



BIOMOLECULES

Carbohydrat

es
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LPT



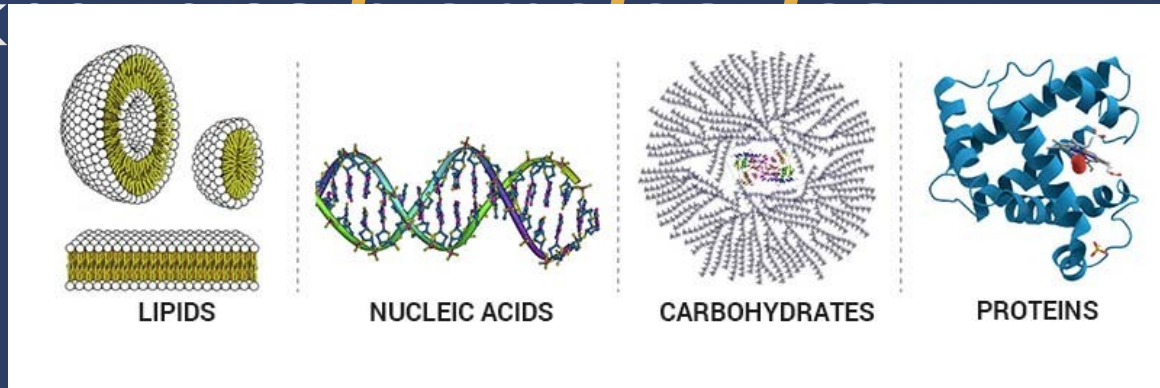
OBJECTIVES



1. Describe carbohydrates
2. Give examples of common monosaccharides, disaccharides, and polysaccharides used in daily life
3. Distinguish the properties of starch, glycogen and cellulose

BIOMOLECULES

- Plants, animals and all other living things are made up of organic molecules which are organized into larger molecules, known as biomolecules.



CARBOHYDRATES (CHO)

- Carbohydrates are compounds made up of carbon, hydrogen, and oxygen.
- Carbohydrates have different biochemical functions.
- Carbohydrates also have structural functions



CARBOHYDRATES CLASSIFICATION

Carbohydrates

Monosaccharide

Glucose
Fructose
Galactose



Single sugar
molecule

Disaccharide

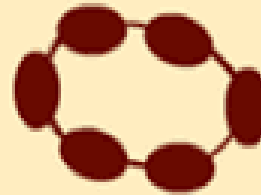
Maltose
Sucrose
Lactose



Two sugar
molecules linked

Polysaccharide

Starch
Glycogen
Cellulose



Many sugar
molecules linked



MONOSACCHARIDES

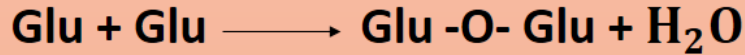
- One unit of sugar (one saccharide)
- Basic building blocks of large carbohydrate molecules
- Contain two kinds of functional groups-two or more hydroxyl groups



MONOSACCHARIDES	FORMULA	STRUCTURE	SOURCES
GLUCOSE	$C_6H_{12}O_6$		Fruits
FRUCTOSE	$C_6H_{12}O_6$		Fruits Honey
GALACTOSE	$C_6H_{12}O_6$		Precursor to glucose production

When two monosaccharides join together through a condensation reaction, a disaccharide is produced along with a molecule of water.

When two glucose units react via condensation reaction, the disaccharide, maltose, is formed.



Maltose

When glucose and fructose are joined, sucrose (table sugar) is formed.

