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Biomolecules-I (Carbohydrates and Lipids)

- **Cell** : Cell is the structural and functional unit of living organism.
- **Biomolecules** : All the compounds found in living tissues can be called biomolecules.
- **Biochemical reactions** : Metabolic activities carried out by cells are an outcome of various chemical reactions called biochemical reactions.
 - Living organisms obtain a variety of molecules and elements from their environment.
 - With this element living organisms synthesize essential components. For the living body mainly four atoms are important viz. C, H, O, N.
 - These substances are of two types found in living organisms : (1) Inorganic substances (Water, Mineral salts, Mineral elements) (2) Organic substances (Carbohydrates, Lipid, Protein, Enzyme, Hormone)

- (1) Which are the important organic elements found in living being ?
 (A) C, H, Mg, P (B) C, K, Na, N (C) C, H, O, N (D) C, H, N, P
- (2) Which of the following is inorganic compound of living ?
 (A) Hormone (B) Minerals (C) Enzyme (D) Nucleotide
- (3) Which substance helps in metabolism in living organisms ?
 (A) Enzymes (B) Organic molecules (C) Inorganic molecules (D) Minerals

Answers : (1-C), (2-B), (3-A)

• Water :

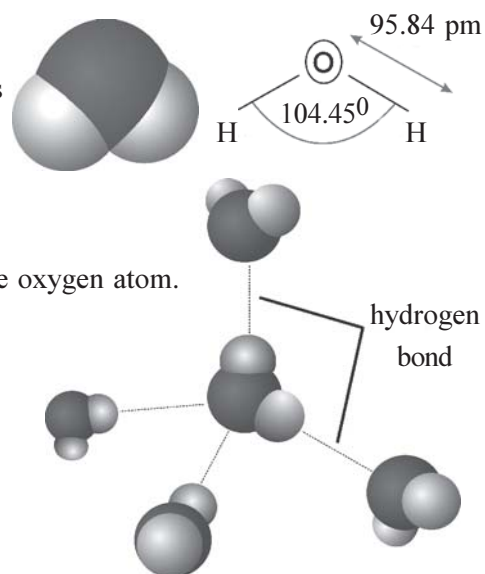
- In the constitution of living organism 65 % of water occurs
- In living cell it may be 70 % to 90 %
- Water usually makes up 55 to 78% of the human body.
- It has two hydrogen atoms covalently bonded to a single oxygen atom.
- H - O - H

Properties :

- Colourless, tasteless and odourless liquid.
- Most efficient solvent.

Most of the chemicals found in organisms are soluble in water, their homogeneity of cytoplasm is maintained. An excellent transport medium for various chemicals.

- O₂ and CO₂ are transported through water.
- Water has polar nature.
- The hydrogen and oxygen units in its constitution bear partial positive and partial negative charges respectively, thus molecules remain bounded with one another.
- Thus normally occurs as liquid.
- Thus it is an efficient solvent also.



- Water has characteristic of high specific and latent heat. Due to these properties any change in the temperature of the surrounding is loss or gain of heat in water does not affect the temperature of water. Since water has a high latent heat, water in lakes and sea does not freeze.
- Cohesive force is very high.
Thus ascent of sap can maintain.
- It has more density and viscosity.
- The density of water is dependent on the dissolved salt content as well as the temperature of the water.
- The density of water is highest at 4° C similarly, its viscosity is also high.
- This property of water enables planktonic organisms to float and move about freely on the surface of water. They do not encounter any mechanical shock in water.
- Water has high capacity to conduct heat, hence heat is equally distributed in all the parts of the body of an organism.
- Water plays an important role in maintenance of three dimensional form of macromolecules. e.g., Proteins, nucleic acids, etc.
- Water also acts as a reactant and provides H^+ and OH^- for many reactions.

- (4) Which is most efficient solvent ?
 (A) Water (B) Ethanol (C) Liquid N_2 (D) Above three
- (5) Water normally occurs as liquid, because of
 (A) polarity of water (B) Thermal conductive energy of water
 (C) latent heat of water (D) cohesive force of water
- (6) What is the distance between H and O in water ?
 (A) 95.84 meter (B) 10^{-12} meter
 (C) 95.84×10^{-12} meter (D) 104.45 picometer
- (7) What is the characteristic of latent heat of water ?
 (A) Do not encounter mechanical shock in water.
 (B) It maintains ascent of sap in plants.
 (C) Heat is equally distributed in all parts of body.
 (D) Water in lakes does not freeze.
- (8) Ascent of sap path is maintained by plant because of
 (A) water high density (B) water high viscosity
 (C) high specific heat of water (D) cohesive force of water
- (9) Planktonic organisms freely float on the surface of the water because of
 (A) polarity of water (B) viscosity of water (C) water heat (D) solubility of water

Answers : (4-A), (5-A), (6-C), (7-D), (8-D), (9-B)

• **Minerals :**

Minerals	Importance
(1) Nitrogen (N)	- Essential for the synthesis of proteins and nucleic acids. - It forms a part of vitamins, enzymes.
(2) Phosphorous (P)	- It is an important constituent of nucleic acids, cell membrane, ATP and various enzymes. - In energy exchange processes. - In the vertebrates about 80 % of the total phosphorous is associated with teeth and bones.
(3) Calcium (Ca)	- For strong bones and teeth. - In clotting of blood and contraction of muscles. - The middle lamella between plant cell is made up of calcium pectate. - It determines the permeability of cell membrane.
(4) Sulphur (S)	- It is found as a structural component. e.g., Cysteine, Methionine - It is also structural component of vitamins. e.g., Biotin, Thiamine - It is present in hyaline cartilage, ligaments and bone marrow
(5) Magnesium (Mg)	- It is constituent of chlorophyll, ATP and in synthesis of carbohydrates - Enzymes involved in carbohydrates, lipids and protein metabolism contain Mg.
(6) Iron (Fe)	- Haemoglobin, Myoglobin and Cytochrome compounds contain iron. - Many enzymes concerned with respiration contain iron in their structure
(7) Manganese (Mn)	- It plays important role in respiration and nitrogen metabolism. - In animals it is useful for the growth of bones and in reproduction. - It is a co-factor for the activation of enzymes like phosphatase.
(8) Zinc (Zn)	- It is essential in our body for general growth and reproduction. - It takes part in repair of worn out cells. - Many enzymes are activated in presence of it.
(9) Boron (B)	- It is associated with the transport of sugars in plants. It plays an important role in the production of flowers and fruits. - Cell division and certain other processes.
(10) Copper (Cu)	- It takes part in the synthesis of haemoglobin in animals. Enzyme tyrosinase has copper as structural component. - It takes part in the synthesis of chlorophyll in plants. It is present in haemocyanin a respiratory pigment in certain arthropods.
(11) Molybdenum (Mo)	- It helps in the fixation of nitrogen in plants. - In animals it is a component of intestinal enzymes.
(12) Sodium (Na) and Potassium (K)	- Maintenance of pH, maintenance of osmotic pressure of intra cellular fluids.
(13) Chlorine (Cl)	- It is amongst the main ions in blood; important role in CO₂ transport - It also takes part in the process of digestion of food, Osmo-regulation in blood and maintenance of pH.

