: Role of RNA

RNA is responsible for directing synthesis of new proteins. RNA receives, reads, decodes and uses genetic information from DNA to synthesize new protein.

Vitamins

Q. 21 What do you know about fat soluble vitamins

Ans: Fat soluble vitamins.

- (i) A vitamin that dissolves in fat is called fat soluble vitamin.
- (ii) These vitamins store in our body and cannot excreted out.
- (iii) Taking excess amount of fat soluble vitamins may be harmful. For instance large excess of vitamin A can cause irritability, dry skin and feeling of pressure inside the head. Too much vitamin D can cause pain in bones, hard deposits in joints and kidneys, and weight loss.
- (iv) For example, vitamin A, D, E and K.

Q. 22 What do you know about water soluble vitamins

Water soluble vitamins:

- (i) A vitamin that dissolves in water is called water soluble vitamin.
- (ii) Our body has limited capacity to store these vitamins.
- (iii) If taken in excess, these are readily excreted from the body. Water soluble vitamins are not toxic even if taken in excess.
- (iv) For example, vitamins B (complex) and C.

Q. 23 How some foods lose their vitamins?

Ans: Some foods lose their vitamin contents when they are cooked in water and then drained. The water soluble vitamins go down the drain with water. For example rice, pulses, beans, gram, peas etc.

Q. 24 What are the sources uses and Deficiency symptoms of vitamin C

Ans Sources:

Oranges, lemons, vegetables, etc.

Important for:

Blood vessels, gums, healing wounds etc.

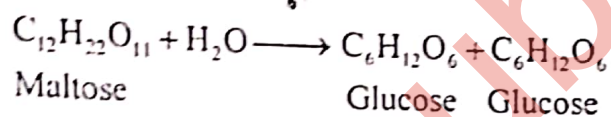
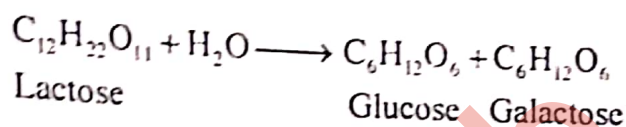
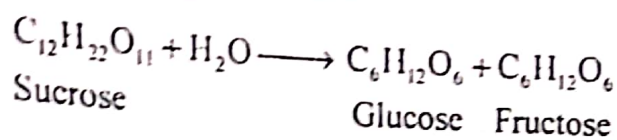
Deficiency disease: Scurvy

SELF ASSESSMENT EXERCISES

13.1

Classify sucrose, lactose and maltose as mono, di or tri-saccharides. Give reason.

Ans: These are di-saccharides because on hydrolysis they product two mono-saccharides
Hydrolysis of these compounds are given below

**13.2**

(1) List

(a) Three examples of monosaccharides.

Ans: (i) glucose (ii) Fructose (iii) Galactose

(b) Three examples of disaccharides

Ans: (i) Sucrose (ii) Lactose (iii) Maltose

(c) One example of trisaccharide

Ans: Raffinose

(d) Two examples of polysaccharides

Ans: (i) Starch (ii) Cellulose

(2) List Sources of

(a) Sucrose:

Ans: Its source is sugar cane, sugar beet and fruits

(b) Maltose:

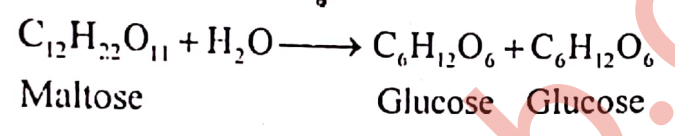
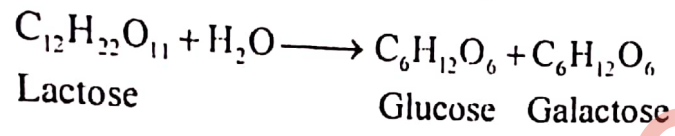
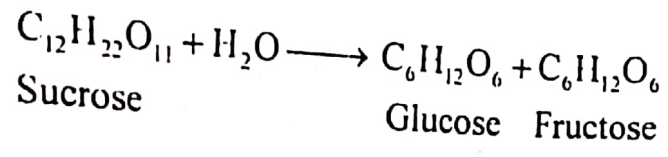
Ans: It is founds in cereals

(c) Lactose:

Ans: Its major source is milk and dairy products.

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(d) Two examples of polysaccharides

Ans: (i) Starch (ii) Cellulose

(2) List Sources of

(a) Sucrose:

Ans: Its source is sugar cane, sugar beet and fruits

(b) Maltose:

Ans: It is founds in cereals

(c) Lactose:

Ans: Its major source is milk and dairy products.

13.3

(1) What two functional groups are found in amino acids.

Ans: Amines and carboxylic acid group are those functional groups which are found in amino acid.

(ii) Define (a) Protein (b) Amino acids

Ans: (2) Proteins:

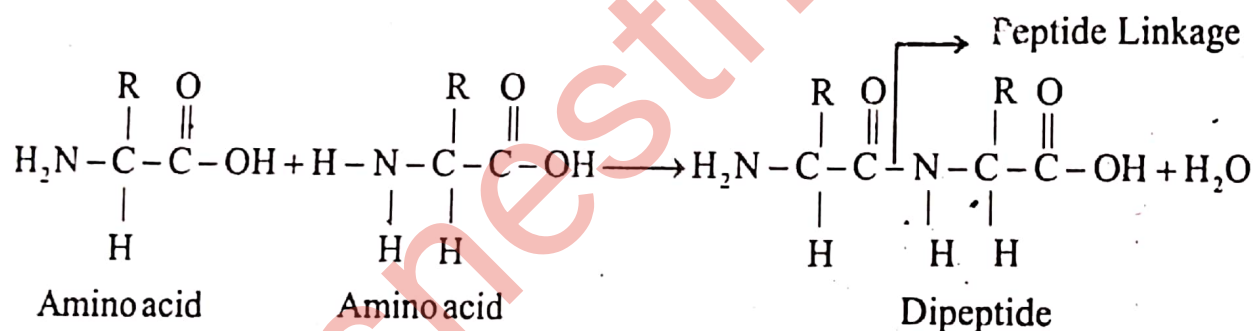
Proteins are complex nitrogenous substances that produce amino acids on complete hydrolysis. These are high molecular weight polymers.

(b) Amino acids:

Amino acids are the building blocks (basic units) of all proteins. On hydrolysis of proteins different types of amino acids are produced which are involved in the formation of twenty amino acids found in protein synthesis in which there are essential amino acids and then there are non-essential amino acids.

(3) Draw peptide linkage

Ans: Peptide linkage:



(4) Define

(a) Essential amino acids

(b) Non-essential amino acids

Ans: (a) Essential amino acids:

Those amino acids which cannot be synthesized by our body and are required through diet or food for proper functioning of the body are called essential amino acids. Ten out of twenty amino acids are essential amino acids.

(b) Non-essential amino acids:

Those amino acids which cannot be synthesized by our body and are not required through diet or food for the desired need of the body are called non-essential amino acids. Then, out of twenty amino acids, there are non-essential amino acids.

13.4

1. Define (a) Lipids (b) Fats (c) Oils

Ans: (a) Lipids:

A lipid is any component of plant or animal tissue that is insoluble in water, but soluble in solvents of low polarity such as ether, hexane, benzene and carbon tetrachloride.

(b) Fats

A lipid is called fat if it is solid at room temperature. It is saturated

(c) Oils

A lipid is called oil if it is liquid at room temperature. It is unsaturated

2. Consult table 13.1 and write

(i) The names two fatty acids that are components of fats.

Ans: (i) Butyric acid (ii) Caproic acid

(ii) The name of one fatty acid that is component of an oil

Ans: Oleic acid is the component of oil

13.5

1. How do DNA and RNA differ in structure?

Ans:

S.No	DNA	RNA
(i)	Two stands are involved to form double helix	It consists of single stranded structure
(ii)	Deoxy ribose sugar is involved in its formation.	Ribose sugar is involved in its formation.
(iii)	Nitrogenous base uracil is not found in DNA. It consists of thymine.	Uracil nitrogenous base is found instead of thymine in RNA

2. Name the two kinds of nucleic acid?

Ans: (i) DNA (Deoxy ribose nucleic acid)

(ii) RNA (Ribose nucleic acid)

3. Write difference between DNA and RNA

Ans:

S.No	DNA	RNA
(i)	Two stands are involved to form double helix.	It consists of single stranded structure.
(ii)	Deoxy ribose sugar is involved in its formation.	Ribose sugar is involved in its formation.
(iii)	Nitrogenous base uracil is not found in DNA. It consists of thymine.	Uracil nitrogenous base is found instead of thymine in RNA.
(iv)	It consists of all types of genetic information about whole body of living organisms.	It involves in protein synthesis while the information about proteins come from DNA.
(v)	It is present in the chromosomes inside the nucleolus.	It is found in the cytoplasm.

4. What is the sugar unit in DNA?

Ans: Deoxyribose sugar is found in DNA.

5. What sugar is found in RNA?

Ans: Ribose sugar is found in RNA.

6. Which nucleic acid is involved in protein synthesis?

Ans: RNA (Ribose nucleic acid) is involved in protein synthesis.

13.6

1. Define vitamins

Ans: **Vitamins:**

Vitamins are specific organic compounds which are required by our bodies to prevent specific diseases but cannot be produced by our bodies. They are accessory growth factors and must be present in our diet in addition to proteins, fats, carbohydrates and minerals.

2. Is vitamin C soluble in fat or in water?

Ans: Vitamin C is water soluble not fat soluble vitamin.

3. Give examples of fat soluble vitamins

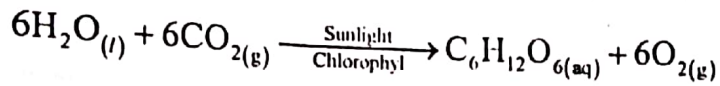
Ans: Vitamins A, D, E and K are examples of fat soluble vitamins.

LONG QUESTION

Q.1 Define carbohydrates. Explain its classification?

Ans: Carbohydrates

Carbohydrates are the most abundant class of organic compounds. Carbohydrates have the general formula $C_x(H_2O)_y$. This formula suggests that they are hydrates of carbon with few exceptions plants synthesize carbohydrates through photosynthesis.



Plants convert this glucose into starch and cellulose. Carbohydrates are monomers and polymers of aldehydes and ketones that have numerous hydroxyl groups attached.

