Chemical elements are joined together to form biological compounds

Water - a polar molecule which allows hydrogen bonds between molecules giving water important properties.

Property	Function		
Solvent	Polar molecules dissolve in water and are able to be transported.		
Metabolite	Water is a reactant in photosynthesis and hydrolysis, produced in aerobic respiration and condensation.		
High specific heat capacity	A lot of energy is required to change the temperature of water so aquatic/cellular environments remain stable.		
High latent heat of vaporisation	Evaporative cooling.		
Surface tension	Support and buoyancy.		

Proteins

Proteins are constructed from **20 types** of amino acid. The general form of an amino acid is shown here. The R group is different in each of the 20. Two amino acids linked form a **dipeptide**. A polymer is called a polypeptide.

Primary Structure

The sequence of amino acids as coded by the DNA. Amino acids are linked together by **condensation** reactions that form peptide bonds.

Secondary Structure

Hydrogen bonds formed between the amino acids in the chain cause it to fold into an alpha helix or beta pleated sheet.

Tertiary Structure

Hydrophobic interactions between the variable groups within the secondary structure forms and disulphide and ionic bonds forms a very specific folded structure e.g. the active site of an enzyme.

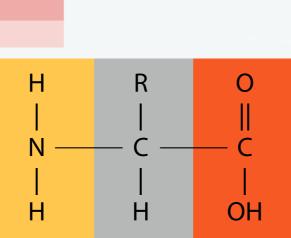
Quaternary Structure

More than one polypeptide chain linked to form a molecule.

Fibrous proteins	e.g keratin- structural function
Globular proteins	e.g enzymes- metabolic function

Test for proteins

Biuret solution -blue Positive reaction - A purple/violet colour is seen.



Hydrogen bonds

Amino(basic) Variable group Carboxyl (acid) group group

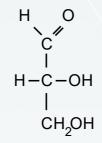


Carbohydrates

Monosaccharides

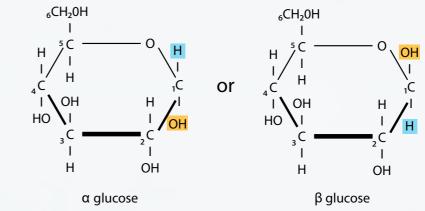
Triose

3C important in respiration and photosynthesis.



Hexose

6C Glucose is a really important hexose sugar. It is used in respiration. Monosaccharides are linked to make dimers and polymers. There are two isomers of glucose.



Disaccharides

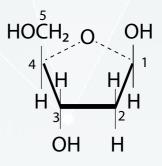
Sucrose	Glucose and fructose linked in a cor of water is lost and a glycosidic bon	
Maltose	As above but the monosaccharides I	
Lactose	A dimer formed from glucose and g	

Polysacch
A polymer of α-glucose (composed of amylopectin) Compact energy storage
A polymer of α -glucose, energy stora
A polymer of β-glucose, adjacent mo other, allowing hydrogen bonds betv structure for plant cell walls.
As cellulose but with some –OH grou acetylamine groups. Strong, lightwei



Pentose

5C Important in nucleotides.



a-glucose OH group points up on carbon 1 but on β -glucose it points down.

ndensation reaction where one molecule d is formed.

linked are α -glucose and α -glucose.

aalactose.

arides

of straight-chain amylose and branched ge in plants with little osmotic effect.

age in animals.

onomers twisted through 180° to each ween chains, forming microfibrils. A strong

ips replaced by nitrogen-containing ight and waterproof for exoskeletons.

Test for starch

Iodine solution - red/brown Positive reaction – A blue /black colour is seen.

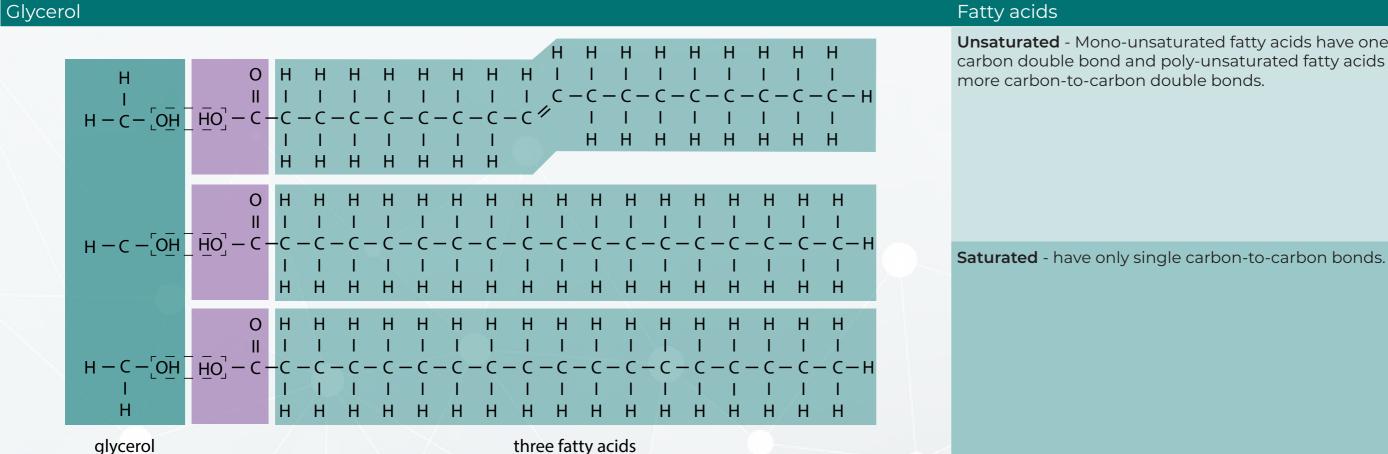
Test for reducing sugar

Benedict's reagent-blue

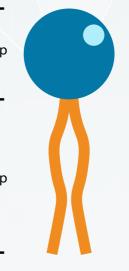
Positive reaction- a semi quantitative test. The further along the colour spectrum the solution goes the more sugar is present. For this test to work on non-reducing sugars (those which do not reduce copper II sulphate) they must be hydrolysed by boiling in hydrochloric acid first.

Inorganic ions - An ion that contains no more than one				Lipids	hydrophilic group	
carbon atom. Ion	Formulae	mulae Function		Triglyceride	Glycerol linked to 3 fatty acid chains during condensation reactions forming	
Magnesium	Mg ²⁺	Chlorophyll			ester bonds.	_
Iron	Fe ²⁺	Haemoglobin		Phospholipids	Chronyel links of the 2 fatty and also interned	hydrophobic group
Potassium	PO ₄ ³⁻	Nucleic acids and phospholipids			Glycerol linked to 2 fatty acid chains and a phosphate molecule. A phospholipid has a hydrophilic head and hydrophobic tail . These properties explain the plasma membrane lipid bilayer.	
Calcium	Ca ²⁺	Strengthening bones and teeth in animals cell walls in plants.				

Functions of lipids include insulation, energy storage and protection.



A high intake of saturated fats, is a contributory factor in heart disease as it raises the low-density lipoprotein (LDL) cholesterol level, which increases the incidence of atheroma's in coronary arteries.



Test for lipids

Mix with **absolute** ethanol then add equal volumes of water.

Positive result- A cloudy emulsion is formed.

Unsaturated - Mono-unsaturated fatty acids have one carbon-to carbon double bond and poly-unsaturated fatty acids contain two or