Carbohydrates

Monosaccharides	Forms	In α-glucose, the –OH group on C1 is on opposite sides as C6. In β-glucose, the –OH group on C1 is on the same side as C6.
	Molecular Structure	<u>What is the significance of the molecular structure of monosaccharides?</u> They are **small in size**. Hence, they are **readily soluble in water** as many hydroxyl groups can form hydrogen bonds with water. Hence, they are **transported easily** in water. Pentoses and hexoses can **exist as rings**, which are **stable building blocks** for larger molecules. Ring structures exhibit α and β **isomerism**. This **increases the diversity** of monosaccharides which can become building blocks for different molecules. They possess a **free carbonyl group**, giving them **reducing ability** and making them a **suitable respiratory substrate**.
Disaccharides	Glycosidic Bond	A covalent bond formed between two monosaccharides by a **condensation** reaction that involves the **loss of a water molecule**. Hydrolysis involves the **addition of one molecule of water** to break a glycosidic bond. This is **catalyzed by an enzyme**.
	Examples	Maltose (maltase): 2 α-glucose joined by an α(1-4) glycosidic bond. Lactose (lactase): glucose and galactose. Sucrose (sucrase, invertase): α-glucose and β-fructose joined by an α(1-2) glycosidic bond.
	Reducing Sugars	Maltose and lactose are reducing sugars while sucrose is not.
	Benedict's Test	This is a test for reducing sugars. Benedict's solution is an irritant. Goggles and gloves should be worn when carrying out the Benedict's test. <u>Describe how a test for reducing sugars is carried out.</u> Carry out **Benedict's test** by placing the sample solution in a test tube and adding an equal volume of Benedict's reagent. Shake mixture and **heat** it in a **boiling water bath** for 3-4 minutes. A **brick-red precipitate** is formed if a reducing sugar is present. <u>Describe how a test for non-reducing sugars is carried out.</u> Carry out **Benedict's test** first by placing the sample solution in a test tube and adding an equal volume of Benedict's reagent. Shake mixture and **heat** it in a **boiling water bath** for 3-4 min. Then carry out acid hydrolysis by **boiling** an equal volume of a new sample of test solution with **dilute hydrochloric acid** for 1 min. Cool the contents of tube and **neutralize** the acid with **sodium bicarbonate** solution. Repeat the Benedict's test on the sample. If only non-reducing sugar is present, then the initial Benedict's test should give a negative result with the solution remaining **blue**. After hydrolysis, Benedict's test should produce a **brick red precipitate**.