- (10) Which mineral play important role in energy exchange processes ?
 (A) Ca (B) P (C) Mg (D) Fe
- (11) Give the true group of sulphur containing vitamins and Amino acid (in sequence).
 (A) Cysteine and thiamine (B) Biotin and thiamine
 (C) Thiamine and Cysteine (D) Methionine and Biotin
- (12) Which mineral is found in hyaline cartilage ?
 (A) Sulphur (B) Zinc (C) Sodium (D) Phosphorus
- (13) Which mineral is found in middle lamella between plant ?
 (A) Phosphorous (B) Sulphur (C) Nitrogen (D) Calcium
- (14) What is the importance of Calcium ?
 (A) Clotting of blood (B) Contraction of muscles
 (C) permeability of cell membrane (D) All of the above
- (15) Which mineral occurs in chlorophyll ?
 (A) Nitrogen (B) Magnesium (C) Calcium (D) Sulphur
- (16) If deficiency of Magnesium in living being process stops.
 (A) Metabolism of food (B) Energy exchange
 (C) permeability of cell membrane (D) Reproduction
- (17) Which is the compound of iron ?
 (A) Haemoglobin, biotin, cytochrome (B) Myoglobin, cytochrome, haemoglobin
 (C) Cysteine, haemoglobin, tyrosinase (D) Methionin, haemoglobin, myoglobin
- (18) Which mineral is important in reproduction ?
 (A) Mn (B) Na (C) Cu (D) B
- (19) Which process stops in absence of zinc ?
 (A) Transport of sugar (B) Nitrogen fixation (C) Respiration of cell (D) Contraction of muscles
- (20) What is importance of boron in plant ?
 (A) Transport of sugar (B) Production of flower and fruits
 (C) Cell division (D) All of the above
- (21) Which mineral is found as respiratory pigment in arthropoda ?
 (A) Fe (B) Cu (C) Mo (D) Zn
- (22) Which is the main compound of intestinal enzymes ?
 (A) Zn (B) Cu (C) Mo (D) Cl
- (23) What is the importance of sodium and chlorine (in sequence) ?
 (A) Transport of CO₂ and maintenance of osmotic pressure
 (B) Maintenance of pH and cell division
 (C) Constituent of haemocyanin and transport of CO₂
 (D) Maintenance of osmotic pressure and water potential of blood

Answers : (10-B), (11-C), (12-A), (13-D), (14-D), (15-B), (16-A), (17-B), (18-A), (19-C), (20-D), (21-B), (22-C), (23-D)

- **Organic substances :**

- It has main component as carbon.

- Carbon has 4 valency. $\left(\begin{array}{c} | \\ - \text{C} - \\ | \end{array} \right)$

- Organic biomolecules of two types.

(1) Simple bio molecules : It has molecular weight less than 1000.

(2) Macro biomolecules : It has molecular weight greater than 1000. e.g., Protein, Polysaccharides, Fat and Nucleic acid.

- **Carbohydrates :** $\text{C}_n (\text{H}_2\text{O})_m$

They are structurally composed of H and O in ratio 2 : 1 with carbon.

- It has mainly three types :

Monosaccharides	Disaccharides	Polysaccharides
• Including only one molecule most simple sugar	• It is made up of two monosaccharides	• Bonding by many unit of monosaccharides
• Value of n and m are similar	• By the glycosidic bond two hexose sugar are joins	• Many glycosidic bonds are present in that its structure
• It has -CHO or $\text{>C} = \text{O}$ group	• $\text{C}_n (\text{H}_2\text{O})_{n-1}$ or $\text{C}_{12} \text{H}_{22} \text{O}_{11}$	• $(\text{C}_6 \text{H}_{10} \text{O}_{11})_n$
• It is known as aldose or Ketose sugar		
Properties :	Properties :	Properties :
• Sweet in taste	• Sweet in taste	• Not sweet in taste
• Soluble in water	• Soluble in water	• Not soluble in water
• Passes simply from the plasma membrane	• Not passes from the plasma membrane	
• Do not hydrolysed	• By an enzyme hydrolysed	

- **Monosaccharides has three types :**

(1) **Triose** ($\text{C}_3\text{H}_6\text{O}_3$) are two types :

(i) **Aldose**

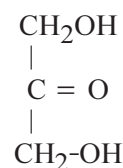
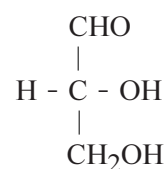
- Glyceraldehyde

- Example : PGAL is formed in dark reaction of photosynthesis

(ii) **Ketose**

- Dihydroxy acetone

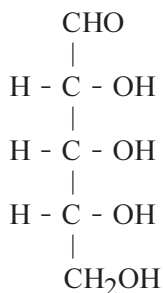
- Example : DHAP is formed in respiration process



(2) **Pentose** ($C_5H_{10}O_5$) are of two types :

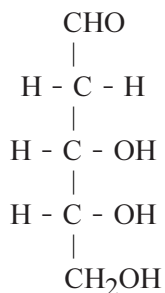
(i) **Aldose** are two types :

Ribose



- In structure of RNA

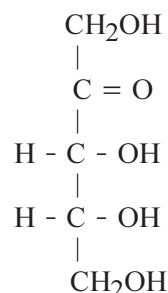
Deoxyribose



- In structure of DNA

(ii) **Ketose**

Ribulose



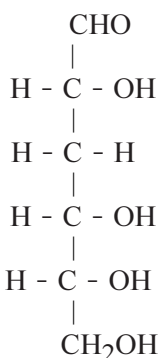
- As a constituent of RuBP

(3) **Hexose** ($C_6H_{12}O_6$) gives energy. It is of two types :

(i) **Aldose** is two types :

