Quadrant II-Transcript and Related Materials

Programme: Bachelor of Science (First Year)

Subject: Zoology

Paper Code: ZOC 101

Paper Title: Diversity of Non-chordates and Cell Biology

Unit: 11

Module Name: Organic- Carbohydrates

Module Number: 26

Name of the presenter: Ms Madhu P Balekai

Carbohydrates are carbonyl compounds such as aldehydes or ketone that contains several hydroxyl groups. They are made up of carbon, hydrogen and oxygen. They are the most abundant organic molecules in nature and are major source of energy of all living beings. Biologically belong to three categories: **monosaccharides, Disaccharides and polysaccharides.**

STRUCTURE OF SIMPLE CARBOHYDRATES

They consist of carbon, hydrogen and oxygen. They are organic compound which are organized in the form of aldehyde and ketone with multiple hydroxyl group attached to carbon chain which forms the backbone of carbohydrates. Each C atom linked to hydroxyl group except one C that has C=O group. This C=O can be attached to aldehydes (aldoses) or ketone (ketoses). Carbohydrates can have an open chain or ring structure.

CLASSIFICATION OF CARBOHYDRATES

Carbohydrates are classified into monosaccharides, disaccharides and polysaccharides based upon the number of sugar units.

1) ***Monosaccharides***

These are the simplest form of carbohydrates and are also known as simple sugar as they cannot be further hydrolyzed into simpler forms. They contain Carbon, Hydrogen and

Oxygen in the 1:2:1 ratio, For example: Glucose ($C_6H_{12}O_6$). Monosaccharides are further classified according to the number of carbon atoms they contain and also on the basis of presence of functional group. On the basis of functional group, they are classified as aldoses or ketoses. And on the basis of number of carbon atom they are classified as *trioses (3C), tetroses (4C), pentoses (5C), hexoses (6C), heptoses (7C)* so on.

2) ***Disaccharides***

These types of carbohydrates are made up of two sugar units. These sugars units are linked by hydrolysis process. Example: Glycolipids and glycoproteins (plasma membrane)

3) Polysaccharides

They are the polymers of monosaccharides. Polysaccharides are usually formed by hydrolysis of more than 10 monosaccharides. The glycosidic bonds between two monosaccharide units are formed via dehydration synthesis. Every polysaccharide differs from one another in type of monosaccharides unit, length of the chain, type of bonds and degree of branching. Polysaccharides are further classified as:

- ***Structural polysaccharides-*** which are also known as Heteropolysaccharides. They are made up of same type of monosaccharide units. Example: cellulose and chitin
- ***Storage polysaccharides-*** which are also known as homopolysaccharides. These are made up of different types of monosaccharide units. Example: starch and glycogen

PROPERTIES OF CARBOHYDRATES

Carbohydrates are sweet molecules which are soluble in water and crystallizes. They are the building blocks for other monomers. In aqueous solution carbohydrates form rings where the aldehyde/ ketone group reacts with hydroxyl group thereby closing into a ring. Stereoisomerism is one the important property of carbohydrates. They are isomer form which have similar chemical formula but different structure. Structural variation is in the configuration of the OH and H on 2,3 and 4 Carbon atoms. Example glucose, galactose and fructose.

FUNCTIONS OF CARBOHYDRATES

Carbohydrates are the major source of energy during cellular respiration. They serve as energy stores, fuel and metabolic intermediates. Pentose which is a form of carbohydrates are the important constituent of RNA and DNA. They intermediate the biosynthesis of fats and proteins. They mediate cell-cell interaction and also with other elements in the surroundings.