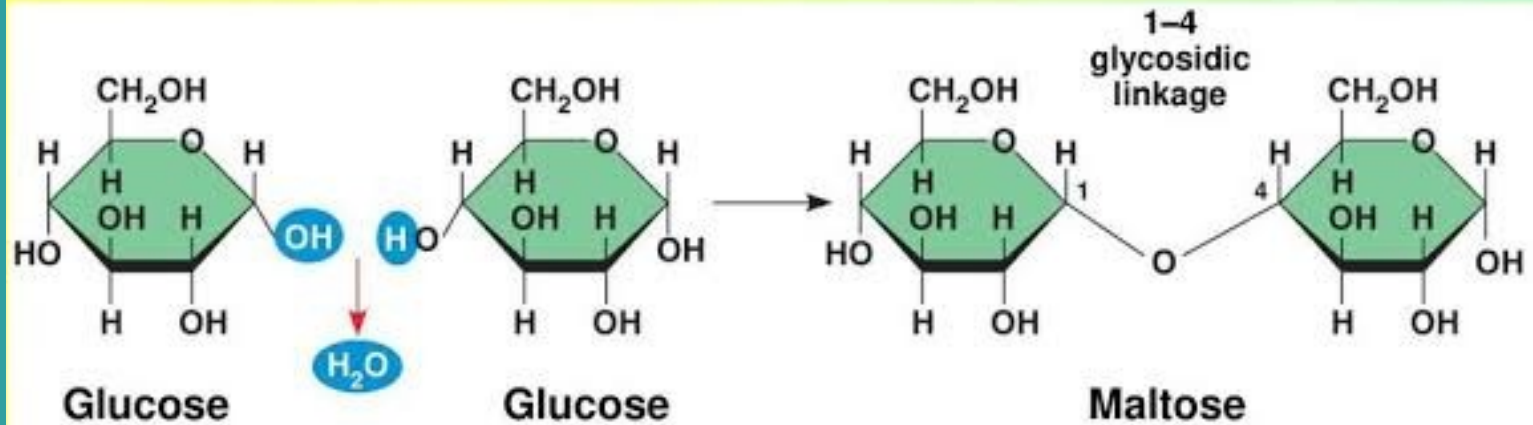


Sucrose

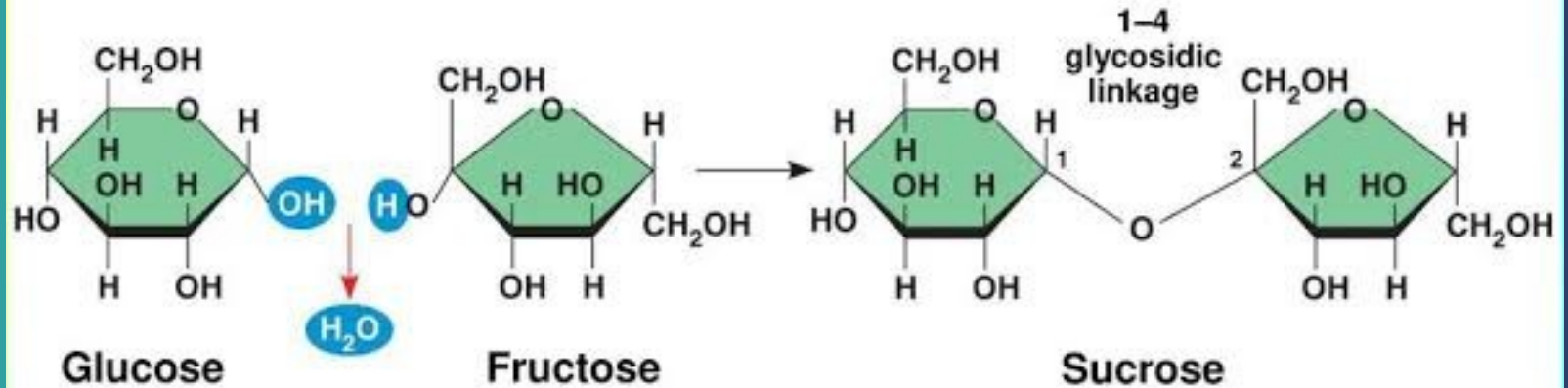
When glucose and galactose are joined, lactose (milk sugar) is formed.