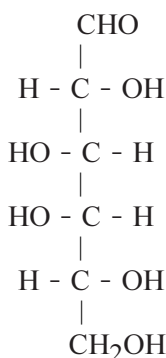
Glucose

- It gets by the digestion of starch



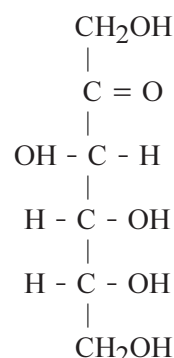
Galactose

- It gets by the digestion of milk



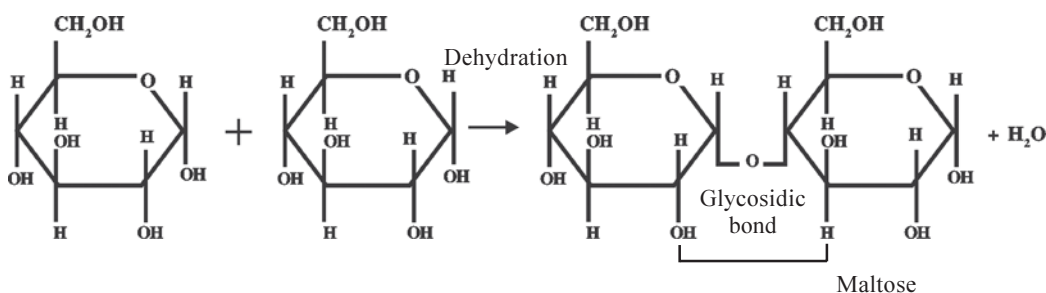
(ii) **Ketose**

- Fructose is present in juices of fruit

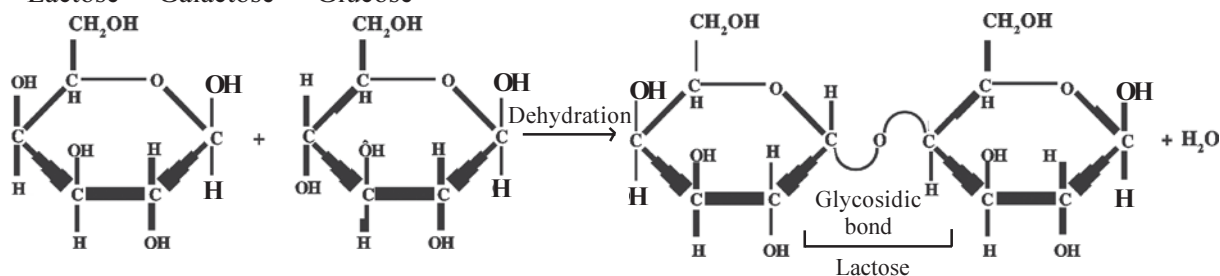


• **Disaccharides** :

Maltose = Glucose + Glucose



Lactose = Galactose + Glucose



- **Polysaccharides :**

Starch :

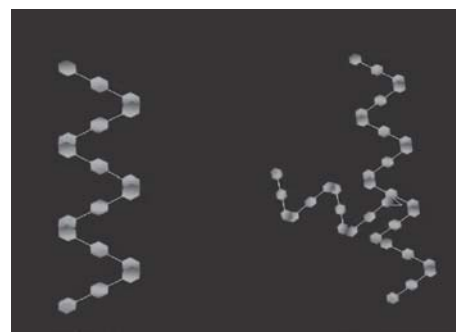
- Amylose is made up of unbranched polysaccharide chains made up of glucose units.
- Branched polysaccharide chains of glucose is amylopectin.
- In plants food is stored as starch.

Glycogen :

- Branched polysaccharide chains of glucose occur in the constitution of glycogen. These chains are branched.
- In animal the food is stored as glycogen.

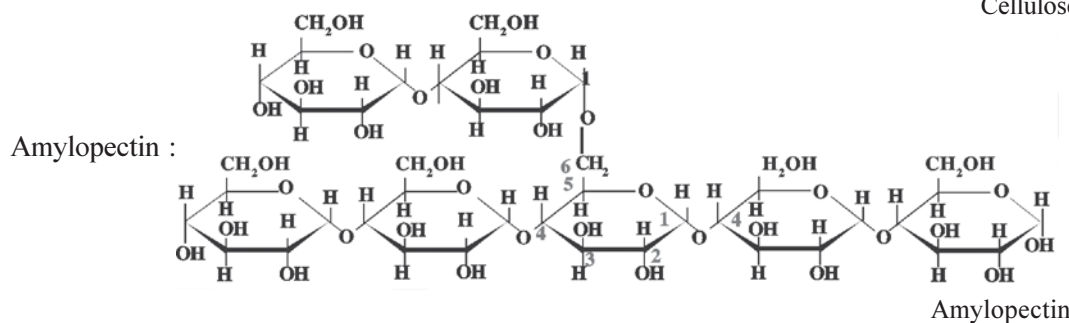
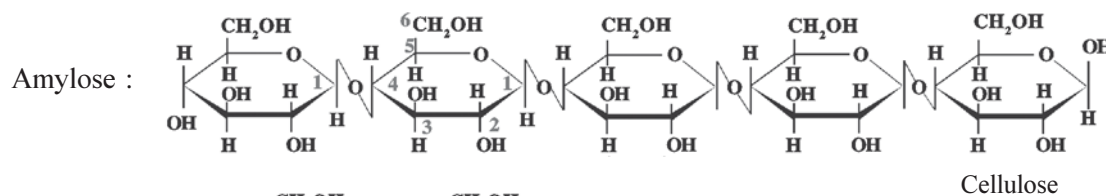
Cellulose :

- Cellulose also made up of polysaccharide chains of glucose and is the structural component of plant cell wall.



Amylose
(Unbranched chain)

Amylo pectin
(Branched chain)



(24) What are micromolecules ?

- (A) Molecular weight less than one thousand Dalton.
- (B) Molecular weight more than one thousand Dalton.
- (C) Consist of one molecule only.
- (D) Consist of more than one molecule.

(25) Which is inappropriate pair ?

- | | |
|---------------------------------|------------------------------------|
| (A) DHAP - Triose - respiration | (B) Ribose - Pentose - ATP |
| (C) Starch - Hexose - Plant | (D) Sucrose - disaccharide - fruit |

(26) Which is appropriate pair ?

- | | |
|--|--------------------------------------|
| (A) deoxyribose - ketose pentose sugar | (B) Fructose - ketose hexose sugar |
| (C) Reibulose - aldose pentose sugar | (D) Galactose - aldose pentose sugar |

(27) Which carbohydrate molecule cannot be hydrolysed ?

- | | | | |
|-------------|------------|---------------|--------------|
| (A) Sucrose | (B) Starch | (C) Cellulose | (D) Fructose |
|-------------|------------|---------------|--------------|

- (28) Which sugar is formed by digestion of glycogen ?
 (A) Glucose (B) Maltose (C) Ribose (D) Glyceraldehyde
- (29) Which bond is responsible of formation of polysaccharide from disaccharide ?
 (A) Ester (B) Peptide (C) Glycosidic (D) Hydrophobic
- (30) Which process is done for the formation of glycosidic bond between the sugar ?
 (A) Reduction (B) Oxidation (C) Hydrolysis (D) All of the above
- (31) Which is the true option of cellulose molecule and structure ?
 (A) Disaccharide $(C_6H_{10}O_5)_n$ (B) Disaccharide $C_{12}H_{22}O_{11}$
 (C) Polysaccharide $(C_6H_{10}O_5)_n$ (D) Polysaccharide $C_n(H_2O)_{n-1}$
- (32) What is amylose ?
 (A) Second name of cellulose (B) Unbranched chain of glucose
 (C) Branched chain of glucose (D) Second of glucose
- (33) Find the inappropriate pair :
 (A) Glucose - Fructose (B) Ribose - Ribulose
 (C) DHAP - PGAL (D) Maltose - Cellulose
- (34) Name the disaccharide present in mammals milk ?
 (A) Glucose (B) Fructose (C) Galactose (D) Lactose
- (35) Which substance is not made up from hexose ?
 (A) Sucrose (B) Starch (C) Glycogen (D) Insulin

Answers : (24-A), (25-C), (26-D), (27-D), (28-A), (29-C), (30-C), (31-C), (32-B), (33-D), (34-D), (35-D)

• **Biological importance of carbohydrates :**

- They play an important role in metabolism of cell and constitutions of tissues.
- Ribose and deoxyribose pentose sugars are the structural components of RNA and DNA respectively.
- It is the main source of energy in living organisms.
- Cellulose forms the plant cell wall.
- Starch serves as a stored food in plants.
- Glycogen served as a reserve food in animals.

- (36) Which sugar is found in RNA structure ?
 (A) Hexose (B) Triose (C) Pentose (D) Tetrose
- (37) Which sugar is found in DNA structure ?
 (A) Deoxyribulose (B) Disaccharide
 (C) Ribose (D) Deoxyribose
- (38) Which sugar is found in cell wall of plant ?
 (A) Monosaccharide (B) Polysaccharide (C) Disaccharide (D) Hexoses

- (39) Which sugar is found in cell wall structure ?
 (A) Starch (B) Cellulose (C) Glycogen (D) Sucrose
- (40) What is Glycogen ?
 (A) Polysaccharide (B) Food storage of animal
 (C) Cell wall of plant (D) Food storage of plant

Answers : (36-C), (37-D), (38-B), (39-B), (40-A)

• **Lipids :**

- A heterogenous group of compounds related to fatty acids.

Properties :

- Insoluble in water but soluble in other solvent like chloroform and benzene. Made up by C, H and O. H numbers are more than O.

Structure : Alcohol + Fatty acids = Lipid

(1) **Alcohol :** Two types of alcohol are used :

- (i) **Monohydroxy** (1 - OH group have)
- (ii) **Trihydroxy** (3C and 3-OH group) e.g., : Glycerol

(2) **Fatty acids :** Two types of fatty acids are used :

(i) **Saturated fatty acid :**

- Two successive carbon atoms therein, are linked by a single bond.
- They are not able to accept hydrogen or halogen atoms.
- **Short chain fatty acids :** e.g., Butyric acid
- **Long chain fatty acids :** e.g., Palmitic acid, Stearic acid.

(ii) **Unsaturated fatty acid :**

- Two successive carbon atoms at certain places there in are linked by double bond.
- They are capable of accepting hydrogen or halogen atoms.
- **Short chain fatty acid :** e.g., Crotonic acid
- **Long chain fatty acid :** e.g., Oleic acid

- (41) Which solvent is best for lipid ?
 (A) Alcohol, Water, Benzene (B) Alcohol, HCl, Ether
 (C) Chloroform, Benzene, Ether (D) Water, Chloroform, Alcohol
- (42) Which molecule is not found in lipid ?
 (A) C (B) H (C) N (D) O
- (43) Which of following is the constituent of glycerol ?
 (A) 3C, 3 - OH group (B) 3C, 1 - OH group
 (C) 1C, 3 - OH group (D) 1C, 1 - OH group

- (44) Which sentence is false for saturated fatty acid ?
 (A) They are not able to accept hydrogen.
 (B) They help in lipid constituent.
 (C) Palmitic acid act like fatty acid.
 (D) They linked by successive carbon atoms by double bonds.
- (45) Find the appropriate pair :
 (A) Butyric acid - saturated fatty acid - long chain
 (B) Crotonic acid - saturated fatty acid - short chain
 (C) Palmitic acid - saturated fatty acid - long chain
 (D) Oleic acid - unsaturated fatty acid - short chain
- (46) Which of the following substance is not capable to accept halogen atoms ?
 (A) Palmitic acid (B) Crotonic acid (C) Steartic acid (D) All of the above

Answers : (41-C), (42-C), (43-A), (44-D), (45-C), (46-B)

- **Lipids are of three types :** (1) Simple lipids (2) Complex lipid and (3) Steroids.

(1) Simple lipids :

- Alcohol + Fatty acids in their structure.
- They are of two types :

(i) Triglycerides :

- Glycerol + Fatty acids $\xrightarrow[\text{Dehydration}]{\text{Easter bond}}$ Triglyceride in their structure
 (3 molecules)

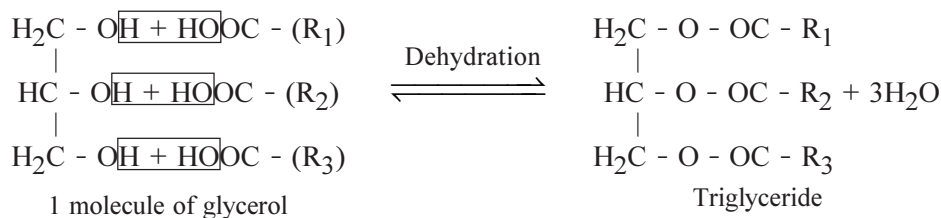
- - COOH group of fatty acid and - OH group of glycerol link with H and form easter bond.

- Type : • **Fat** - Saturated fatty acid.

- e.g., Butter, Ghee, Animal fats

- **Oil** - Unsaturated fatty acid

- e.g., Ground nut oil, Coconut oil, oil of til.



(ii) Waxes :

- Monohydroxy alcohol + (1 molecule) of saturated fatty acid in their structure.

(2) Complex lipid :

- Lipid + Non lipid component is present in their structure.
- e.g., Glycolipid (Carbohydrate, Glycogen)

(3) Steroids :

- Only alcohol is present in their structure.
- It is of two types :

Sterol	Steroids
OH group is present	COOH or $\geq C = O$ group is present
e.g., Cholesterol, Ergosterol	E.g., Cortisone, Progesterone
	(Animal hormone)

- (47) Which bond is found in lipid ?
(A) Glycosidic bond (B) Ester bond (C) Phosphodiester bond (D) Hydrogen bond
- (48) Which group is present in the formation of ester bond ?
(A) - COOH and - OH (B) $\geq C = O$ and - OH
(C) $\geq C = O$ and - COOH (D) - NH₂ and - OH
- (49) In which of the following both carbohydrate and lipids are present ?
(A) Phospholipid (B) Waxes (C) Glycolipid (D) Cholesterol
- (50) Find in appropriate pair :
(A) Cortisone - Sterol (B) Phospholipid - Phosphate
(C) Oil - Triglyceride (D) Ergosterol - Sterol
- (51) When carbohydrate joined with lipid it is called
(A) Phospholipid (B) Glycolipid (C) Sterol (D) Simple lipid
- (52) What is formed by mixture of fat and oil ?
(A) Alcohol (B) Acid (C) Ester (D) Aldehyde
- (53) In which way the waxes and fats differentiate ?
(A) presence of fatty acid (B) Types of lipid
(C) Types of alcohol (D) All of the above
- (54) Which is example of animal Hormone ?
(A) Cholesterol (B) Glycolipid (C) Progesterone (D) Ergosterol

Answers : (47-B), (48-A), (49-C), (50-B), (51-B), (52-C), (53-C), (54-C)

• Biological importance of Lipids :

- It liberate a very large amount of energy than carbohydrates.
- It is stored in body mass as a reserve food.
- They form insulating layer as follow :

Myelin sheath	Subcutaneous layer	Protective layer
Around the nerve fibre	Subcutaneous loci	Outer surface of the aerial plant organs
Prevent the passage of nerve impulses	Maintain body temperature	It has protective function

- Vitamin A, D, E, K are fat soluble.
- Act as a constituent of cellular organelle
- For the activation of enzymes : e.g., glucose phosphate
- Significant for the synthesis of steroidal hormone and vitamin D, E.

- (55) Which is false for myelin sheath ?
 (A) It is around the nerve fibre (B) It prevents the passage of nerve impulses
 (C) It is made up of lipid (D) It is made up of non conductive layers
- (56) Which lipid forms a protective layer on the outer surface of the aerial plant organs ?
 (A) Fats (B) Waxes (C) Phospholipid (D) Ergosterol
- (57) Which lipid is found in organelle membrane ?
 (A) Glycolipid (B) Lipoprotein (C) Phospholipid (D) Triglyceride
- (58) Glucose phosphatase is which type of biomolecule ?
 (A) Lipid (B) Enzyme (C) Hormone (D) Carbohydrate
- (59) Which vitamins are synthesized by derivatives of lipid ?
 (A) Vitamin E, K (B) Vitamin A, D (C) Vitamin D, E (D) Vitamin A, E

Answers : (55-D), (56-B), (57-C), (58-B), (59-C)

• **True - False (T - F) type questions :**

Given sentence are true or false, choose appropriate answer :

- (60) (1) Organic molecules include carbohydrate, lipid, protein and minerals.
 (2) Living organism receives molecule from food for synthesis of important components.
 (3) In water molecule, hydrogen and oxygen joined by coordinate bond.
 (4) In the entire body for the biochemical process water is essential which possess is necessary substance.
 (A) T, T, T, F (B) F, F, F, T (C) F, T, T, F (D) F, F, T, T
- (61) (1) At 40°C temperature the density of water is very high.
 (2) Plants absorb N₂ from atmosphere.
 (3) Water provides OH⁺ and H⁻ ion for chemical reaction.
 (4) Respiration and metabolism occur in the presence of Mn in plant.
 (A) F, F, F, T (B) T, F, T, T (C) T, F, F, T (D) T, T, T, F
- (62) (1) For synthesis of haemoglobin Cu is important in animal.
 (2) Main ion of blood is made up of Fe.
 (3) Organic molecules is only made up from C, H, O, N and P.
 (4) Density of water depends on dissolve salts and lateral heat.
 (A) F, T, T, F (B) T, T, T, F (C) T, F, F, F (D) T, F, T, F
- (63) (1) Hydrolysis of glyceraldehyde is not possible.
 (2) At the end of digestion of milk glucose and sucrose found.
 (3) Lactose is not diffusible through the cell membrane.
 (4) Chain branches of glucose units are called amylopectin.
 (A) F, T, T, F (B) T, F, T, T (C) F, F, T, T (D) T, F, F, T

- (64) (1) Lignin is a complex lipid.
 (2) Fructose is a ketose sugar found in fruit juice.
 (3) In plant food storage is in the form of sucrose.
 (4) Fructose is a useful component in respiration process.
 (A) F, F, T, T (B) T, F, T, F (C) T, T, F, F (D) F, T, F, F
- (65) (1) H is double then O in the composition of lipid.
 (2) Waxes is composed of molecule of monohydroxy alcohol not glycerol.
 (3) Subcutaneous waxes layer maintains the body temperature.
 (4) Fats consist of unsaturated fatty acid.
 (A) F, T, T, F (B) F, T, F, F (C) T, T, T, F (D) T, T, T, T
- (66) (1) Absence of alcohol in lipid is called complex lipid.
 (2) Crotonic acid is not example of unsaturated fatty acid.
 (3) In hydrolysis of maltose more than two molecule of monosaccharide is formed.
 (4) Lipids liberate a very large amount of energy.
 (A) T, T, F, T (B) F, F, F, T (C) F, T, F, T (D) T, F, F, T
- (67) (1) Lipid dissolved in water is for storage as reservoir food.
 (2) In progesterone composition - COOH group is found.
 (3) Ester bond derived as C - O - O - C bond.
 (4) For the activation of phosphate enzyme, Mn acts as a accessory substance.
 (A) T, F, T, T (B) F, F, T, T (C) F, T, T, T (D) T, F, T, F
- (68) (1) Main composition of DNA is carbohydrate compound.
 (2) Due to high energy value, carbohydrate is main respiratory substance.
 (3) Fat, fatty acid related homologous group compounds.
 (4) Monosaccharide is classified by number of carbon atoms.
 (A) T, T, T, T (B) T, F, T, T (C) F, T, T, T (D) T, F, F, T

Answers : (60-D), (61-A), (62-C), (63-B), (64-D), (65-A), (66-B), (67-C), (68-D)

• **A - Assertion, R - Reason.**

Choose the correct option from the given below :

- (A) A and R both are true, R is correct explanation of A.
 (B) A and R both are true, R is not correct explanation of A.
 (C) A is true, R is false.
 (D) A is false, R is true.

(69) Assertion A : Water in lakes and sea does not freeze.

Reason R : Water has a high specific heat.

- (A) (B) (C) (D)

- (70) Assertion A : Water reaches upto even tall trees like sequoia.
Reason R : Water has high thermal conductivity.
(A) (B) (C) (D)
- (71) Assertion A : Planktonic organisms do not encounter any mechanical shock in water.
Reason R : Water density and velocity is high.
(A) (B) (C) (D)
- (72) Assertion A : Due to the property of cohesive other ions are submerged in water molecule.
Reason R : Due to polarity water act as an active solvent.
(A) (B) (C) (D)
- (73) Assertion A : Sugar is transported in plant by Boron.
Reason R : Calcium is in composition of biotin and Thiamine.
(A) (B) (C) (D)
- (74) Assertion A : Sulphur is present in ligaments and hyaline cartilage.
Reason R : Sulphur is in composition of amino acid.
(A) (B) (C) (D)
- (75) Assertion A : Calcium determines the permeability of cell membrane.
Reason R : Middle layer of plant cell is made up of phospholipid.
(A) (B) (C) (D)
- (76) Assertion A : Plant do not get Nitrogen in deficiency of Molybdenum.
Reason R : Molybdenum help in Nitrogen fixation.
(A) (B) (C) (D)
- (77) Assertion A : Those which have molecules weighs 2970 Daltons are called macro molecules.
Reason R : Those which have molecular weight less than one thousand Dalton are called micro molecules.
(A) (B) (C) (D)
- (78) Assertion A : The general formula of carbohydrate is $C_n(H_2O_n)_m$.
Reason R : Value of m and n is equal in triose sugar.
(A) (B) (C) (D)
- (79) Assertion A : Monosaccharide cannot be hydrolysed.
Reason R : Monosaccharide is a simple carbohydrate.
(A) (B) (C) (D)
- (80) Assertion A : By adding enzyme and acid hydrolysis of carbohydrate is possible.
Reason R : Monosaccharide passes through membrane very easily.
(A) (B) (C) (D)
- (81) Assertion A : Starch is made up of branched glucose.
Reason R : Branched chain of glucose are called amylopectin.
(A) (B) (C) (D)

- (82) Assertion A : Butyric acid is a saturated fatty acid.
Reason R : Lipid liberate a double amount of energy than carbohydrate liberate.
(A) (B) (C) (D)
- (83) Assertion A : The oil are in liquid at room temperature.
Reason R : All fatty acid of lipid are saturated.
(A) (B) (C) (D)
- (84) Assertion A : Complex lipid is not included in any fatty acid.
Reason R : The nomenclature of complex lipids is dependant on the non-lipid component present in it.
(A) (B) (C) (D)
- (85) Assertion A : In structure of some molecule some of the loci of respective carbon are linked by double bond.
Reason R : Some of the fatty acid recieveing ability to hydrogen or halogen.
(A) (B) (C) (D)
- (86) Assertion A : During the dark reaction of photosynthesis DHAP is produced.
Reason R : DHAP is example of Keto-triose sugar.
(A) (B) (C) (D)
- (87) Assertion A : Vitamins D and E are synthesized from the derivatives of polysaccharide.
Reason R : Vitamins A, D, E, K are soluble in lipid.
(A) (B) (C) (D)
- (88) Assertion A : Lipid form an insulating layer.
Reason R : Cell wall of plant is made up of cellulose.
(A) (B) (C) (D)

