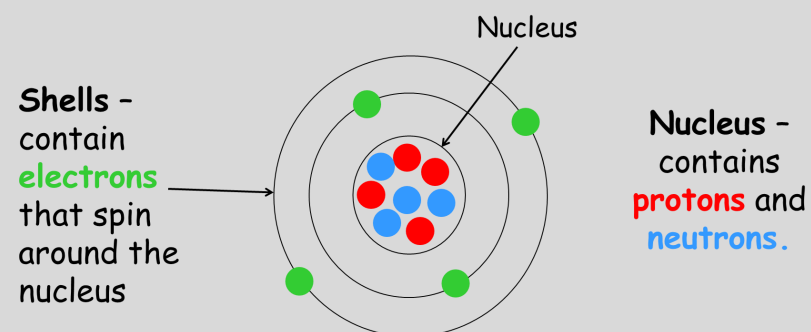


1. Definitions

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.

2. Structure of the atom

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



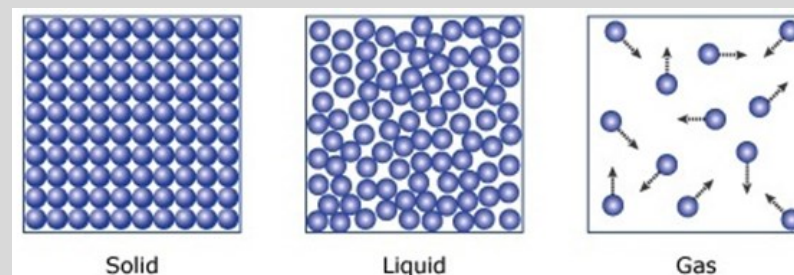
The typical size of an atom is 1×10^{-1} m.

3. States of Matter

Solid: Particles have a **regular arrangement**. **Vibrate** in a fixed position.

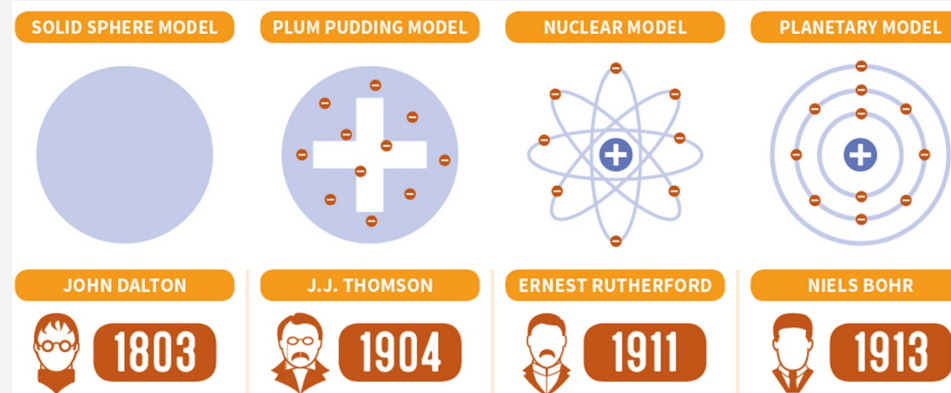
Liquid: Particles in a **random arrangement**. Move over each other.

Gas: Particles in a **random arrangement**. Move **quickly** in all directions.



- The particles have forces between them.
- They become weaker the further apart the particles get.
- They are stronger in solids and weaker in gases.

4. History of the atom



Dalton— atoms which were **small, indivisible spheres** that could be different types called **elements**.

Thomson— The Plum Pudding model stated that there were **negatively charged electrons** scattered randomly in a **positive mass**.

Rutherford— conducted the 'gold foil experiment' where he shot positively charged alpha particles at gold foil. Most of these went **straight through** so he concluded the atom was **mostly empty space**. A small number of alpha particles were **deflected** so he concluded that there was a **small, positively charged nucleus** in the centre.

Bohr— Bohr added to Rutherford's model, stating that **electrons** were found on **energy levels** called **shells**.

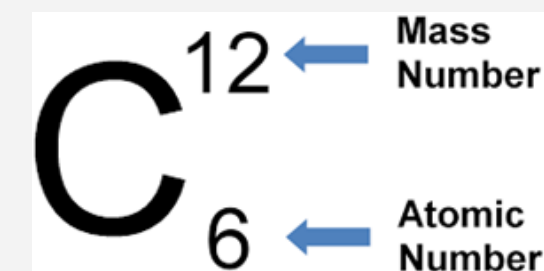
5. The periodic Table

The **atomic number** shows the number of **protons**.

An atom always has the **same number** of positive protons and negative electrons, this means it has an overall neutral charge.

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

The number of neutrons = mass number—atomic number

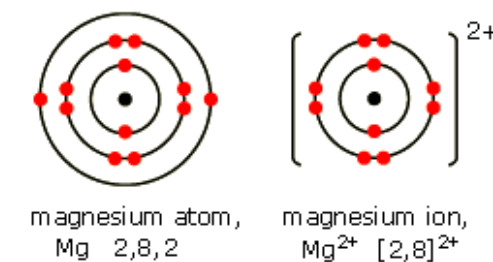


6. Ions

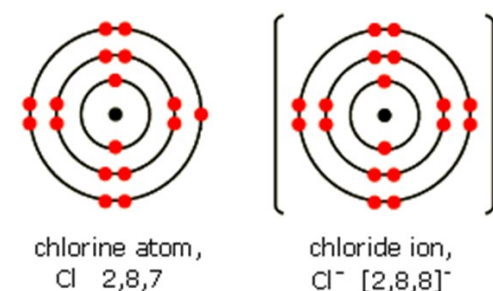
Atoms will bond to gain a **full outer shell of electrons** (2 on the first shell, 8 on the next shells). One way is to lose or gain electrons to form an ion.

- Metals lose electrons to become **positively** charged.
- Non-metals gain electrons to become **negatively** charged.

For example, an atom of magnesium has 2 electrons in its outer shell, so it loses 2 electrons to become Mg^{2+}

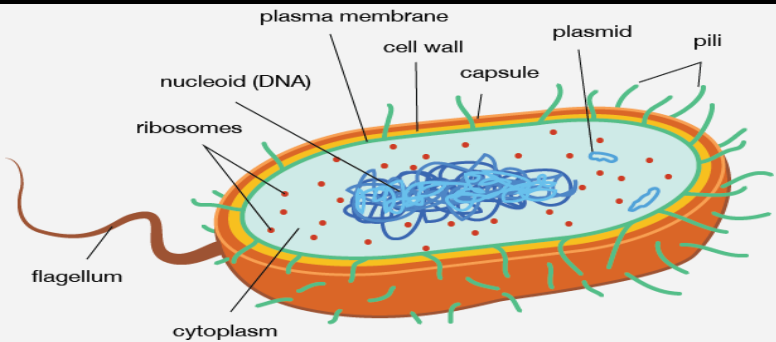


For example, an atom of chlorine has 7 electrons in its outer shell, so it gains 1 electron to become Cl^-



1. Cell structures

Organelle	A structure found within a cell e.g. cytoplasm, nucleus.
Ribosomes	Protein synthesis takes place here.
Prokaryotic cells	Cells without a nucleus e.g. bacteria. They do not contain membrane bound organelles .
Eukaryotic cells	Cells with a nucleus e.g. plant and animal cells. They contain membrane bound organelles such as mitochondria and chloroplasts.



3. