

Assignment - 1

CARBOHYDRATES

Definition:

“Carbohydrates are organic compounds, these comprise of only Carbon, hydrogen and Oxygen.”

Classification:

Carbohydrates are classified into;

- (1) Simple Carbohydrates (monosaccharides, oligosaccharides)
- (2) Complex Carbohydrates (Polysaccharides)

Monosaccharides

“Monosaccharides are called simple sugar. They are simplest sugar and cannot be hydrolyzed.”
Their general formula is $C_n(H_2O)_n$. They are subdivided into trioses, tetrose, pentose, hexoses etc.

Example

- (i) Glucose: Immediate source of energy
- (ii) Galactose: A sugar in milk and yogurt.
- (iii) Fructose: A sugar in honey.

Oligosaccharides

“Oligosaccharides are called compound sugars. On hydrolysis they yield 2 to 10 molecules of same or different monosaccharides.”

Oligosaccharides yielding 2 molecules of monosaccharides on hydrolysis is known as disaccharides. and the ones yielding 3 or 4 monosaccharides are known as trisaccharides or tetrasaccharides respectively and so on.

Their general formula is $C_n(H_2O)_{n-2}$ for disaccharide and $C_n(H_2O)_{n-2}$ for trisaccharides and so on.

Example:

(i) Sucrose: Common table sugar.

Glucose + Fructose.

(ii) Lactose: Major sugar in milk.

Glucose + Galactose.

(iii) Maltose: Product of starch digestion.

Glucose + Glucose.

Polysaccharides:

“Polysaccharides are complex sugars and yield more than 10 molecules of monosaccharides on hydrolysis.”

Homopolysaccharides

“Homopolysaccharides yield same type of monosaccharides on hydrolysis.”

Example:

Starch, glycogen, cellulose, pectin.

(8) Heteropolysaccharides

"Heteropolysaccharides yield different types/units of monosaccharides."

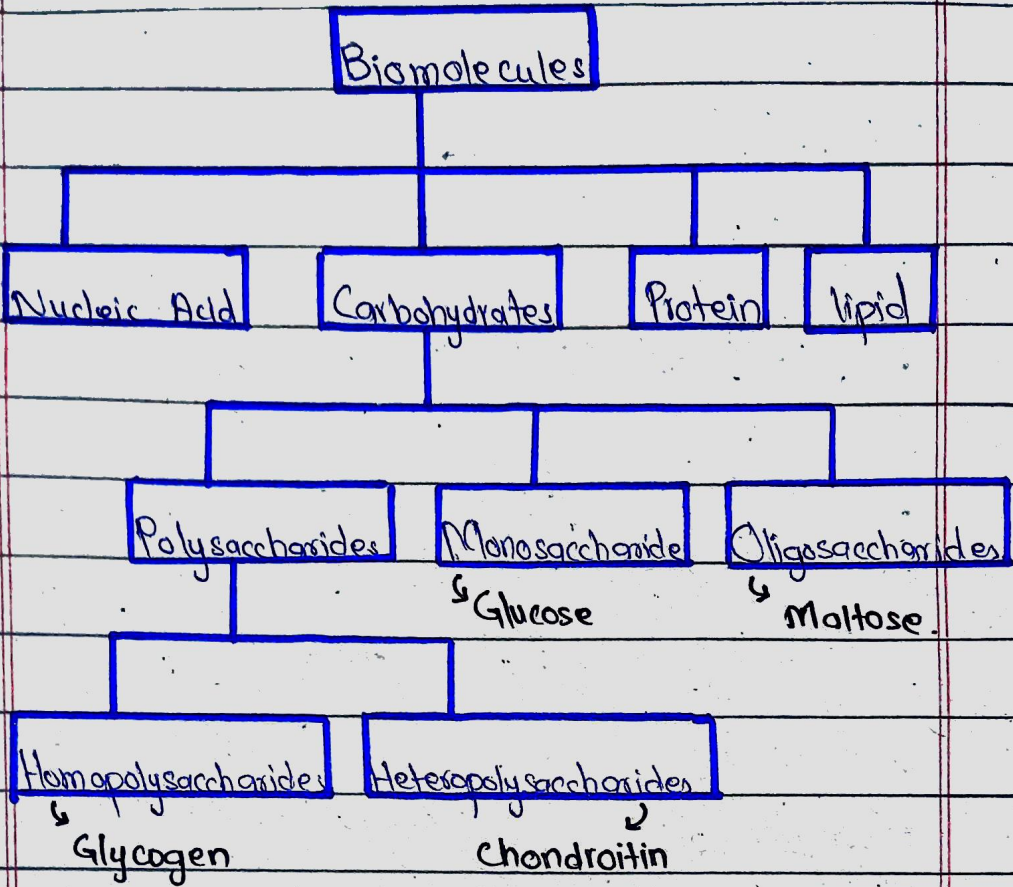
Example:

Hyaluronic acid and Chondroitin.