Answers : (69-B), (70-B), (71-A), (72-D), (73-C), (74-B), (75-C), (76-A), (77-A), (78-B), (79-A), (80-D), (81-A), (82-B), (83-B), (84-D), (85-A), (86-D), (87-D), (88-B)

- (89) Select the appropriate pair :

Column - I

Column - II

- | | | |
|----------------|--------------------------------------|---|
| (i) Boron | (p) Maintenance of pH in blood | (A) i - r, ii - s, iii - t, iv - p, v - q |
| (ii) Magnesium | (q) Intestinal enzyme components | (B) i - r, ii - p, iii - t, iv - q, v - s |
| (iii) Copper | (r) Process of cell division | (C) i - t, ii - r, iii - s, iv - p, v - q |
| (iv) Chlorine | (s) Synthesis of ATP | (D) i - s, ii - r, iii - q, iv - p, v - t |
| (v) Molybdenum | (t) Composition of tyrosinase enzyme | |

- (90) Select the appropriate pair :

Column - I

Column - II

- | | | |
|----------------------------|--------------------|------------------------------------|
| (i) Phospholipid | (p) Steroid | (A) i - q, ii - r, iii - s, iv - p |
| (ii) Phosphoglyceraldehyde | (q) Polysaccharide | (B) i - p, ii - s, iii - q, iv - r |
| (iii) Ergosterol | (r) Complex lipid | (C) i - r, ii - q, iii - p, iv - s |
| (iv) Lignine | (s) Triose sugar | (D) i - r, ii - s, iii - p, iv - q |

(91) Select the appropriate pair :

Column - I	Column - II	
(i) Crotonic acid	(p) Sterone	(A) i - r, ii - q, iii - p, iv - s
(ii) Waxes	(q) Animal fat	(B) i - s, ii - r, iii - p, iv - q
(iii) Cortisone	(r) Monohydroxy alcohol	(C) i - s, ii - p, iii - q, iv - r
(iv) Triglyceride	(s) Unsaturated fatty acid	(D) i - p, ii - r, iii - s, iv - q

(92) Select the appropriate pair :

Column - I	Column - II	
(i) Glycogen	(p) $C_{12}H_{22}O_{11}$	(A) i - q, ii - r, iii - p, iv - s
(ii) Lactose	(q) $C_6H_{12}O_6$	(B) i - q, ii - p, iii - r, iv - s
(iii) Galactose	(r) $(C_6H_{10}O_5)_n$	(C) i - r, ii - p, iii - q, iv - s
(iv) Ribulose	(s) $C_5H_{10}O_5$	(D) i - r, ii - q, iii - p, iv - s

(93) Select the appropriate pair :

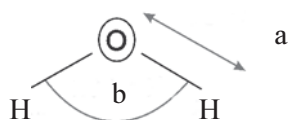
Column - I	Column - II	
(i) Cohesive force	(p) Water temperature	(A) i - q, ii - r, iii - s, iv - p
(ii) Water polarity	(q) Mechanical shock	(B) i - q, ii - p, iii - r, iv - s
(iii) Water density	(r) Ascent of sap in plant	(C) i - r, ii - p, iii - q, iv - s
(iv) Water viscosity	(s) Efficient solvent	(D) i - r, ii - s, iii - p, iv - q

(94) Select the appropriate pair :

Column - I	Column - II	
(i) Pass through the cell membrane	(p) Cu^{+2}	
(ii) Growth of animal bone	(q) Ca^{+2}	
(iii) Structure of chlorophyll	(r) Mn^{+2}	
(iv) Synthesis of chlorophyll	(s) Mg^{+2}	
(A) i - q, ii - r, iii - s, iv - p	(B) i - q, ii - r, iii - p, iv - s	
(C) i - r, ii - q, iii - s, iv - p	(D) i - q, ii - s, iii - r, iv - p	

Answers : (89-A), (90-D), (91-B), (92-C), (93-D), (94-A)

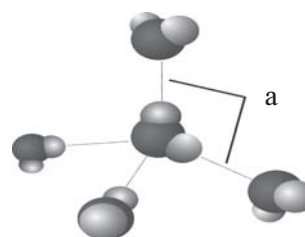
(95) What is the measurement of a and b respectively in given diagram ?



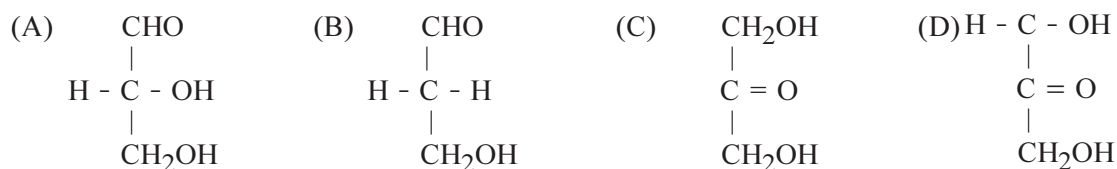
- (A) 104.45° , 95.84 pm (B) 95.84 pm, 104.45°
 (C) 95.84 nm, 104.45° (D) 104.45° , 95.84 nm

(96) What 'a' indicate in given figure ?

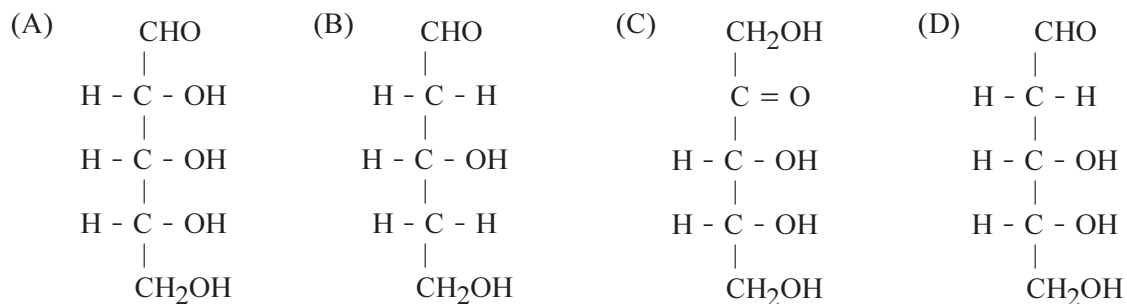
- (A) Ester bond (B) Hydrophilic bond
 (C) Hydrogen bond (D) Oxygen bond



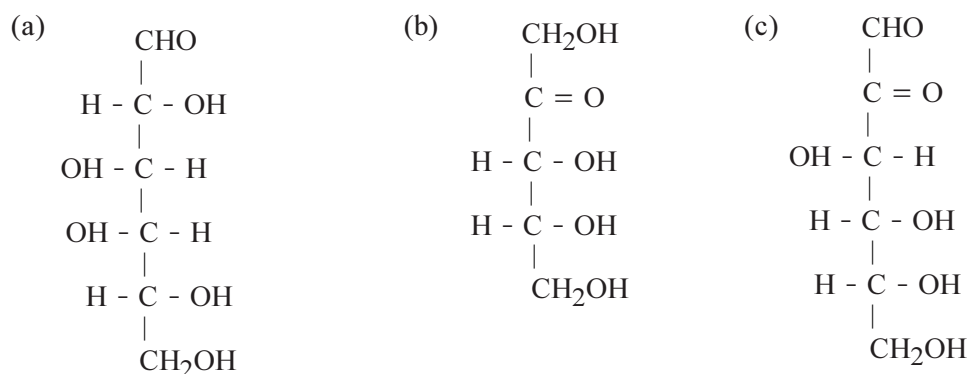
(97) What is constitution of DHAP ?