Lactose



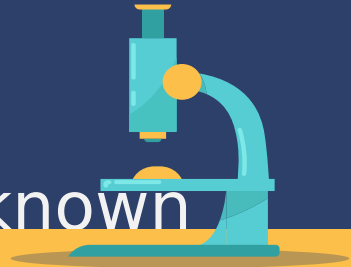
(a) Dehydration reaction in the synthesis of maltose

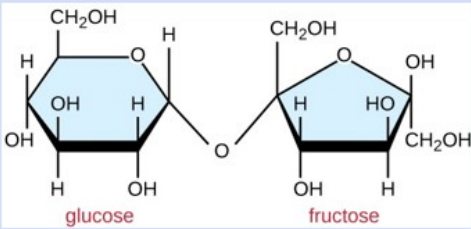
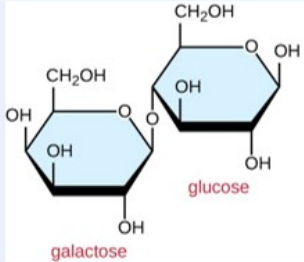
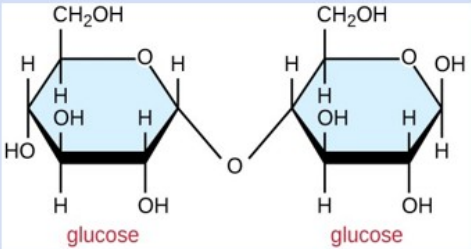


(b) Dehydration reaction in the synthesis of sucrose

DISACCHARIDES

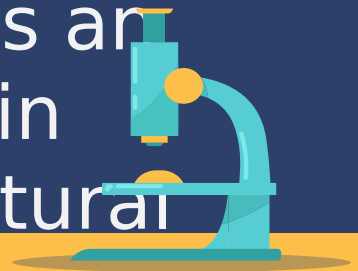
- Two units of sugar (two saccharides)
- They act as a source of monosaccharides
- The two similar or different monosaccharide molecules are attached via a **glycosidic bond** to form a disaccharide. As a water molecule is released in this condensation process, it is also known as a **dehydration reaction**



DISACCHARIDES	FORMULA	STRUCTURE	SOURCES
SUCRCOSE	$C_{12}H_{22}O_{11}$	 <p>glucose fructose</p>	Fruits Nectars Sugar cane
LACTOSE	$C_{12}H_{22}O_{11}$	 <p>galactose glucose</p>	Milk
MALTOSE	$C_{12}H_{22}O_{11}$	 <p>glucose glucose</p>	Some fruits Grains

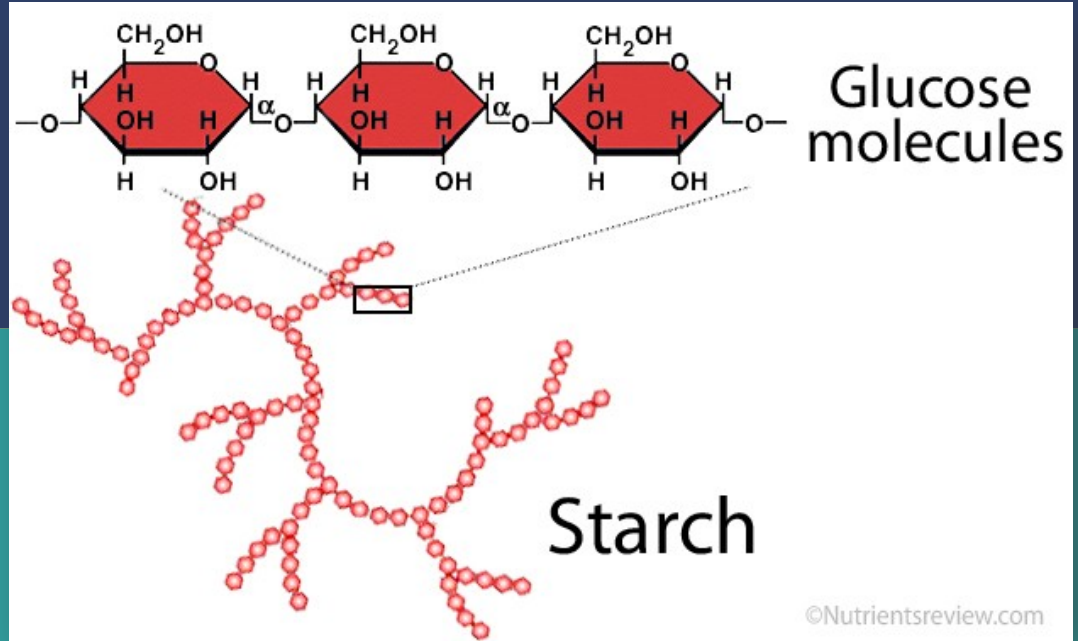
POLYSACCHARIDES

- Are made up of several monosaccharide units joined together by covalent bonds called ***glycosidic bonds***.
- These complex bio-macromolecules functions as an important source of energy in animal cell and form a structural component of a plant



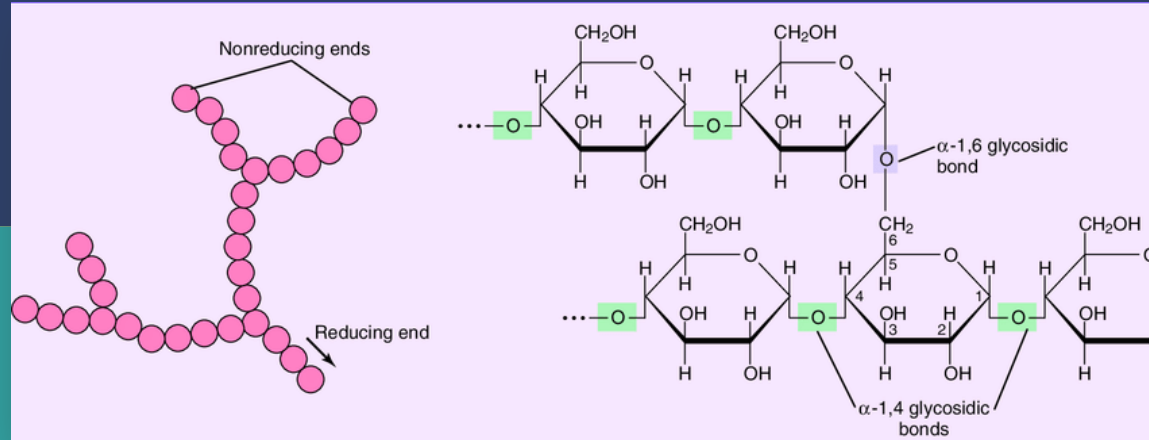
STARCH

- Occurs as microscopic granules in the cells of roots, tubers and seeds of plants.
- Serve as a major source of energy for animals & humans.



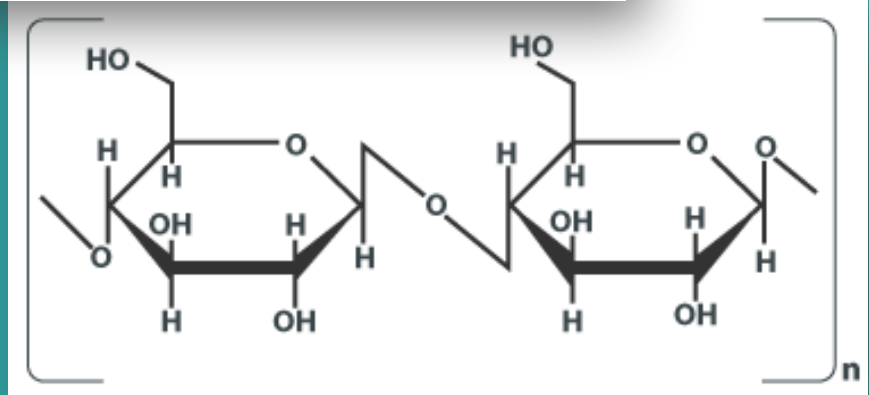
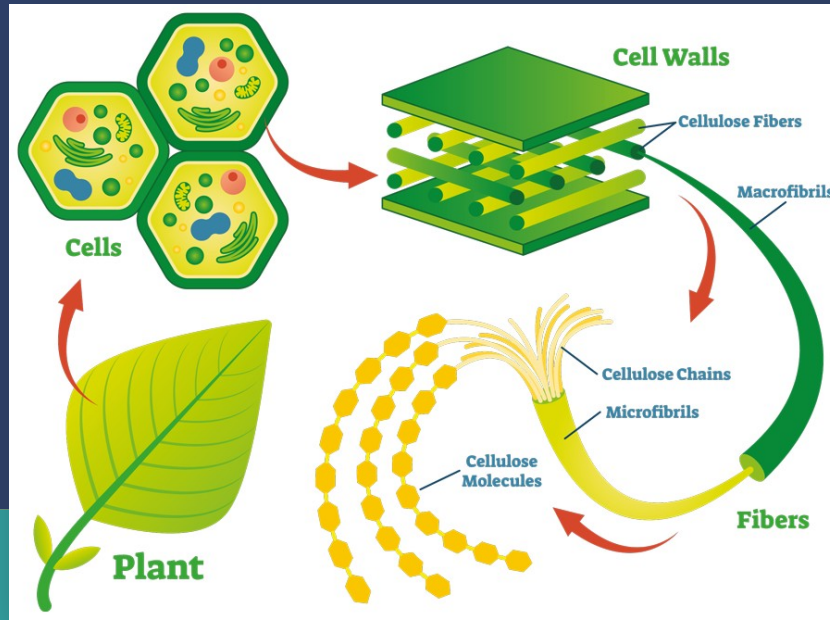
GLYCOG

