

MODULE 12

AIM

The aim of this module is to provide the students with an introduction to carbohydrates.

CONTENTS AND OBJECTIVES

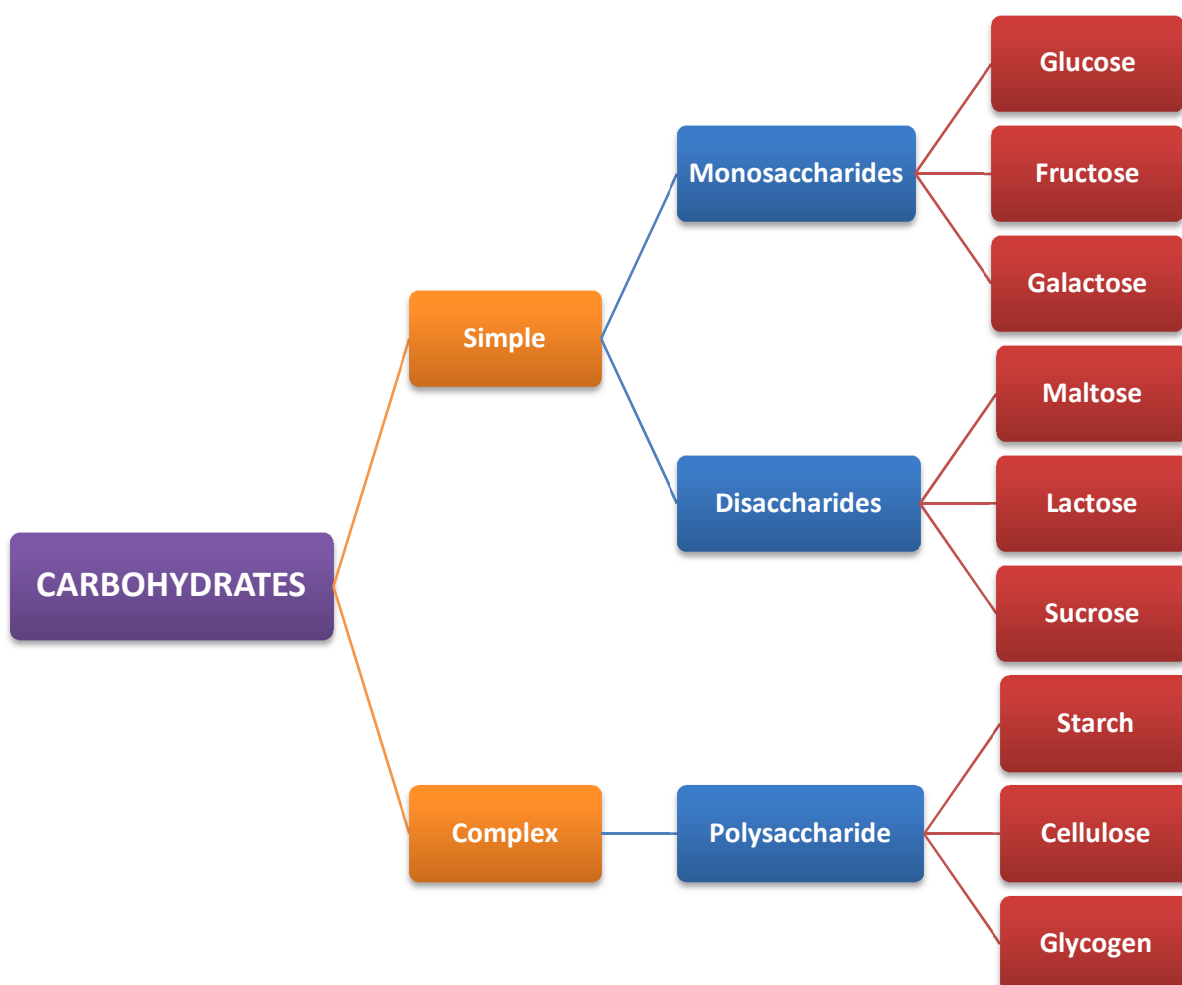
- ✓ Introduction
- ✓ Classification of carbohydrates
 - Simple carbohydrates-
 - Monosaccharide
 - Disaccharide
 - Complex Carbohydrates
 - Polysaccharide
- ✓ Functions of carbohydrates

CARBOHYDRATES

INTRODUCTION

- Carbohydrates are the most abundant biomolecules on Earth.
- All the sugars, starches and fibres found in fruits, grain, vegetables and milk products are collectively named as carbohydrates. They are one of the most important organic compounds found in almost all the living organisms.
- Carbohydrates are optically active polyhydroxy aldehyde or ketone. Some people also refer to them as hydrates of carbon. The empirical formula of carbohydrates is $(\text{CH}_2\text{O})_n$.
- Saccharide is a Greek word which means ὄσugarō, and is sometimes used to refer to carbohydrates because almost all the carbohydrates are sweet in taste.

