Welcome to AS Biology!...

...Time for a homework!

Print the specification for next week:

-Just the "subject content" part will be fine

- Make sure you print the "Revised GCE" spec. (not the old spec.) (pages 10-35)

-Print 2 pages to the page

- Use this website:

http://www.ccea.org.uk/biology/

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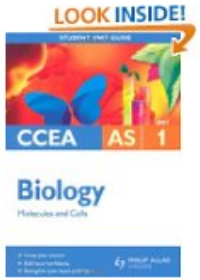

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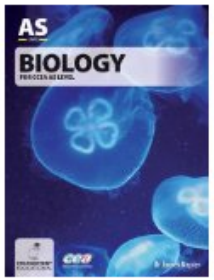

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WATER AND INORGANIC IONS

- The water molecule has many unique properties
- It is a polar molecule
- This means it carries a slight charge and results in hydrogen bonds being formed between the O of one water molecule and the H of another
- Hydrogen bonds are weak but because there are lots of them they form a strong lattice framework
- (The hydrogen bonds give water its cohesive properties. This allows water to move through the xylem in transpiration)

Temperature regulation:

Water also has an important role in temperature regulation, since evaporation from a surface cools it down. The energy required to break the hydrogen bonding in a liquid is known as *the latent heat of evaporation*

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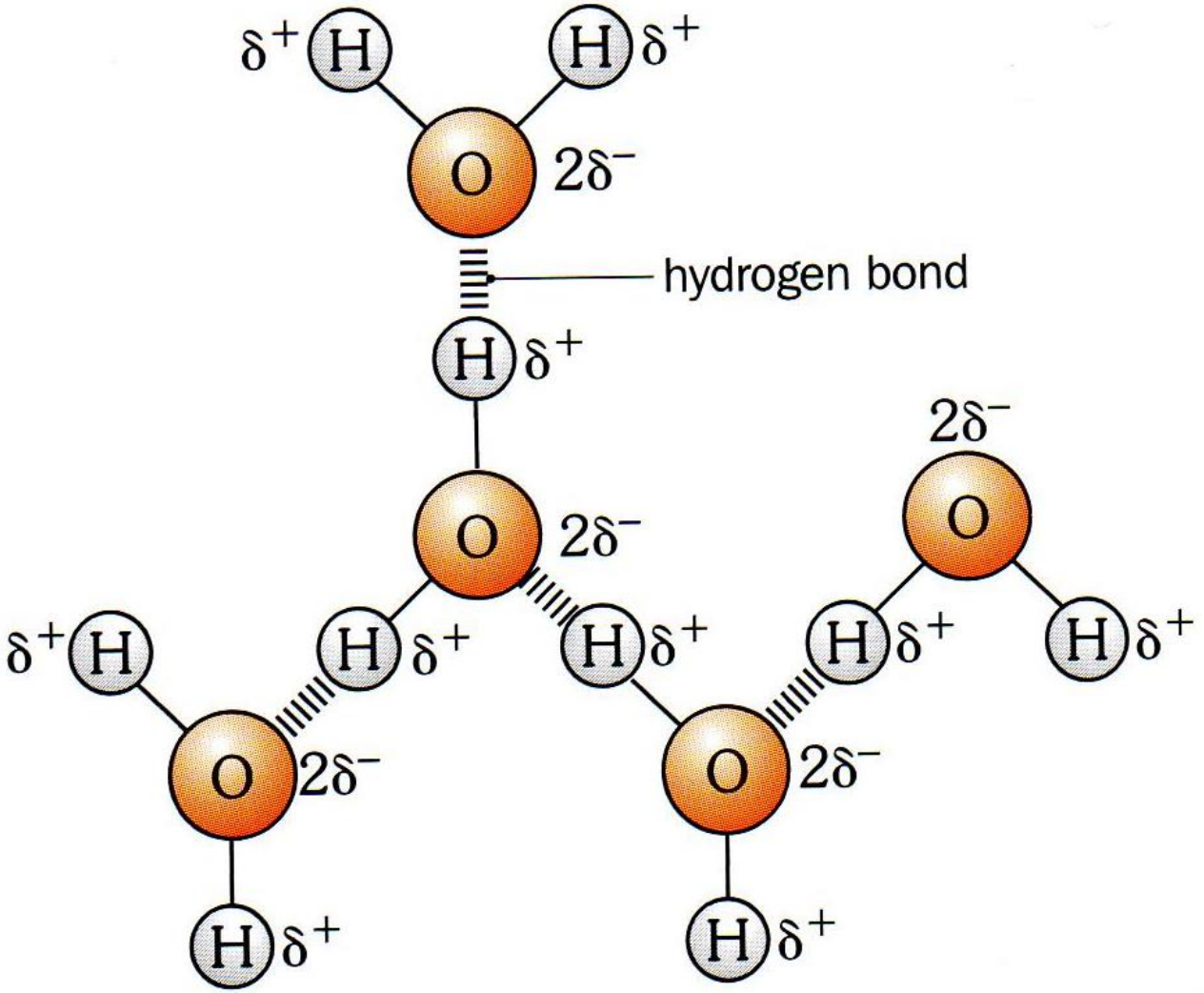
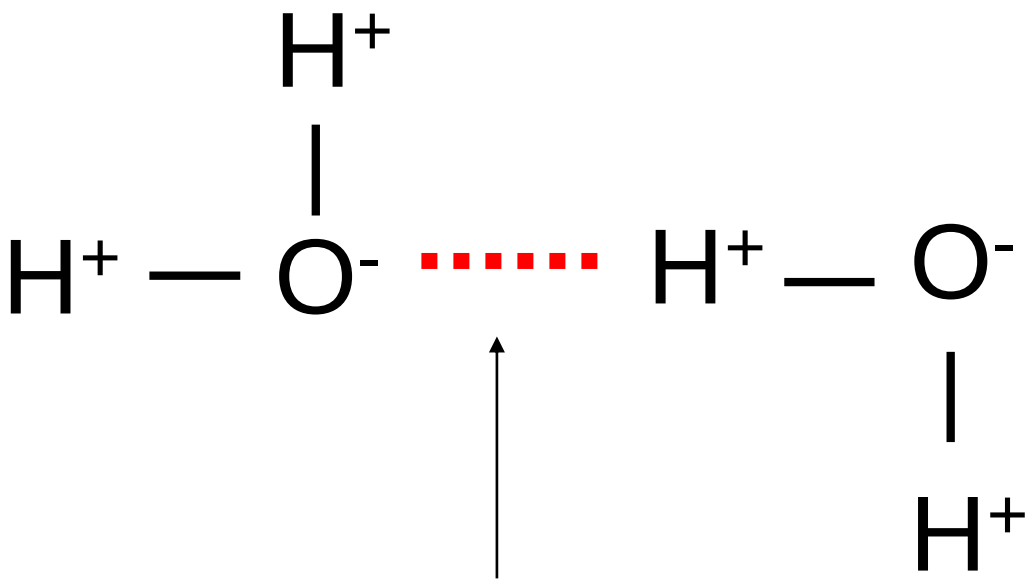


Water molecules are held together by hydrogen bonds



H bond

O slight -ve charge

H slight +ve charge

(due to sharing of electron in the covalent bond)

Water is the solvent of life:

- It's polar molecules are attracted to charged ions and polar substances (have 2 slight charges on them) e.g. glucose, which then dissolve and form solutes
- Even molecules as large as proteins can dissolve in water if they have ionic and polar regions on their surface
- Many different molecules are dissolved in water of biological fluids such as blood, the sap of plants and the liquid cytoplasm within every cell.

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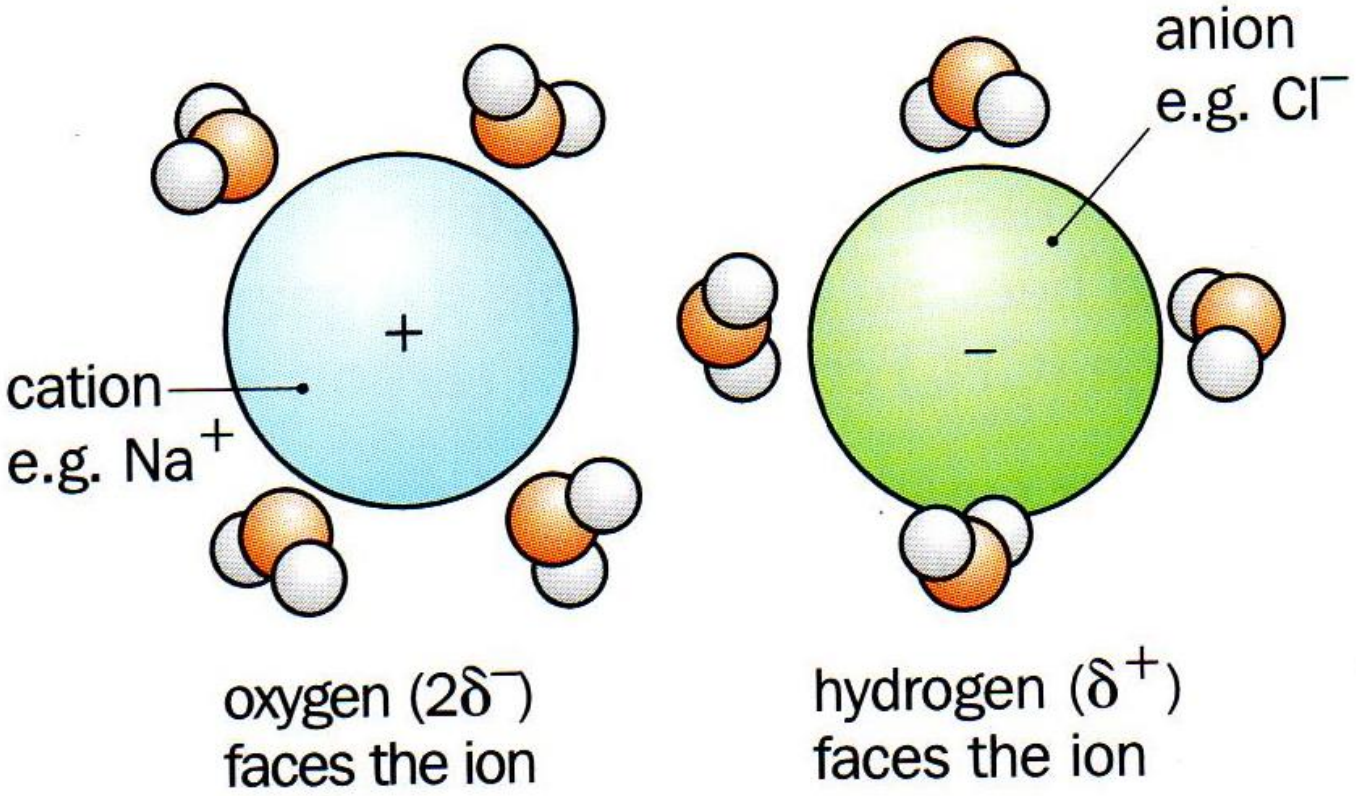


The way in which water molecules arrange themselves around ions in solution

Water may also be used as a solvent for:

1. Transport: blood plasma, tissue fluid and lymph are all predominantly water and are used to dissolve a wide range of substances which can then be easily transported
2. Excretion (removal of wastes): metabolic wastes like ammonia and urea are removed from the body in solution in water
3. Secretions: most secretions comprise substances in aqueous solution. Most digestive juices have salts and enzymes in solution; tears consist largely of water and snake venoms have toxins in suspension in water.