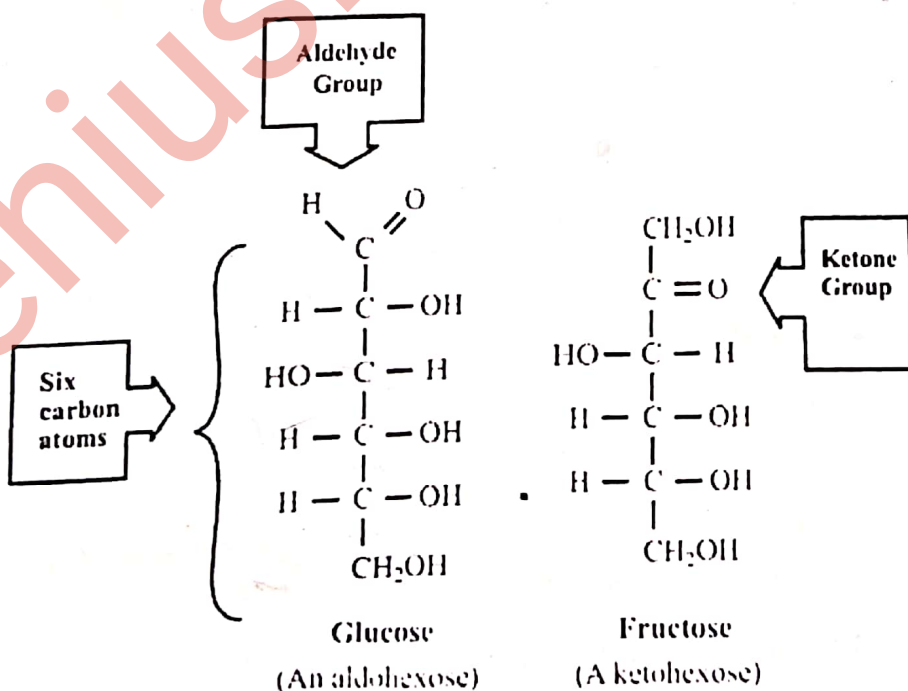
Classification of Carbohydrates

Carbohydrates are classified as

- (i) Monosaccharide
- (ii) Oligosaccharides
- (iii) Polysaccharides

Monosaccharide

Monosaccharides are the simplest carbohydrates. They cannot be hydrolyzed. They have general formula $(CH_2O)_n$ where n is 3 to 6 carbon atoms. So monosaccharides contain 3 to 6 carbon atoms. They are further classified as trioses, tetroses, pentoses, hexoses etc. This classification is based on the number of carbon atoms they contain. The two most familiar monosaccharides are glucose and fructose. Both have molecular formula $C_6H_{12}O_6$. Is glucose a pentose? Glucose is a pentahydroxy aldehyde, whereas fructose is a pentahydroxy ketone. Their open chain structures are as follows. They are called simple sugars.



Chapter-13

Some monosaccharide molecules can rotate the plane of plane polarized light to right (clockwise). They are called dextro – rotatory or dextrose sugars.

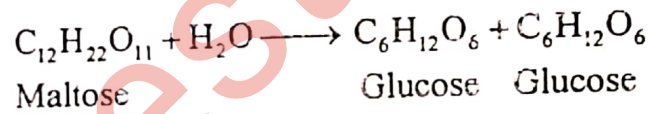
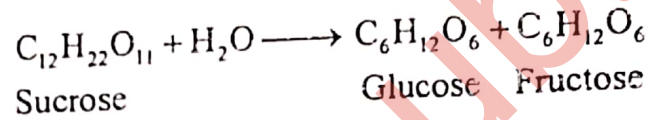
Glucose, manose, galactose are dextrose sugars. Monosaccharides are white crystalline solid. They are soluble in water and have sweet taste. They cannot be hydrolyzed. They are reducing in nature.

Oligosaccharides

Carbohydrates which upon hydrolysis form 2 to 9 molecules of monosaccharides or simple sugars are called oligosaccharides.

Therefore, depending upon the number of monosaccharide units they produce on hydrolysis, they are further clarified as disaccharides, trisaccharides etc. prefixes di, tri, tetra, penta etc. indicate the number of monosaccharide units, they produce on hydrolysis. They are white crystalline solids. They have sweet taste and are soluble in water.

Hydrolysis of some compounds are given below.



Polysaccharides

Carbohydrates which upon hydrolysis form 100 to 1000 units simple sugars are called polysaccharides. Starch and cellulose are polysaccharides. They are amorphous solids. They are tasteless and insoluble in water. They are non-reducing in nature.

Q.2 Write a note sources and uses of carbohydrates?

Ans: Carbohydrates are the most abundant class of carbon containing compounds. They have varied sources.

Source of Carbohydrates

- Monosaccharides such as glucose, fructose and galactose are obtained from fruits, vegetables and cereals. They also present in honey.
- Disaccharide such as sucrose is obtained in sugarcane, sugar beet and fruits. Maltose is found in cereals. Lactose is main sugar in milk and dairy products.
- Cellulose is obtained from plants e.g. Cotton is pure cellulose.
- Starch is present in cereals, wheat, barley, rice, maize, potato, sweet potato etc.

