Key Terms

Conden-sation	The **removal** of a water molecule to **form** a bond between 2 molecules.
Hydrolysis	The **chemical addition** of a water molecule to **break** a bond between 2 molecules.
Ion	A **charged** atom or molecule that has **gained** or **lost** electrons.
Isomer	Molecules with the **same chemical formula**, but with a **different arrang-ement** of **atoms**

Structures

Should be able to recognise the **structural formulae** of the main biological molecules and show **how** bonds are **formed**. See pg.8

Inorganic Ions

Magnesium	Constituent of **chlorophyll** -> needed for **photosynthesis**. When lacking, leaves appear yellow (**chlorosis**).
Iron	Constituent of **haemoglobin**, so is involved in **transport of oxygen**. A diet **deficient** in **iron** can lead to **anaemia**.

Inorganic Ions (cont)

Calcium	**Structural** component of **bones** and **teeth** (phosphate is also required).
Phosphate	Needed for **making nucleotides** including **ATP**. A constituent part of **phospholipids** in cell membranes.

Carbohydrates

Structure:

Small organic molecules containing **carbon, oxygen and hydrogen.**

Function:

Building blocks for more **complex** molecules, e.g. ribose, which forms a **constituent** molecule of **RNA**

Source of **energy**, e.g. **glucose**

Energy storage molecules, e.g. **glycogen and starch**

Structural support, e.g. cellulose and chitin

Key terms

Dipolar	A **polar** molecule with a **positive** and **negative** charge.
Hydrogen bond	**Weak** attractive **force** between a **positively** charged **hydrogen** atom and a **negatively** charged **oxygen** or **nitrogen** atom.

Water Structure

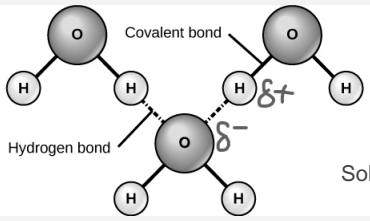
It is a **dipolar** molecule - Has a **positively** charged **hydrogen** end and a **negatively** charged **oxygen** end but **no** overall **charge**.

Hydrogen bonds easily form **between** the **hydrogen** on one molecule and the **oxygen** on another.

Individually water molecules are weak however **together** they are **strong.**

The majority of water's properties arise from its **dipolar** nature and **hydrogen bonding.**

Water Molecule



Monosaccharides

All contain **carbon, hydrogen and oxygen** $(CH_2O)_n$ where n is a number between 3 and 6.

The **triose sugars** are important in **respiration pathways.**

Pentose sugars such as ribose and deoxyribose are important constituents of **nucleic acid** and deoxyribonucleic acid **(DNA)**

Glucose

Glucose is a **hexose sugar**.

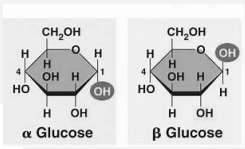
Other hexose sugars include **galactose** and **fructose**.

Isomers are substances that have the same formula but different structures.

The isomers of glucose are **a-glucose** and **b-glucose**.

For Carbon no.1 of **a-glucose** the hydroxyl group (OH) is in the down position whereas visa versa for **b-glucose**

Alpha and Beta Glucose



Properties

Solvent	Involved in many **biological reactions**, e.g. hydrolysis and condensation - Allows **polar molecules** e.g. glucose and ions, to **dissolve**. It a **transport** medium e.g. blood.

Water Properties (cont)

High specific heat capacity	Large amount of **heat energy** needed to **increase** the temp of a **body of water** (due to large number of hydrogen bonds that need to be broken) large **fluctuations** in temperature are **prevented**. **Aquatic environments** are therefore relatively **thermally stable.**
High latent heat of vaporisation	Large amounts of **heat energy** are needed to **vaporise water**, so it is often used as a **cooling mechanism** e.g. sweating in mammals.
Metabolite	It is involved in many **biochemical reactions**, e.g. hydrolysis and condensation and as a reactant in photosynthesis.

Water Properties (cont)

Cohesion	Water molecules **attract each other** and form **hydrogen bonds** between themselves. This allows **water** to be drawn up the **xylem** vessels of trees, and creates **surface tension** allowing insects such as the **pond skater** to be supported. Water also **provides support** for other aquatic organisms e.g. **jellyfish**
High density	Water has a **maximum density** at **4degreesC**: as a result, **ice floats**, and acts as an **insulator preventing** the water beneath from **freezing completely**, protecting the aquatic habitat.

Water Properties (cont)

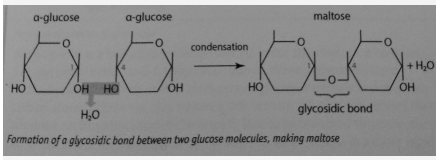
Trans parent	Allows **light** to pass through **enabling** aquatic plants to **photosynthesise**.

Disaccharides

Formed by **joining 2 monosaccharides** together

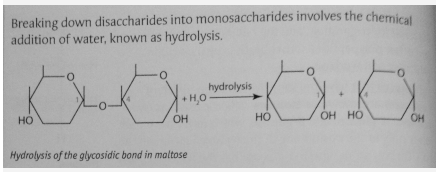
Involves the **loss** of a molecule of **water** and the **formation** of a **glycosidic bond**, via a **condensation reaction**

Formation of Maltose



Formation of a glycosidic bond between two glucose molecules, making maltose

Hydrolysis of Maltose



Hydrolysis of the glycosidic bond in maltose

Types of Disaccharide

Disaccharide	Component Monosaccharides	Biological Role
Maltose	Glucose + glucose	In germinating seeds
Sucrose	Glucose + fructose	Transport in phloem flowing plants
Lactose	Glucose + galactose	In mammalian milk

Polysaccharides

Formed when many monosaccharides **combine together** to make a **polymer**

They are good **energy storage molecules** because:

-Unable to **diffuse** out of the cell