Excretion

- occurs when the body gets rid of waste products of metabolism e.g. using water to dilute urea to form urine

Secretion

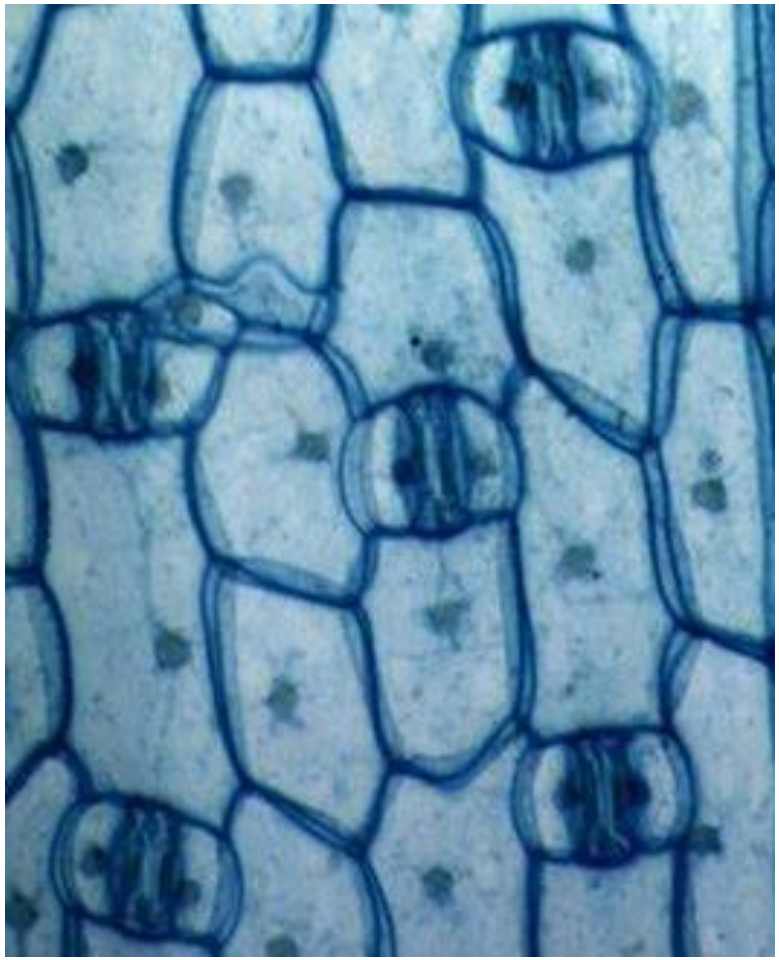
- occurs when the cells release a solution or suspension of substances which are used elsewhere in the body e.g. the secretion of insulin from the pancreas to control blood glucose levels

The role of inorganic ions

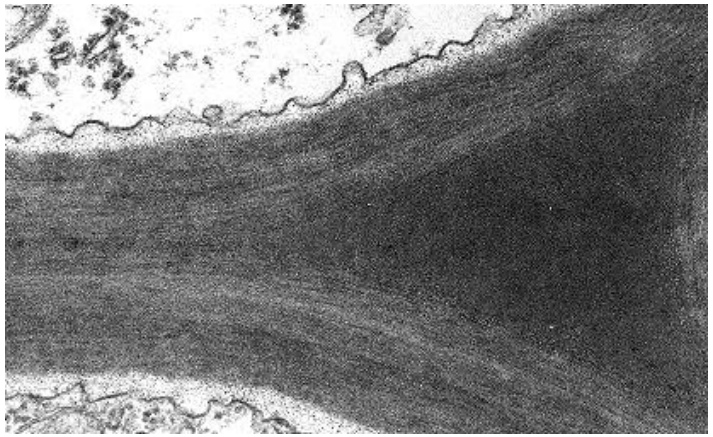
- Organic molecules contain carbon. Inorganic molecules do not. Ions are atoms that have lost or gained electrons (they are charged)
- Water is the most important inorganic molecule in biology
- Dissolved in the water inside living organisms are a large number of inorganic ions
- The ions of potassium, calcium, magnesium and iron are macronutirents or major elements which are needed in very small quantities by living organisms

