

DETAILS : Section 3.3

(1)

Carbohydrates : Sugars + polymers of sugars

- (1) Mono saccharides
- (2) Disaccharides
- (3) Poly saccharides

Mono saccharides

- major nutrients for cells
- multiple of CH_2O (molecular formula)

↓
 $\text{C}_3\text{H}_6\text{O}_3$ (Glyceraldehyde - A triose)

$\text{C}_5\text{H}_{10}\text{O}_5$ (Ribose - A pentose)

$\text{C}_6\text{H}_{12}\text{O}_6$ (Glucose/Fructose - hexose)

- carbonyl group ($\text{C}=\text{O}$) and multiple hydroxyls (OH) (Alcohols)

⇒ in Aqueous solution, glucose and other 5 and 6 carbon sugars form RINGS

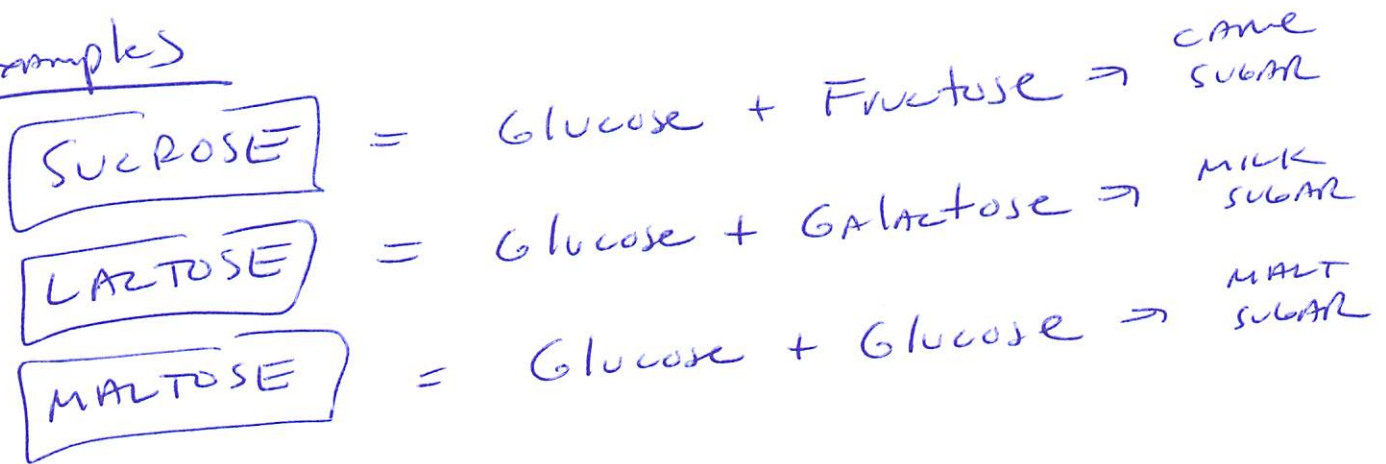
⇒ sugars are either KETONES or Aldehydes

⇒ carbon skeletons of sugars are used to build other organic molecules → i.e. Amino acids

DISACCHARIDES

- two monosaccharides joined by a glycosidic linkage (the name for the bond formed between 2 mono's in a Dehydration reaction).

Examples



MINOR DETAIL

★ Because Fructose forms a 5-sided ring (even though it is a hexose), the numbering system of the carbons in Glucose and Fructose are very different —



Therefore $\rightarrow$ the glycosidic linkage is a 1-2 link

POLYSACCHARIDES

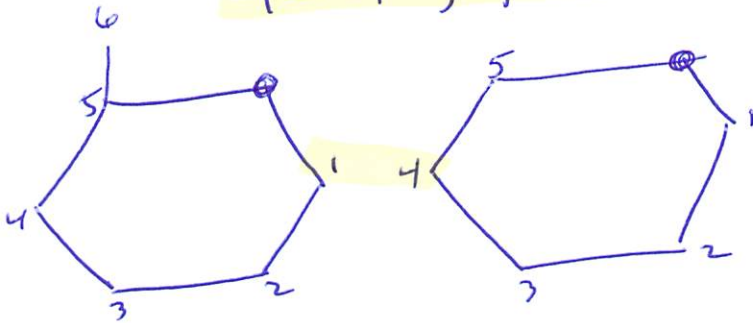
Macromolecules $\rightarrow$ polymers $\rightarrow$ monomers are SUGARS

$\Rightarrow$ STRUCTURE AND FUNCTION DETERMINED by the SUGAR MONOMERS and positions of the GLYCOSIDIC LINKAGES

Types:

- | | | |
|-------------|---|------------------------|
| ① Starch | - | STORAGE |
| ② Glycogen | - | STORAGE |
| ③ Cellulose | - | STRUCTURE (plants) |
| ④ Chitin | - | STRUCTURE (arthropods) |

① STARCH - "stored energy"
 soluble - potatoes, corn, wheat, rice $\rightarrow$ plant starch
 - glucose monomers joined by
 1-4 glycosidic linkages



generic
 glucose
 NOT
 addressing
 α or β forms

(4)

→ branched versus unbranched polysaccharides

Confusing - so...

Cellulose - unbranched → leads to microfibrils
which → leads to strength
* Details unnecessary.

↓
insoluble as well unless organisms have
evolved enzymes to digest it

- (2) Glycogen - storage
- liver & muscle cells
- can be hydrolyzed to release
glucose
- in humans, could provide energy for a diet
- branched → don't worry.

- (3) Back to Cellulose & Chitin
- structural
- 1-4 linkages but Different

WHY?

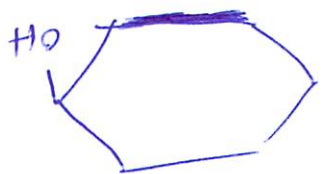
★ there are 2 forms of

ringed glucose

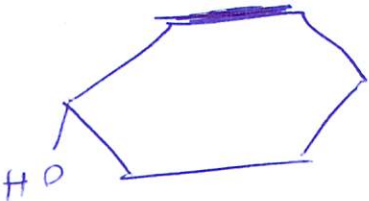
Alpha (α) glucose

and

Beta (β) glucose



-OH below plane



-OH above plane

because starch and glycogen are made up of α glucose, they tend to form helices (based on amount of branching - don't worry!)

- all -OH's below plane

because cellulose is not branched it doesn't form helices → stays straight

because it is made up of β-glucoses they have to alternate to form the glycosidic linkages (don't worry)

alternating OH's become available to form 1,4 glycosidic bonds with adjacent chains → 12UG4

⇒ "cable-like" microfibrils of cellulose used for plant structure

(6)

★ CHITIN - structural polysaccharide

- arthropods - insects, spiders, crustaceans
- like cellulose but glucose monomer has nitrogens attached