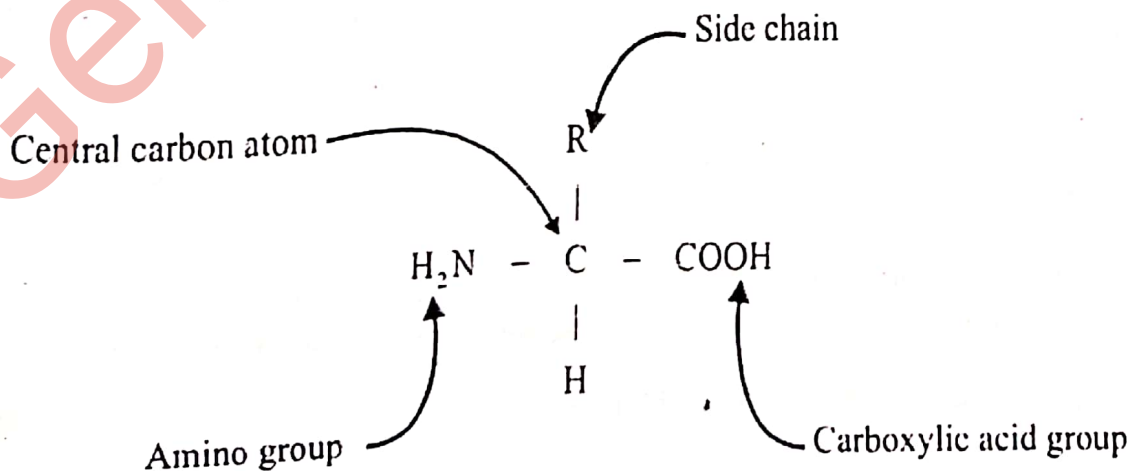
Use of carbohydrates

- Carbohydrates store and transport energy in both plants and animals. 1g of glucose provides us 15.6 KJ of energy.
- They serve as food source for most organisms.
- Carbohydrates serve as structural material for plants. Cellulose in the human diet is referred as fibre. It is found in bran, whole meal bread, fruit and vegetables. We cannot digest it but it is very important for us. It helps the muscles of your intestines to move food efficiently through the digestive track. It absorbs and carries away toxic chemicals in food that would otherwise harm us. It also helps in lowering cholesterol and regulates blood pressure.
- Sucrose is used as common table sugar.
- Glucose is stored in animal muscles and liver cells in the form of glycogen. Glycogen serves as long term energy reservoir. It can be converted back to glucose when needed for energy. Plants store excess energy as starch.
- Starch is used to make rectified spirit by fermentation process.
- Starch is converted to dextrin which is used as an adhesive for stamps and as wallpaper glue.
- Cows, cattle, goats, deer, sheep and termites derive nutrition from cellulose.
- We use cellulose in the form of wood for heat, housing and furniture.
- Wood is also used to make paper and wood pulp.
- Cellulose fibre of cotton is used to make rayon and cellulose acetate, which are used in textile industry for making cloth.

Q.3 Explain that amino acids are the building block of protein?

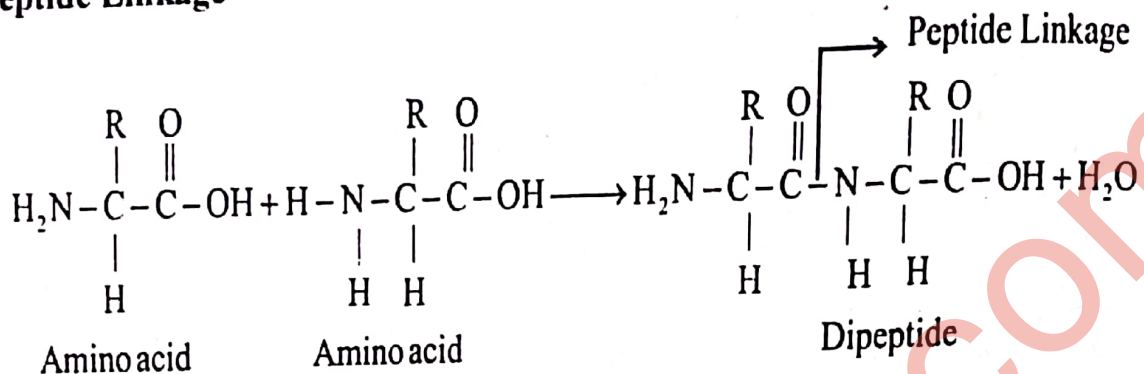
Ans: Amino Acids as Building Block

An amino acid has two functional groups one is amino group and the second is carboxylic acid group. Amino acids are building blocks of protein synthesis. Twenty different amino acids are involved in protein synthesis. Out of twenty amino acids, our bodies can synthesize only ten such amino acids. Such amino acids are called non-essential amino acids. The remaining ten are called essential amino acids. Essential amino acids must be present in our diet.



Molecules of amino acids join together through amino (-NH₂) group of one molecule and carboxyl (-COOH) group of another molecule by eliminating a molecule of water.