Potassium K^+

- plays an important role in the transmission of nerve impulses. It helps to maintain the electrical, osmotic and ionic balance across cell membranes
- Potassium is also involved in the mechanism for the opening and closing of stomata

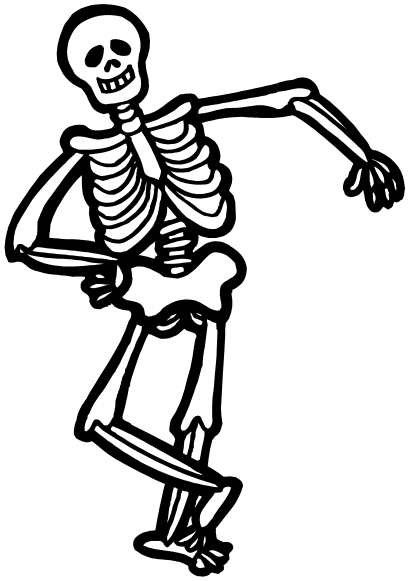


Calcium Ca^{2+}



- In plants calcium pectate is an important component of the middle lamella of cell walls, and is vital for their proper development

- Calcium salts are important in skeletal structures such as bones of mammals and shells of molluscs

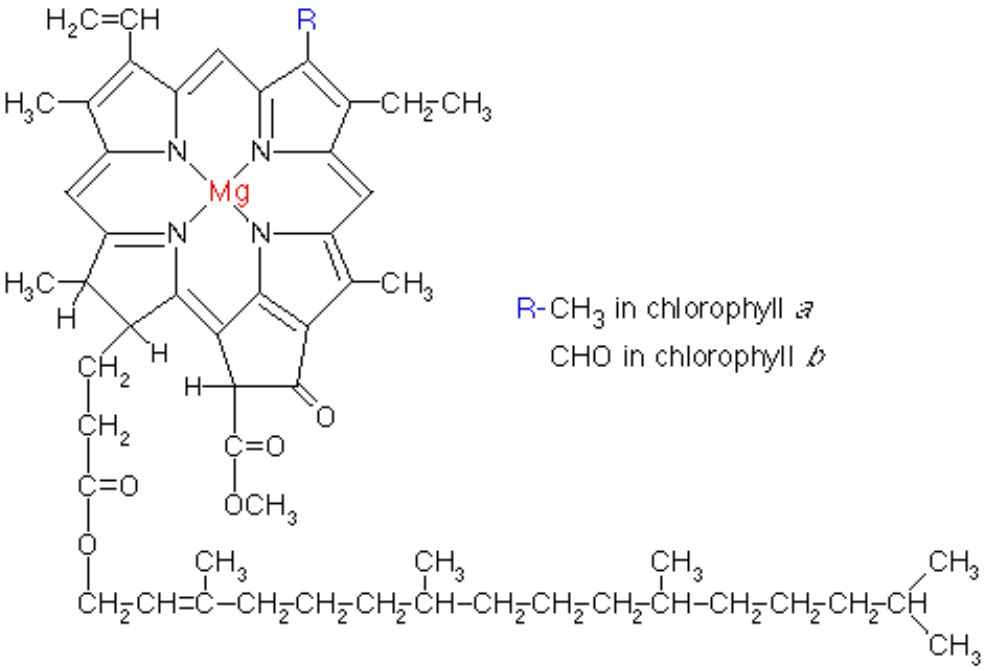


Homework for Wednesday

Complete notes and questions from
www.kdbio.weebly.com

Magnesium Mg^{2+}

- An important constituent of chlorophyll
- Present in bones and teeth



The structure of chlorophyll

Iron Fe^{2+} or Fe^{3+}

- A constituent of electron carriers, a group of molecules needed in respiration and photosynthesis
- Constituent of many important enzymes
- Required for chlorophyll synthesis
- Part of the haem group in the pigment haemoglobin and myoglobin; deficiency in animals leads to anaemia