(98) Which sugar is found in DNA structure ?



(99) Which is the true group of a, b, c :



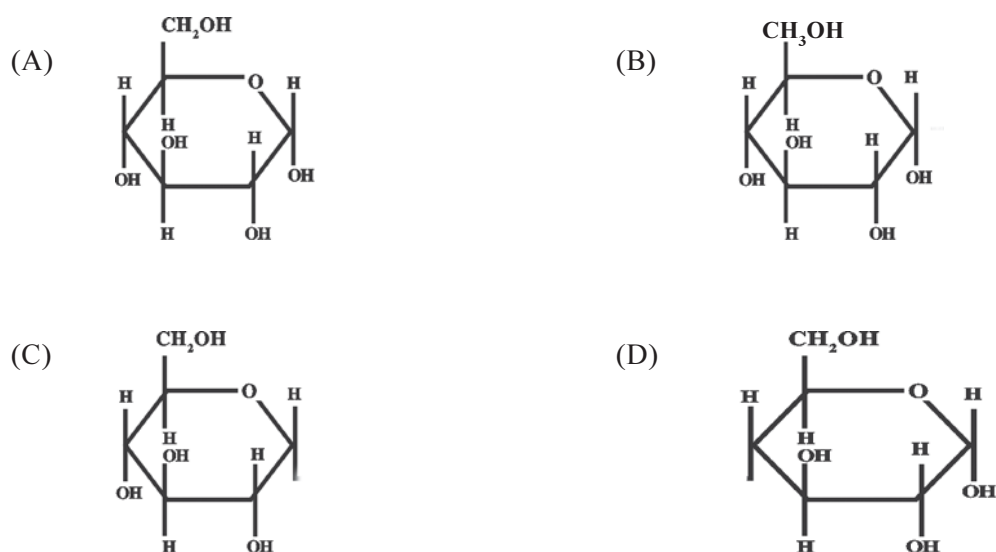
(A) Galactose, Ribulose, Fructose

(B) Fructose, Ribose, Galactose

(C) Galactose, Ribose, Fructose

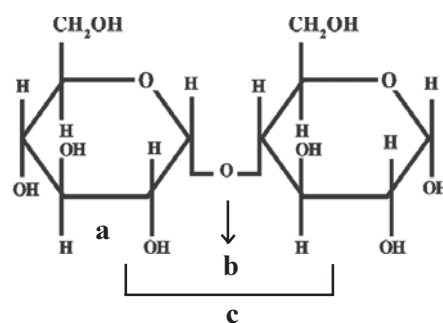
(D) Fructose, Ribulose, Galactose

(100) Which one is structure of glucose ?

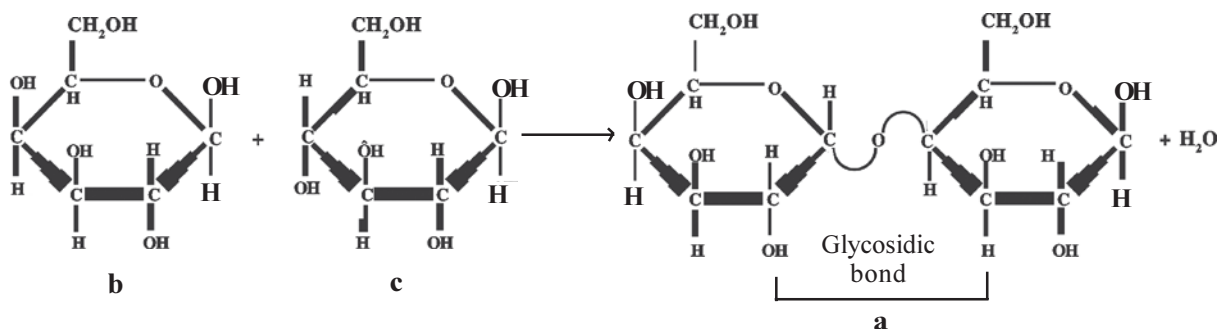


(101) Give the name of a, b, c from given structure :

- (A) glucose, hydrophilic bond, lactose
 (B) galactose, glycosidic bond, lactose
 (C) glucose, glycosidic bond, maltose
 (D) glucose, glycosidic bond, maltose

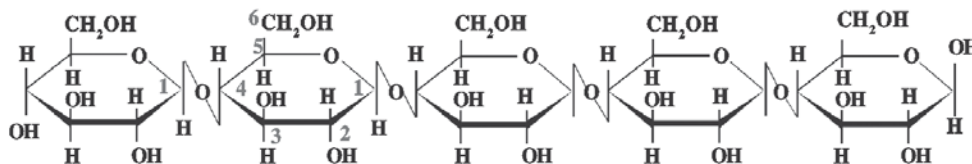


(102) Give the name of a, b, c from given structure :



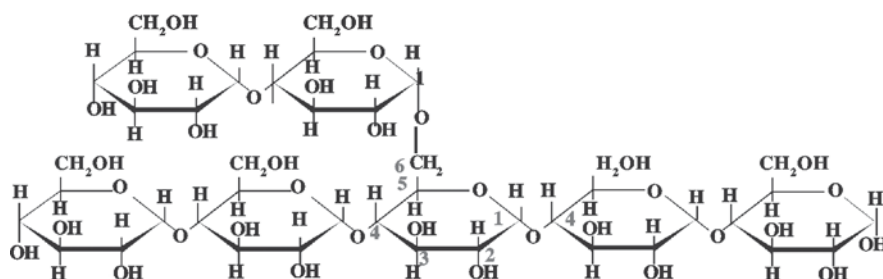
- (A) Lactose, galactose, glucose
 (B) Lactose, glucose, galactose
 (C) Maltose, glucose, galactose
 (D) Lactose, galactose, glucose

(103) The following structure is of :



- (A) Amylopectin
 (B) Amylose
 (C) Starch
 (D) Cellulose

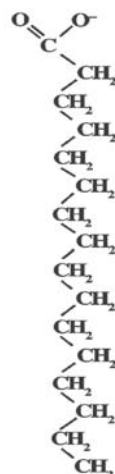
(104) What indicate this structure ?