Peptide Linkage



The linkage $\begin{array}{c} \text{O} \\ || \\ -\text{C}-\text{NH}- \end{array}$ which joins two amino acid units is called a peptide bond. The resulting molecule is called a di-peptide. There is still an amino group on the left and a carboxyl group on the right. Each of these groups can react further to join more amino acid units. In this way thousands of amino acid units join to form a giant molecule of protein.

Q.4 Write a note sources of proteins?

Ans: Sources of Protein:

Most proteins obtained from animal sources contain all the essential amino acids in adequate amounts. Meat, fish, eggs, milk and cheese are important sources of proteins. Plants also provide us proteins. For example, pulses, beans, meat, egg, fish etc. are rich in proteins.

Uses of Protein:

- We require proteins in our diet. to provide amino acids to make muscles hair, enzymes and repair of body tissues.
- Proteins are essential for the formation of protoplasm and components of cells.
- Proteins are essential for both physical and mental growth especially in children.
- A protein called gelatin is obtained by heating bones and tendons in water. It is used in bakery goods.
- Enzymes are proteins that catalyze specific biological reaction, without which life would be impossible.
- The antibodies that help us to fight against disease are large protein molecules.

Q.5 What are the sources and uses of lipids?

Ans: Sources of Lipids:

Animals, plants and marine organisms such as salmon and whales are rich source of lipids. Milk is an important source of animal fats from which butter, ghee, cheese etc are obtained. Seeds of many plants such as sunflower, corn, cotton, ground nut, coconut, olive etc are good source of vegetable oils. Cod liver oil is obtained from salmon and whales.

Uses of Protein:

- Butter, ghee and vegetable oils are used for cooking and frying of food, preparing bakery products and sweets.
- In mammals a layer of fat is present under the skin. This layer acts as a thermal insulator.
- Fats protect delicate organs from shocks. A layer of fat around our heart and kidneys protect these organs from injury.
- Lipids provide some vitamins such as A, D and E which are essential for health. These vitamins are insoluble in water and soluble in lipids.
- Fats and oils are important food stores in living organisms. They provide about twice, as much energy per gram as do carbohydrates.
- Vegetable oils are converted into vegetable ghee or margarine by catalytic hydrogenation.
- Fats and oils are also used for the manufacture of materials like soaps and detergents, cosmetic, polishes, paints and varnishes.
- In our bodies cholesterol is essential for the synthesis of several hormones. vitamin D and bile acids.

Q.6 What do you know about nucleic acid? Also discuss its types?

Ans: Nucleic Acids

More than 100 years ago, a Swiss biochemist discovered a class of nitrogen-containing compounds in the nuclei of cells. These nitrogen-containing compounds which were first obtained from the pus of infected wounds are called nucleic acids.

Nucleic acids are vital components of all life. They are found in every living cell. They serve as the information and control of the cell. They are long chain molecules made up of nucleotides. Each nucleotide consists of three components.

- (i) Nitrogenous base
- (ii) A pentose sugar or five carbon sugar.
- (iii) Phosphate group

Types of Nucleic Acids:

There are two kinds of nucleic acids, Deoxyribonucleic acid (DNA) and ribonucleic acid (RNA). How is it that each species reproduces its own kind?

DNA can store and transmit all the genetic information needed to build organisms. For instance, in human beings, the single fertilized egg cell carry the information for making legs, hands, head, liver heart, kidneys etc. DNA is found primarily in the cell nucleus.

Structure of DNA was discovered by J. Watson and Francis Crick in 1953. they were awarded the 1962 Nobel Prize for their work. This discovery initiated the field of molecular biology. Cancer research involves an extensive study of nucleic acids.

Deoxyribonucleic Acid (DNA):

DNA exists in the form of two strands twisted around each other in a spiral formation called a double helix (Figure 13.4). each chain or strand is made up of a deoxyribose sugar, phosphate unit and a nitrogen base. The strands are held together by hydrogen bonds. The order of the base pairs in a strand is a code that stores information which is used to produce proteins. They key to the ability of DNA of store genetic information and to pass it on from generation to generation is its double stranded structure.

Structure of DNA:**Ribonucleic Acid (RNA)?**

RNA exists in the form of single strand. It is made of a ribose sugar, phosphate unit and nitrogen base. RNA is synthesized by DNA to transmit the genetic information. RNA is responsible for directing synthesis of new proteins. RNA receives, reads, decodes and uses genetic information from DNA to synthesize new proteins.