Nitrates NO_3^-

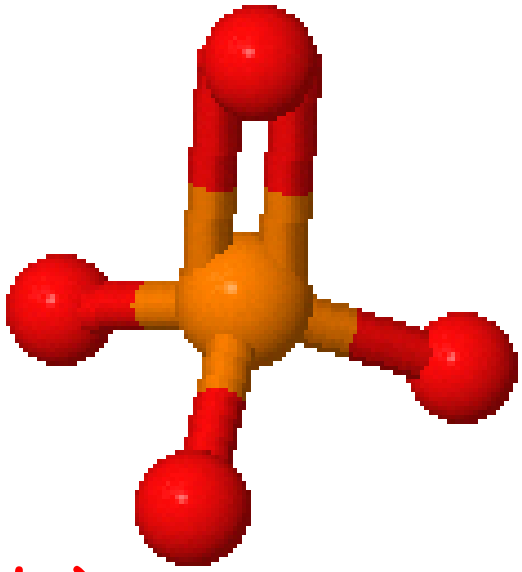
Needed to make:

- Amino acids (for proteins)
- Proteins
- Vitamins
- Nucleotides (for DNA and RNA)
- Chlorophyll
- Some hormones
- Plants take up nitrates by active transport through root hair cells
- Animals consume nitrogen containing compounds such as proteins

Phosphates PO_4^{3-}

Needed to make

- Nucleotides (in DNA and RNA)
- ATP (energy molecule)
- Some proteins

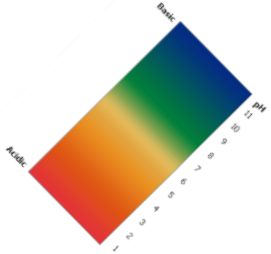


Constituent of

- bones and teeth
- Cell membranes (phospholipids)

Hydrogen carbonate HCO_3^-

- Important buffer in blood, maintaining constant pH
- The majority of carbon dioxide produced in respiration combines with water in the blood to form carbonic acid. This readily dissociates into hydrogen and hydrogen carbonate ions.
- The H^+ and hydrogen carbonate system acts as a buffer in body fluids, so resisting pH change, maintaining it around 7.4
- A buffer is just a mixture of weak acid and it's conjugate alkali (or vice versa). The acid will donate H+ ions to neutralise an added alkali. The alkali will accept H+ ions to neutralise an added acid



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A buffer works by:

- *Accepting H+ ions from a solution when they are in excess i.e. when there is a drop in pH and*
- *Donating hydrogen ions to the solution when they have been depleted (responding to a rise in pH).*

Response to a rise in pH (alkali added)