- Glycogen is a large, branched polysaccharide that is the main storage form of glucose in animals and humans.
- Glycogen is also an important form of glucose storage in fungi and bacteria.
- Found in the muscles and liver.



CELLULOSE

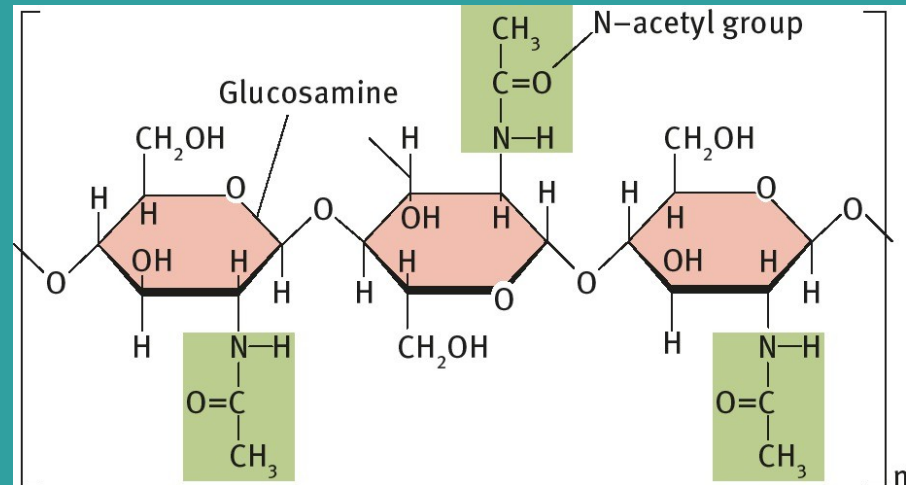
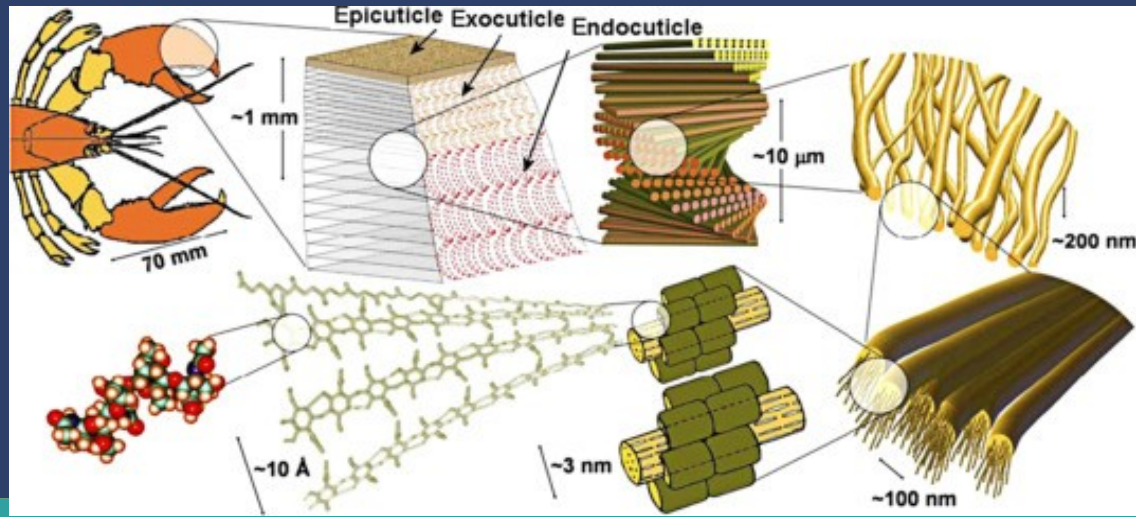
- Material that makes up plant cell walls.
- It is insoluble in water and cannot be digested by humans.
- Generally used in paper making, used in the production of rayon, photographic films & nitrocellulose.