- (A) Branched chain of glucose
 (B) Unbranched chain of glucose
 (C) Polysaccharide chain of glycogen
 (D) Polysaccharide chain of cellulose

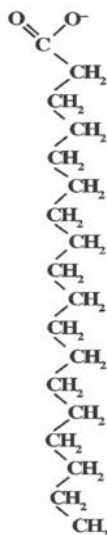
(105) Which type of fatty acid is seen in given structure ?

- (A) Saturated short chain of fatty acid
 (B) Unsaturated long chain of fatty acid
 (C) Saturated long chain of fatty acid
 (D) Unsaturated short chain of fatty acid



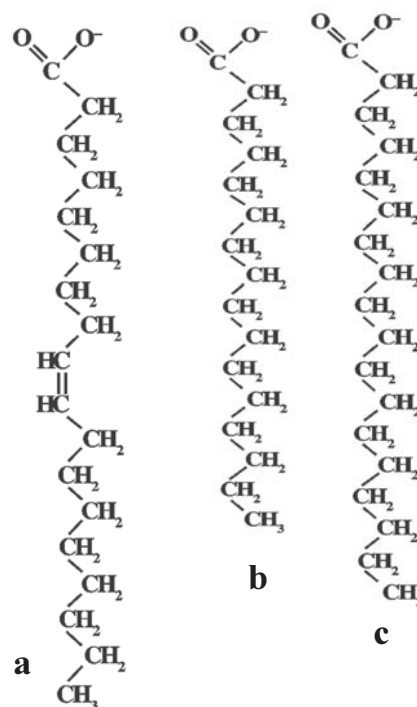
(106) Give the name of fatty acid.

- (A) Oleic Acid
 (B) Crotonic Acid
 (C) Stearic Acid
 (D) Palmitic Acid

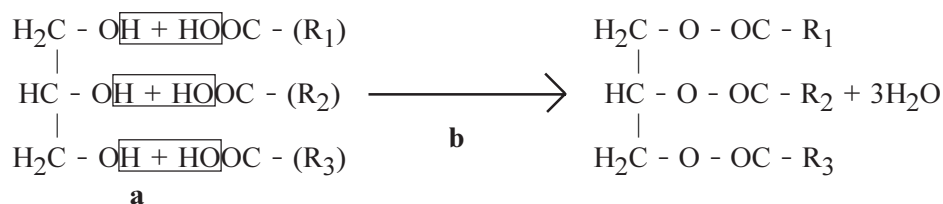


(107) Which is true structure of a, b, c fatty acid ?

- (A) stearic acid, palmitic acid, oleic acid
 (B) palmitic acid, stearic acid, oleic acid
 (C) oleic acid, palmitic acid, stearic acid
 (D) oleic acid, stearic acid, palmitic acid



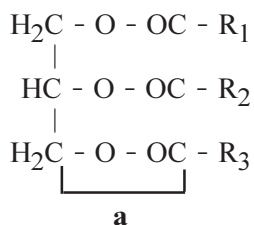
(108) What indicate a, b ?



- (A) Glycerol, dehydration
 (B) Fatty acid, dehydration
 (C) Triglyceride, dehydration
 (D) Mono hydroxy alcohol, dehydration

(109) What indicate a ?

- (A) Glycosidic bond
(B) Hydrogen bond
(C) Easter bond
(D) Peptide bond



Answers : (95-B), (96-C) , (97-C), (98-D), (99-A), (100-A), (101-C), (102-D), (103-B), (104-A), (105-B), (106-C), (107-C), (108-A), (109-C)

• **Questions for NEET :**

(110) Which one is non reducing sugar ?

- (A) Glucose (B) Galactose (C) Sucrose (D) Fructose

(111) In which cell wall Chitin is found ?

- (A) Algae (B) Bacteria (C) Fungi (D) Yeast

(112) Which one is reducing sugar ?

- (A) Cellulose (B) Starch (C) Sucrose (D) Maltose

(113) In which neutral substance cellulose is found in huge amount ?

- (A) Wood (B) Pith of fruit (C) Wheat (D) Cotton

(114) Which one is not disaccharide ?

- (A) Maltose (B) Lactose (C) Sucrose (D) Galactose

(115) Cellulose $\xrightarrow{\text{Cellulase}}$?

- (A) Glycogen (B) Starch (C) Glucose (D) Fructose

(116) Which are main '6' minerals found in living organism ?

- (A) C, H, O, N, S, Mg (B) C, H, O, N, P, Ca
(C) C, H, O, N, P, S (D) C, H, O, N, Mg, Na

(117) By whom biomolecules are produced mostly in earth ?

- (A) Some bacteria, algae, green plant (B) Fungi, algae, bacteria
(C) Green plant, Fungi, algae (D) Virus, Bacteria, fungi

(118) Lipid are insoluble in water, because lipid molecule is

- (A) Neutral (B) Hydrophilic (C) Hydrophobic (D) Zwitter ion

[Hint: Hydrophilic = affinity towards water, Hydrophobic = tending to repel to mix with water. Zwitterion = group having +ve and -ve charged groups]

(119) Sucrose is made up of

- (A) Glucose + Fructose (B) Glucose + Lactose
(C) Glucose + Galactose (D) Glucose + Maltose

(120) Starch is made up of

- (A) Cellulose (B) Protein (C) Amylopectin (D) Amino acid

(121) What is the simple monomer of carbohydrate ?

- (A) Fructose (B) Sucrose (C) Maltose (D) Glucose

- (122) Which molecule is basic structure of lipid ?
 (A) Glycerol (B) Glutamic acid (C) Galactose (D) Guanine
- (123) Thymine works as
 (A) Enzyme (B) Vitamin (C) Protein (D) Hormone
- (124) Which one is complex protein of containing carbohydrate ?
 (A) Eretroprotein (B) Meteloprotein (C) Glycoprotein (D) Lipoprotein
- (125) Which is insoluble polysaccharide in green plant ?
 (A) Starch (B) Sucrose (C) Refinose (D) Glycogen
- (126) Which chemical bond is present in Amylose ?
 (A) α ,1, 6- Glycosidic bond (B) α - 1 - Glycosidic bond
 (C) β - 1, 4 - Glycosidic bond (D) β - 1, 6 - Glycosidic bond
- (127) Take starch solution in test tube add saliva. Keep it in 38° C temperature and pH 2 to 8. After that add I₂. What is your observation ?
 (A) Violet colour and sweet test (B) Colourless and sweet test
 (C) Violet colour and no test (D) Colourless and no test
- (128) Select the appropriate pair :
- | Column - I | Column - II |
|------------------------------------|------------------------------------|
| (i) Triglyceride | (p) Animal Hormone |
| (ii) Cell membrane lipid | (q) Feather and beak |
| (iii) Steroid | (r) Phospholipid |
| (iv) Waxes | (s) Stored lipid in small globule |
| (A) i - s, ii - r, iii - p, iv - q | (B) i - q, ii - r, iii - s, iv - p |
| (C) i - r, ii - s, iii - p, iv - q | (D) i - s, ii - p, iii - q, iv - r |

Answers : (110-C), (111-C), (112-D), (113-D), (114-D), (115-C), (116-C), (117-A), (118-C), (119-A), (120-C), (121-D), (122-A), (123-B), (124-C), (125-A), (126-C), (127-B), (128-A)