$H_2CO_3 \rightarrow HCO_3^- + H^+$

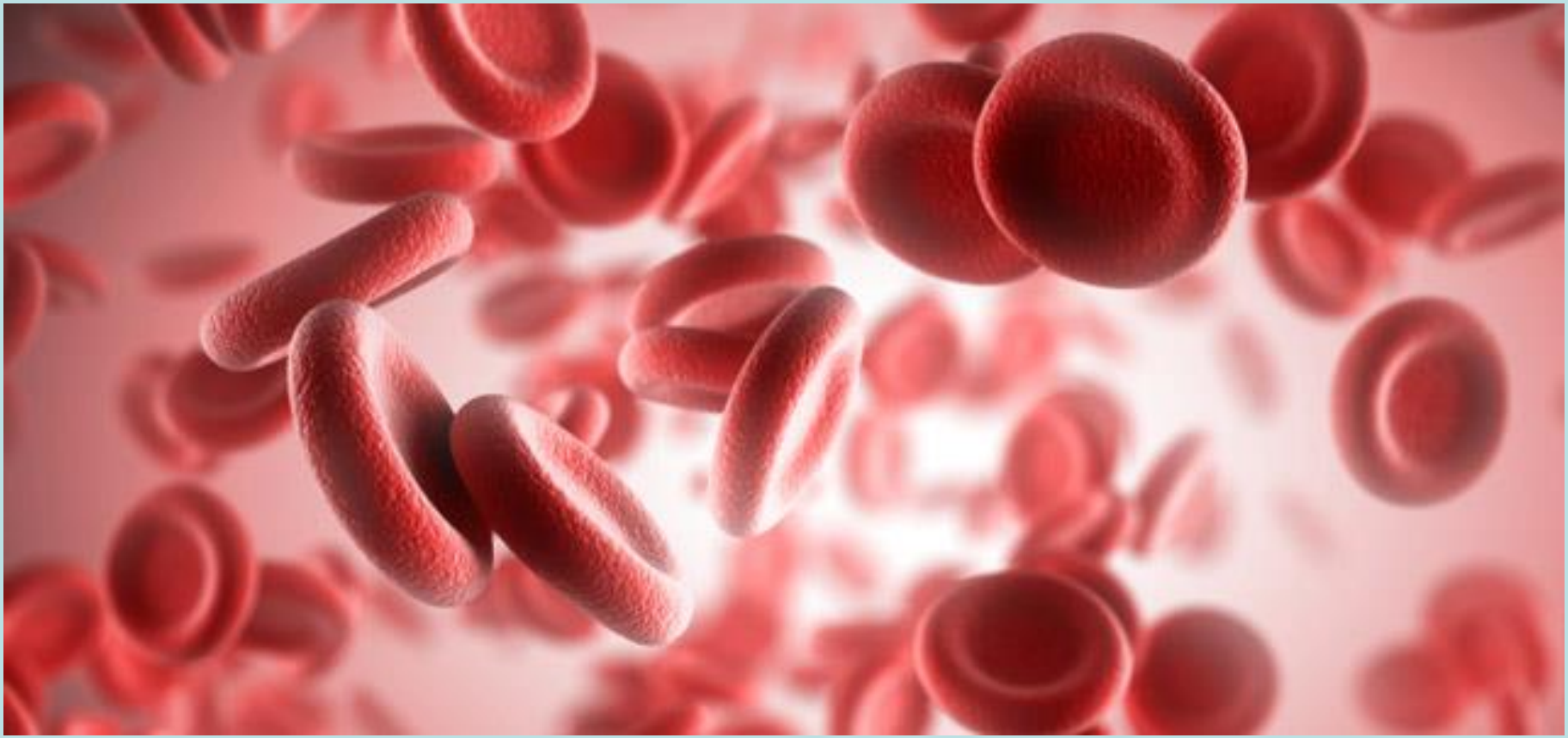
H+ donor (acid) — H+ acceptor(base)

Response to a drop in pH (acid added)

$HCO_3^- + H^+ \rightarrow H_2CO_3$

H+ acceptor(base) — H+ donor (acid)

Hydrogen carbonate is an important natural buffer; as is the protein albumin. Both are found in blood. Buffers are often used in experiments with enzymes – they regulate the pH of the solutions to ensure the enzyme remains at its optimum pH.



Biological Molecules

– an introduction

Macromolecule:

very large organic molecules containing many different elements

e.g. lipids = fatty acids + glycerol

Monomer:

small building blocks which are identical or very similar

e.g. nucleotides, monosaccharides, amino acids

Polymer:

