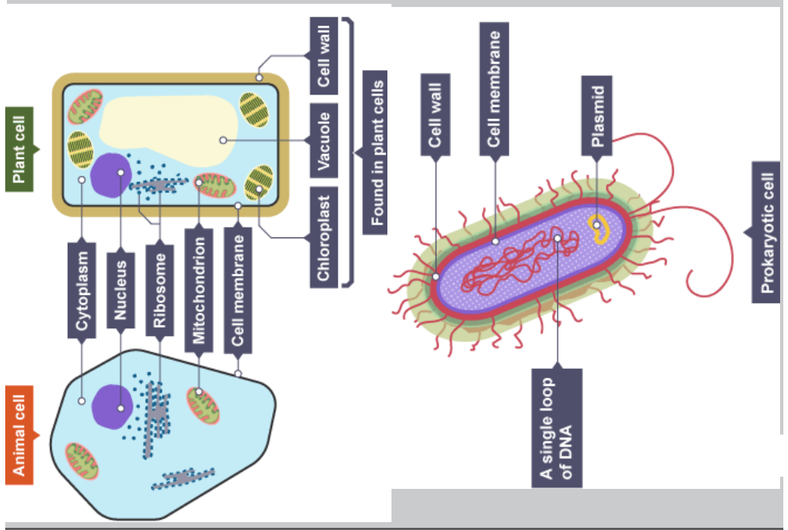
Science Year 9 Cells

Cell structure



Magnification calculations

Image size = actual size x magnification

Example:

A specimen appeared 10mm in length under a microscope with a magnification of 1,000 times. Calculate actual length.

E: Image size = actual size x magnification

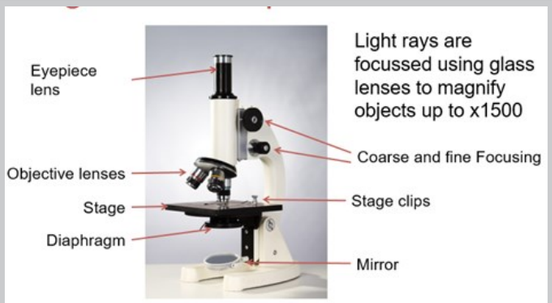
C: 100mm = 100,000um

S: 100,000 = actual size x 1000

S: 100 = actual size

U: nm

Light microscopes

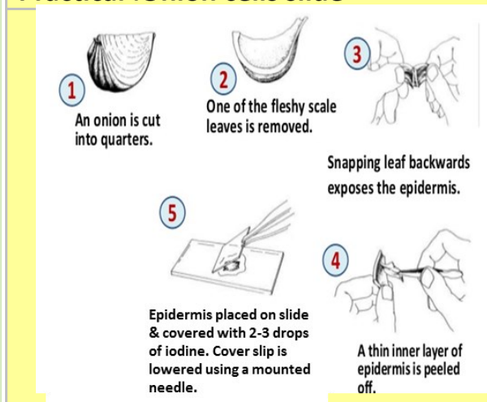


Keyword definitions

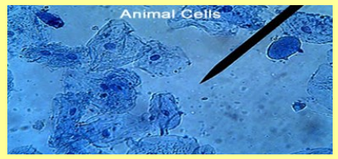
Nucleus	Contains genetic material, which controls the activities of the cell
Cytoplasm	Most chemical processes take place here, controlled by enzymes
Mitochondria	Most energy is released by respiration here
Ribosome	Protein synthesis happens here
Cell membrane	Controls the movement of substances into and out of the cell
Cell wall	Surrounds the cell. Made of a tough fibre called cellulose. Makes the wall rigid and supports the cell.
Chloroplast	Contain chlorophyll, which absorbs light for photosynthesis
Vacuole	Filled with cell sap to help keep the cell turgid
Microscope Cell Staining	A technique used to enable better visualisation of cells and cell parts under the microscope. By using different stains, a nucleus or a cell wall are easier to view
Magnification	The magnifying power of a microscope
Resolution	The shortest distance between two points that can be made out as separate objects e.g. how well you can see detail