Characteristics of Carbohydrates.

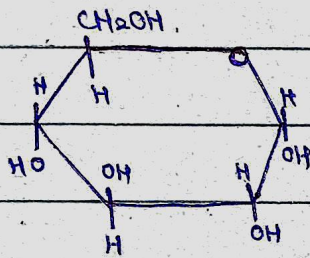
- (1) Composed of monosaccharides that have a ring structure.
- (2) Monosaccharides are connected with glycosidic bonds.
- (3) Carbohydrates are soluble in water.
- (4) Carbohydrates are sweet in taste.
- (5) They are polyhydroxy aldehydes or ketones.
- (6) Simple carbohydrates digest quickly and send immediate bursts of glucose (energy) into the bloodstream.
- (7) Glucose is stored as glycogen in animals and starch in plants.
- (8) Stored carbohydrates act as energy source instead of protein.
- (9) Carbohydrates are rich in fiber content help to prevent constipation.
- (10) They provide 3.9 calories of energy per gram.

Flow sheet:

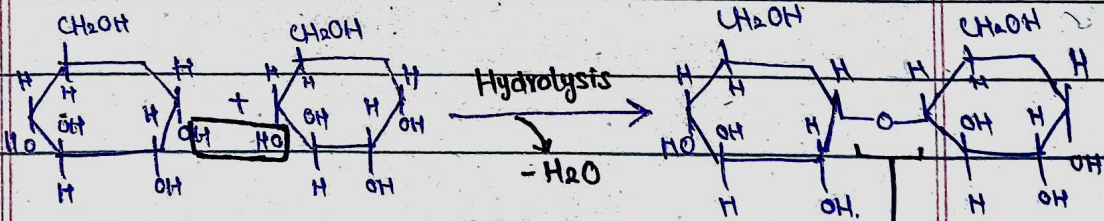


Structure:

(1)



Glucose



Glucose Glucose

glycosidic bond

Maltose

PROTEINS

Definition:

“Proteins are complex molecules made up of carbon, hydrogen, oxygen and nitrogen (sometimes sulphur and phosphorus)”

Examples:

Digestive enzyme, hemoglobin, keratin.

Characteristics of Protein:

1. Proteins are polymers made up of monomers called the amino acid.
2. Proteins carry out regulating activities as enzymes and hormones.
3. Proteins are productive as antibiotics.
4. Proteins build new tissues of the body and maintain and replace damaged tissues.
5. Proteins are responsible for movement as contractile proteins actin and myosin form basic structure of muscles.
6. Keratin protein forms hair, nail, feathers, horns and beaks.
7. Carrier protein move molecules from one place to another around the body, e.g. haemoglobin.
8. Proteins provide 4.1 calories of energy per gram.

Classification of Proteins

Q1) Classification of Protein based on Structure of Proteins:

There are four structural levels of organization to describe the complex macromolecules, proteins based on the degree of complexity of the molecule.

They are primary, secondary, Tertiary and quaternary structure.

(1) **Primary structure of Protein:** The primary structure of protein exist as a long chain of amino acid arranged in a particular (Linear) sequence. They are non-functional.

(2) **Secondary Structure of Protein:** When the polypeptides chain are coiled into a spiral or helix to have a three dimensional structure. called secondary structure of protein, where the amino acids interact by the formation of hydrogen bonds. e.g; keratin, silk fiber.

(3)

Tertiary structure of proteins: Long polypeptide chains become more stabilized by folding and coiling by the formation of ionic or hydrophobic bonds or disulphide bridges, this results in the tertiary structure of protein.

e.g.; Globulins of blood.

(4)

Quaternary structure of Protein: When a protein is an assembly of more than one polypeptide or subunits of its own this is said to be the quaternary structure of protein.

e.g.; Hemoglobin and insulin.