CLASSIFICATION OF CARBOHYDRATES



Simple Carbohydrates-

- These are composed of not more than one or two sugars. These include **monosaccharides** and **disaccharides (or Oligosaccharides)**.
- They are not hard to digest.
- Milk products, fruits, etc., are the major sources of simple carbohydrates.
- Examples of simple sugars are glucose, fructose, sucrose (Cane sugar), maltose, galactose, etc.
- Oligosaccharides don't occur freely in the living cells but are conjugated with nonsugar molecules like- Protein and Lipids.

Complex Carbohydrates-

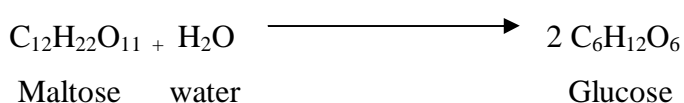
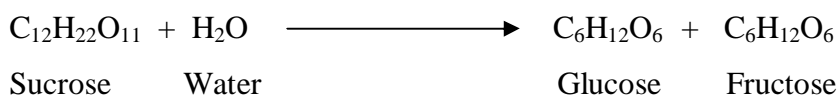
- Complex carbohydrates are composed of more than 20 sugar molecules. These include **polysaccharides**.
- Their digestion is comparatively slower than the simple sugars.
- They are found abundantly in potato, rice, cereals, corn, beans, etc.
- Example- starch, glycogen, cellulose, etc.
- Some polysaccharides are linear chains (eg- Cellulose) and others are branched chains (eg- Glycogen).

MONOSACCHARIDES

- Monosaccharides are the simplest form of carbohydrates.
- They are colorless and crystalline solids. Monosaccharides are soluble in water but insoluble in non-polar solvents.
- These are basically polyhydroxy aldehydes or ketones which cannot be hydrolyzed further to give simple sugar.
- These may further be classified on the basis of the nature of the carbonyl group:
 - **Polyhydroxy aldehydes** or **aldoses** which have the carbonyl group at an end of the carbon chain.
 - **Polyhydroxy ketones** or **ketoses** which have the carbonyl group at any other position.

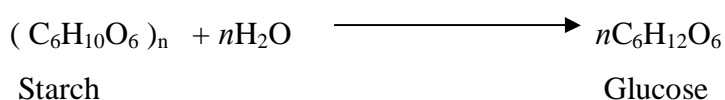
DISACCHARIDES

- Disaccharides are the carbohydrates which produce two monosaccharide units on hydrolysis.
- The two monosaccharide units thus produced maybe the same of different.
- For example- sucrose yields one unit of glucose and one unit of fructose on hydrolysis. Maltose, on the other hand, yields two molecules of glucose.



POLYSACCHARIDES

- Polysaccharides produce more than 20 monosaccharide units on hydrolysis.
- These monosaccharide units are linked to each other via glycosidic bonds.
- The general formula of polysaccharides is $(\text{C}_6\text{H}_{10}\text{O}_5)_n$.
- Polysaccharides are also sometimes referred to as non-sugars because they are not sweet in taste.
- A few examples are- Starch, Glycogen, and cellulose.



FUNCTIONS OF CARBOHYDRATES

Source of Energy

- É Glucose is the major source of energy for all the body cells
- É 1g carbohydrate provides 4 Kcal energy

Protein sparing function

- É Carbohydrates help in regulating the protein metabolism

Anti-ketogenic effect

- É Presence of carbohydrates is important for normal fat metabolism

Excretion of toxins

- É Glucuronic acid, a metabolite of glucose combines with chemical and bacterial toxins and helps in their excretion from the body.

Act as precursors

- É They serve as precursors to compounds such as nucleic acid, connective tissue matrix, etc.