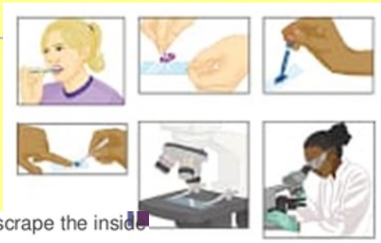
Microscopy

Practical :Onion cells slide



Practical: Cheek cells slide





1. Take a clean cotton swab and gently scrape the inside of your mouth.
2. Smear the cotton swab on the centre of the microscope slide for 2 to 3 seconds.
3. Add a drop of methylene blue solution and place a coverslip on top.
4. Remove any excess solution by allowing a paper towel to touch one side of the coverslip.
5. Place the slide on the microscope, with 4x or 10x objective in position and find a cell. Then view at higher magnification

Light Microscopes

Advantages	Disadvantages
Can view living specimens	Low resolution
Can view in colour	Low magnification

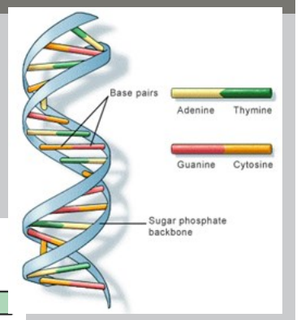
Electron Microscope

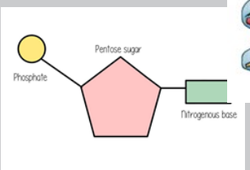
Advantages	Disadvantages
High magnification	Expensive
High resolution	Specimens must be dead
	Images are black and white

Science Year 9 Cells

DNA structure

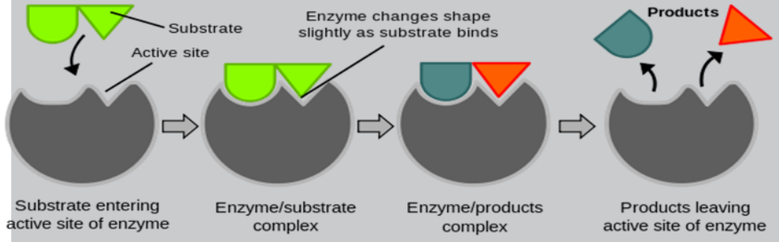
DNA Is a polymer. It is made of lots of monomers. These are called nucleotides (bases). Nucleotides pair up to create the double helix structure of DNA.





Enzymes

- Enzymes are biological catalysts, they speed up reactions in living things.
- Enzymes act on substrates following the lock and key mechanism shown in the picture to the right (the enzyme is the lock and the substrate is the key). Enzymes have a specific complementary shape to one substrate.
- Lots of factors can affect the rate of an enzyme controlled reaction. The optimum conditions are achieved when the rate of an enzyme controlled reaction is at it's highest.



Trinity TV

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Trinity TV > Year 9

Keyword definitions

Double Helix	The structure of DNA
Polymer	Long chained molecule made of repeating monomer units
Monomer	Small molecule, join together to form polymers
Nucleotide	Monomer of DNA. Complementary nucleotides bond together (A-T, C-G)
Protein	Polymer made of amino acids. Structure determined by DNA coding.
Enzyme	Biological catalyst
Substrate	Molecule complementary to enzyme active site
Rate	How quickly something happens.
Optimum	The best conditions, where the rate is the highest
Denatured	Active site of an enzyme is changed.
Complimentary	Structures that fit together

Enzymes

Enzymes in the Digestive System

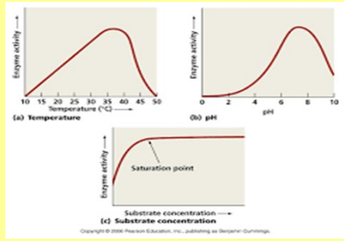
Enzymes in the digestive system act to break down polymers in food into monomers that can be absorbed into the blood:

Enzyme	Polymer	Monomer
Amylase	Starch	Sugars
Protease	Protein	Amino Acids
Lipase	Lipids	Fatty acids + glycerol

Factors affecting enzyme action

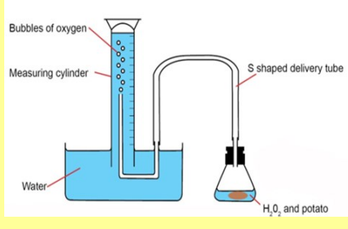
Factors that can affect the rate of enzyme controlled reactions:

- pH
- Temperature
- Concentration of enzyme
- Concentration of substrate



PRACTICAL: Rates of enzyme controlled reactions

Hydrogen peroxide is broken down by the catalase enzyme found in potatoes. Oxygen gas is produced. The volume of gas is measured over 5 minutes to calculate rate. This is repeated with differing concentrations of hydrogen peroxide.