(02) Classification of Protein on the basis of Biological function:

Proteins can be classified on the basis of the biological function they perform.

(1)

Enzymatic Protein: They are most varied and highly specialized proteins with catalytic activity. Enzymes catalyze a variety of

reactions.

e.g; Urease, amylase, catalase etc.

(2) **Structural Protein:** These proteins helps to protect biological structures.

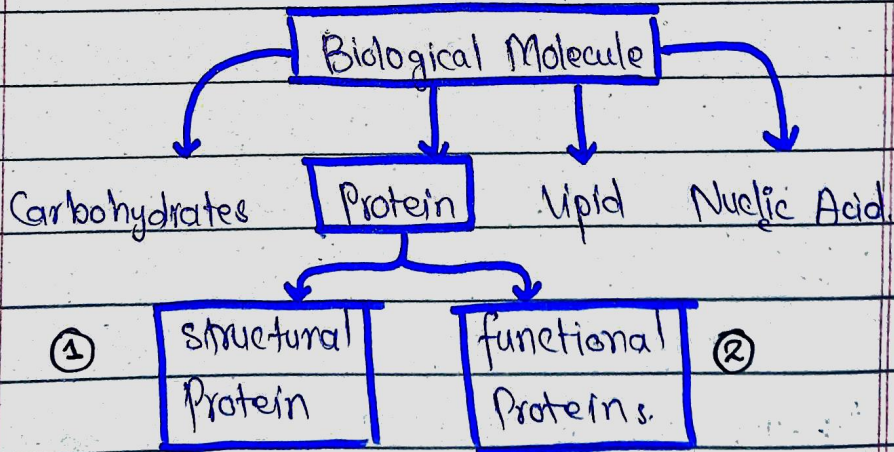
e.g; collagen, keratin, collagen,

(3) **Transport Proteins:** Transport or carrier protein help in transport of ion or molecules in the body

e.g; Myoglobin, hemoglobin.

(4) **Nutrient and storage Proteins:** These provides nutrition to growing embryos and store ions.

Flow sheet:



Protein +	Primary	Enzymatic structural Helping Transport Nutrient and storage	Proteins.
	Secondary		
	Tertiary		
	Quaternary		

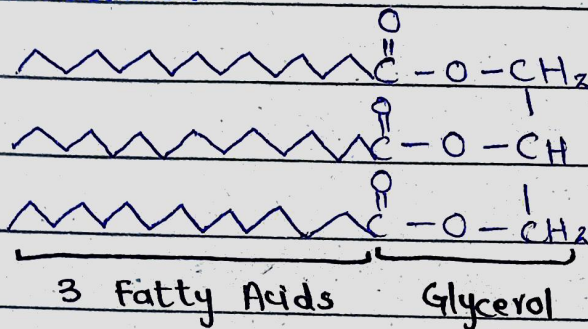
(Fats + Oils)

Definition:

“Lipids are naturally occurring organic compounds, commonly known as oils and fats.”

- **Triglyceride**: It is the basic unit of lipids synthesized from glycerol and fatty acid.

- Structure:



Triglyceride

- The second most common class of lipids are phospholipids. They contain glycerol and fatty acids also contain phosphoric acid and low molecular weight alcohol.
- Common phospholipids are lecithins and cephalins.

Classification of lipids:

Lipids can be classified into following:

- (1) Saturated fat.
- (2) Trans fat
- (3) Unsaturated fat.

(1) Saturated Fat :

Saturated fats are solid at room temperature that's why they are also known as "solid fat".

Saturated fats can rise cholesterol.

A healthy diet has less than 10% of daily calories from saturated fat.

Animal foods: Saturated fats are mostly in animal foods such as milk, cheese and meat.

Poultry foods: They have relatively less saturated fat than red meat.

Tropical Oils: They are also in tropical oils, such as coconut oil, palm oil and cocoa butter.

Others: Other sources which contain saturated fats include ; (snacks) snacks, non-dairy foods, coffee creamers, whipped toppings, butter, margarine, shortening etc.

(2) Trans Fat :

This is a fat that has been changed by a process of hydrogenation. This process increases the shelf life of fat and makes the fat harder at room temperature.

Trans fats also increase your cholesterol

Level.