	Cellulose	Starch		Glycogen
		Amylose	Amylopectin	
Source	Plant	Plant	Plant	Animal
Subunit	β -glucose	α -glucose	α -glucose	α -glucose
Bonds	1-4	1-4	1-4 and 1-6	1-4 and 1-6
Branches	No	No	Yes (~per 20 subunits)	Yes (~per 10 subunits)
Diagram				
Shape				

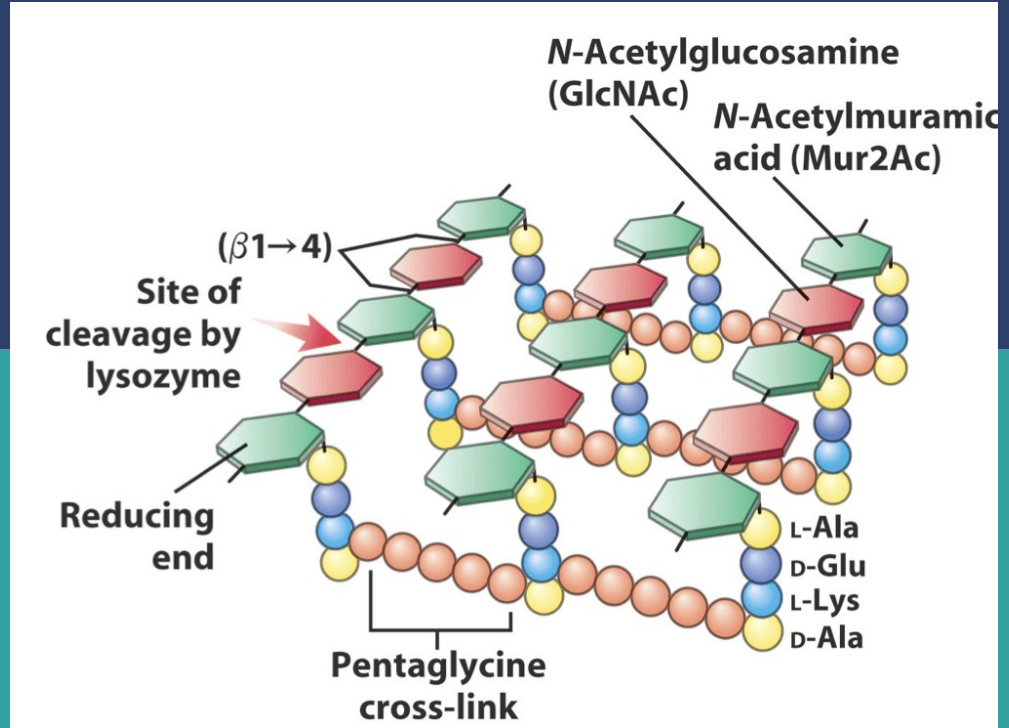
CHITIN

- Found in the exoskeletons of insects, the cell walls of fungi, and certain hard structures in invertebrates and fish.



PEPTIDOGLYCAN

- Is a polymer that makes up the cell wall of most bacteria.
- Provides a very important role in bacteria because bacteria are unicellular; it gives strength to the outer structure of the organism.



KEY

TAKEAWAYS:

- Biomolecules are the most essential organic molecules, which are involved in the maintenance and metabolic processes of living organisms.
- There are four major classes of Biomolecules – Carbohydrates, Proteins, Nucleic acids and Lipids.
- Carbohydrates are compounds made up of carbon, hydrogen, and oxygen. They are built from three types of sugar units—

THANK YOU FOR LISTENING!

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