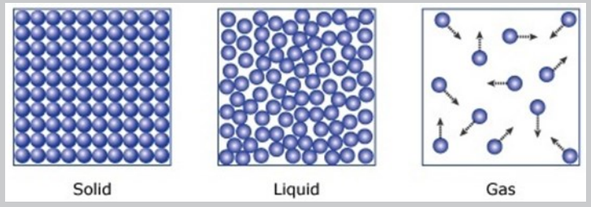


Year 9 Particles

Sub-atomic particles

Subatomic particle	Relative Mass	Relative Charge
Proton	1	+1
Neutron	1	0
Electron	0.0005	-1

Solids, Liquids and Gases



Solid: Particles have a regular arrangement. Vibrate in a fixed position.
Liquid: Particles in a random arrangement. Move over each other.
Gas: Particles in a random arrangement. Move quickly in all directions.

Forces Between Particles

- The attractive forces between particles are electrostatic forces.
- They occur between positive and negative charges.
- They become weaker the further apart the particles get.
- They are stronger in solids and weaker in gases.

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Definitions

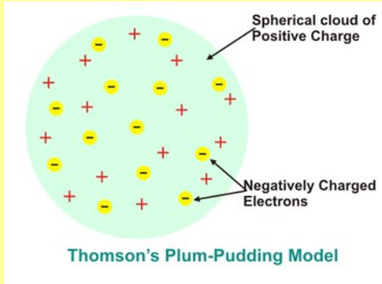
Atom	The smallest particle of an element that still has its chemical properties.
Molecule	Made from two or more atoms joined together.
Chemical reaction	Makes one or more new substances with properties that are different to the original substance.
Physical reaction	No new substance is made. Often a change of state.
Ion	An atom that has lost or gained electrons to become a charged particle.
Isotope	An atom that contains the same number of protons but a different number of neutrons.
Mass number	Shows the number of protons + neutrons in the nucleus.
Atomic number	Shows the number of protons in the nucleus.

Bond Length

Bond length = combined atomic radius of 2 covalently bonded atoms

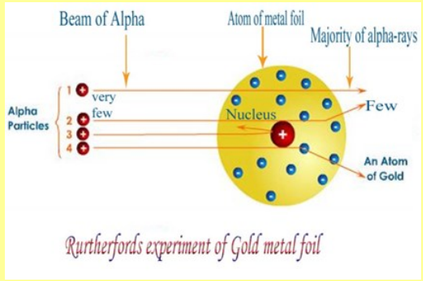
Atomic radius is typically about 1×10^{-10}m

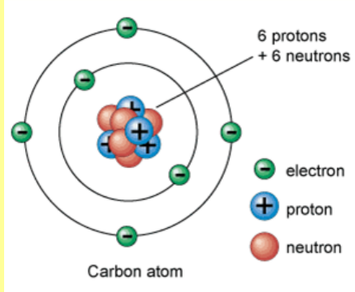
Particle Models



Thomson - (Plum pudding model) Discovered the electron. Suggested that they were distributed throughout the positive atom.

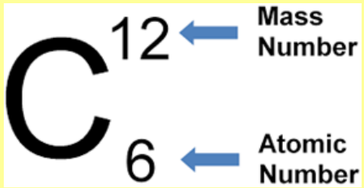
Rutherford - (Gold foil experiment) Discovered that the atom was mostly empty space with a dense positive nucleus.





Bohr -Discovered that electrons orbit the nucleus in shells.

The Periodic Table



Mass Number
The 'massive' number shows the number of protons and neutrons added together.

Atomic Number
The atomic number shows the number of protons.

The number of neutrons = mass number—atomic number