monomers joined together

e.g. proteins, nucleic acids e.g. DNA, polysaccharides e.g. starch

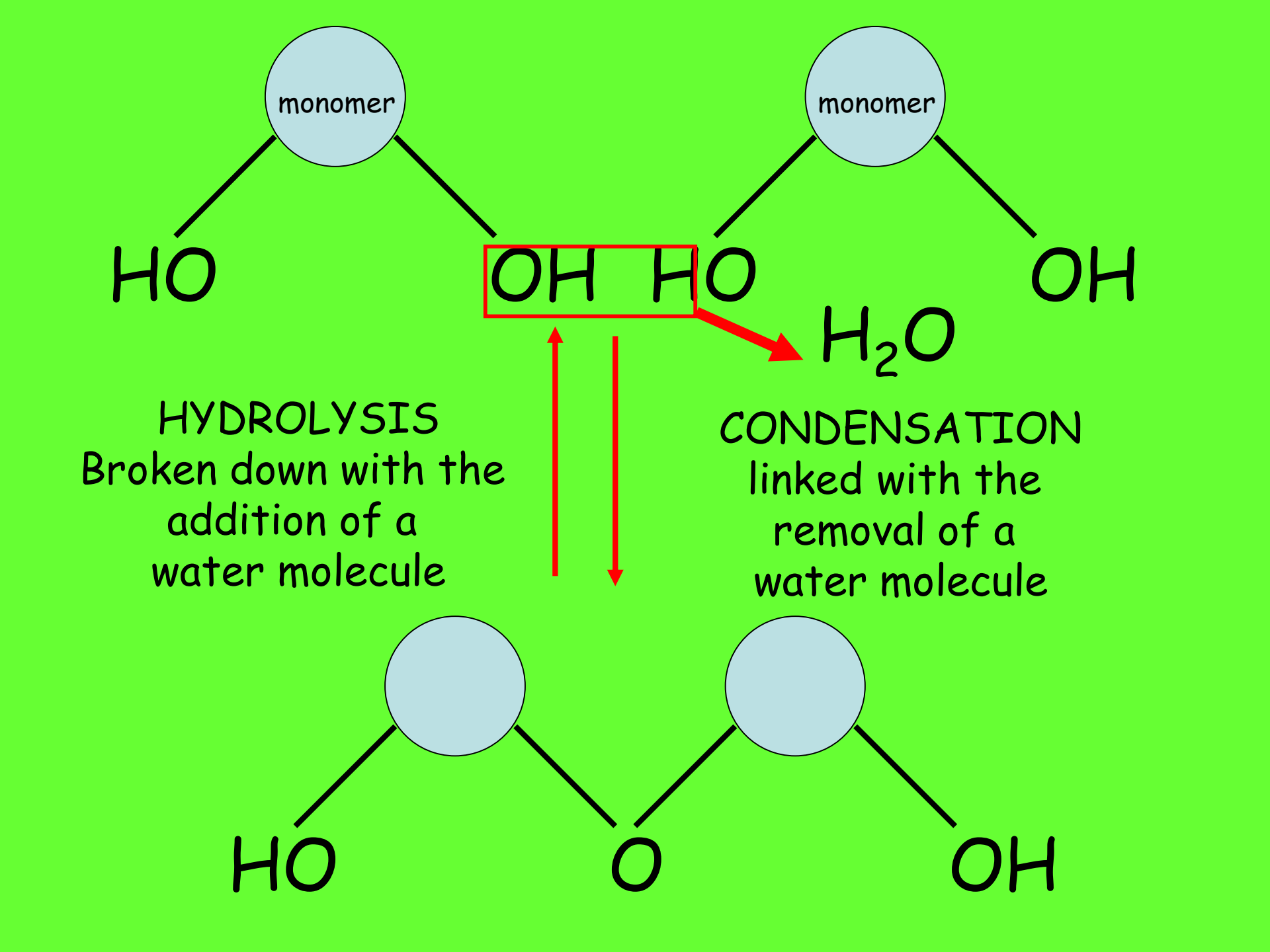
Organic Macromolecules

The main organic macromolecules to be studied are carbohydrates, proteins, lipids and nucleic acids

They all contain the elements carbon, hydrogen and oxygen (nucleic acids and proteins contain Nitrogen)

Polymers form by condensation reactions

- Individual monomers join by condensation reactions to form polymers, releasing water.
- The hydroxide groups (OH) from two monomers react.
- Hydrogen (H) from one and hydroxide (OH) from the other are released as water (H_2O).
- The monomers then join by the remaining oxygen atom (O)


monomer
monomer
HO
OH
HO
OH
H_2O
HYDROLYSIS
Broken down with the addition of a water molecule
CONDENSATION
linked with the removal of a water molecule
HO
O
OH