Q.7 Define vitamins. Also discuss its importance and types.

Ans: Vitamins are specific organic compounds which are required by our bodies to prevent specific diseases but cannot be produced by our bodies. They must be present in our diet in addition to proteins, fats, carbohydrates and minerals.

Importance of Vitamins:

Vitamins are substances that are essential for our bodies. Vitamin A is important in vision. B helps to regular nerve impulse transmission, in the formation of haemoglobin and activates more than 100 different enzymes. Vitamin D regulates blood calcium. It is necessary for proper bone and tooth growth.

Types of Vitamins

There are two types of vitamins

Fat Soluble Vitamins

- (a)
- (v) A vitamin that dissolves in fat is called fat soluble vitamin.
 - (vi) • These vitamins store in our body and cannot excreted out.
 - (vii) Taking excess amount of fat soluble vitamins may be harmful. For instance large excess of vitamin A can cause irritability, dry skin and feeling of pressure inside the head. Too much vitamin D can cause pain in bones, hard deposits in joints and kidneys, and weight loss.
 - (viii) For example, vitamin A, D, E and K.

Water Soluble Vitamins

- (b)
- (i) A vitamin that dissolve in water is called water soluble vitamin.
 - (ii) Our body has limited capacity to store these vitamins.
 - (iii) If taken in excess, these are readily excreted from the body. Water soluble vitamins are not toxic even if taken in excess.
 - (iv) For example, vitamins B (complex) and C.

Q.8 Write a note sources, uses of vitamins and diseases due to their deficiency.

Ans:

Vitamin	Sources	Necessary for	Deficiency Symptoms
A	Milk, butter, fish oils eggs, fresh green vegetable	Eyes and skin	Night blindness, dry skin
B (a group of several vitamins)	Whole meal bread, rice, yeast liver, soybeans, fresh green vegetables	Energy production in cells, nerves, skin	Skin diseases, tongue inflammation, anemia, bleeding gums
C	Oranges, lemons tomatoes fresh green vegetables.	Blood vessels, gums, healing wounds, preventing colds	Scurvy
D	Milk, butter, eggs, fish oils	Bones, teeth	Rickets, osteomalacia
E	Whole meal bread, rice eggs, butter, fresh green vegetables	Antioxidant	Hemolysis of red blood cells, sterility
K	Fresh green vegetables liver	Clotting blood	Hemorrhage delayed blood clotting

EXERCISE

- Q.1 Select the correct answer**
- (i) Which compound found in every living cell, serves as the information and control center?
 (a) Amino acid (b) Protein
 (c) Lipid (d) DNA
- (ii) Plants convert glucose into
 (a) Starch (b) Lipids
 (c) Proteins (d) Amino acids
- (iii) Glucose is a
 (a) Tetrose (b) Pentose
 (c) Disaccharide (d) Hexose
- (iv) Which is not a dextrose sugar glucose
 (a) Glucose (b) Mannose
 (c) Galactose (d) Fructose
- (v) Raffinose, $C_{18}H_{32}O_{16}$ on hydrolysis forms _____ sugars.
 (a) 1 (b) 2
 (c) 3 (d) 3 to 9
- (vi) Which is not a source of starch?
 (a) Wheat (b) Rice
 (c) Cotton (d) Potato
- (vii) Which is not a protein?
 (a) Gelatin (b) Antibodies
 (c) Enzymes (d) Cholesterol
- (viii) Soaps and detergents are made from
 (a) Proteins (b) Carbohydrates
 (c) Fats and oils (d) All of these
- (ix) Which is not present in DNA?
 (a) Deoxyribose sugar (b) Ribose sugar
 (c) Phosphate unit (d) Nitrogen base
- (x) Raffinose $C_{18}H_{32}O_{16}$ is
 (a) Monosaccharide (b) Disaccharide
 (c) Oligosaccharide (d) Polysaccharide

ANSWER KEY

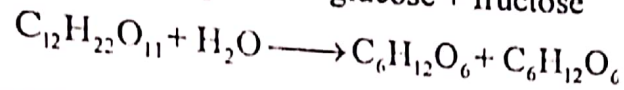
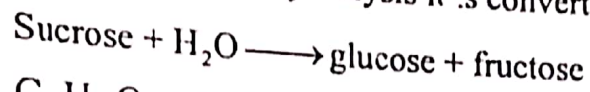
Q.	Ans.	Q.	Ans.	Q.	Ans.	Q.	Ans.
1	d	4	d	7	d	10	c
2	a	5	c	8	c		
3	d	6	c	9	b		

SHORT QUESTIONS

Q.2 Give Short Answer

(i) Decide, whether sucrose is a disaccharide or monosaccharide. Give reason.