Sources:

Sources of Trans fats are as following;

- (1) Processed foods.
- (2) Snacks foods, such as chips and crackers.
- (3) Cookies
- (4) Some margarine and salad dressings.
- (5) Foods made with shortening and partially hydrogenated oils.

(3) Unsaturated Fats:

Unsaturated fats are liquid at room temperature.

It is mostly oils from plants.

Unsaturated fats help to improve the cholesterol level.

There are two types of unsaturated fats.

- (1) Monounsaturated fat
- (2) Polyunsaturated fat.

(1) Monounsaturated Fat:

Monounsaturated fats keep good HDL cholesterol levels high.

Sources: Avocado, nuts, vegetable oils, canola, olive, peanut oil.

(2) Polyunsaturated fat :

Polyunsaturated fat in place of saturated fat may lower LDL cholesterol.

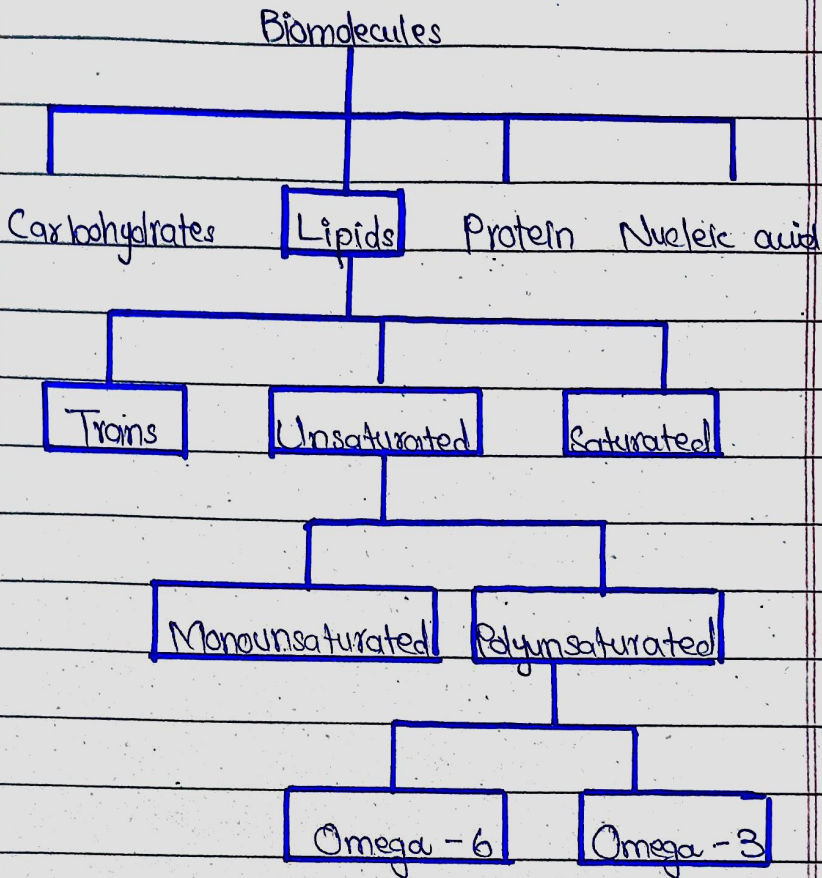
This type of fat is mainly in vegetables, oil, and seafood.

Omega-3 and omega-6 fatty acids are two types of polyunsaturated fat.

Characteristics of Lipids :

- (1) Lipids are insoluble in water.
- (2) They are soluble in organic solvents; ether.
- (3) They have high energy content.
- (4) They act as an electrical insulator.
- (5) Saturated fats are solid at room temperature.
- (6) Unsaturated fats are liquid at room temperature.
- (7) Melting point of fats depends on the length of the chain of constituent fatty acid and degree of unsaturation.
- (8) They act as cellular metabolic regulators.
- (9) They protect many vital organs of body.
- (10) They help to regulate the body temperature.

Flow Sheet:



Description:

Lipids: Organic compounds, fats and oil

Trans: Transitional stage (fatty acid) fats; snacks

Saturated: Solid fats; milk, meat, cheese

Unsaturated: liquid fats; vegetable oil

Monounsaturated: found in nuts, olive, palm oil,

Polyunsaturated: safflower, sunflower.

Omega-6: Crucial role in brain development; normal growth

Omega-3: Healthy fats; that support heart health