Ans: Sucrose is a disaccharide because on hydrolysis it is converted into glucose and fructose

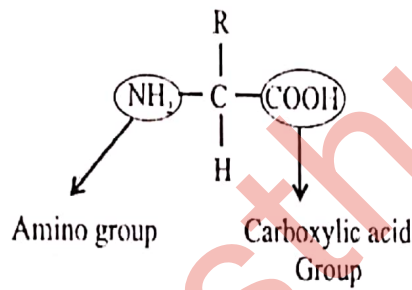


(ii) What is a dextrose sugar?

Ans: See short question answers

(iii) Write the formula of an amino acid and identify functional groups in it.

Ans:



(iv) What is a peptide bond?

Ans: See short questions answers

(v) Which compounds are included in lipids?

Ans: See short questions answers

(vi) What is the function of DNA?

Ans: See short questions answers

Q.3 Distinguish between mono, di- and tri-saccharides. Give examples.

Ans: See long questions answers

Q.4 Describe bonding in a protein molecule.

Ans: See long questions answers

Q.5 Explain sources and uses of lipids.

Ans: See questions answers

Q.6 Give sources and uses of proteins.

Ans: See questions answers

Q.7 Give sources and uses of carbohydrates.

Ans: See questions answers

Chapter-13

Q.8 Differentiate between fats and oils.

Ans: See long questions answers

Q.9 Define and explain vitamins.

Ans: See questions answers

Q.10 Why are vitamins important for us?

Ans: See questions answers

Q.11 Describe the importance of nucleic acids.

Ans: See questions answers

Q.12 Explain why agricultural and nutritional sciences are vital.

Ans: See questions answers

Q.13 Explain hydrogenation of vegetable oil.

Ans: See questions answers

Q.14 List commercial uses of enzymes.

Ans: See questions answers

Q.15 Explain the use of dextrose in drips.

Ans: See questions answers

Q.16 Separate water soluble vitamins from the following.

Vitamin A, Vitamin C, Vitamin E, Vitamin B

Ans: Vitamin C and Vitamin B are water soluble vitamins.

While the others vitamin A and E are fat soluble vitamins

THINK-TANK

Q.17 What three elements are important in both proteins and carbohydrates?
Ans: Carbon (C), Hydrogen (H) and oxygen (O) are three important element in both protein and carbohydrates.

Q.18 What is the name of the bond that forms between two amino acids in building a protein?

Ans: The name of the bond between two amino acid in a protein is peptide bond or peptide linkage.

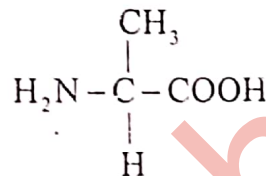
Q.19 How many molecules of water are needed to allow a disaccharide to form monosaccharide.

Ans: One molecule of water is needed is to allow a disaccharide to form two monosaccharide.

Q.20 Draw the structure of each of the following molecules

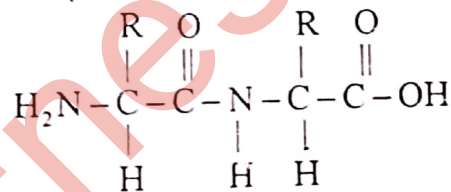
(a) An amino acid having $-CH_3$ as R group

Ans:



(b) A protein containing two amino acids

Ans:



Q.21 What five elements are primarily responsible for the makeup of DNA and RNA?

Ans: Carbon (C), Hydrogen (H), Oxygen (O), Nitrogen (N) and phosphorous (P) are the elements which are responsible for the makeup of DNA and RNA.

Q.22 Write structural formula of an amino acid containing four carbon atoms

Ans:

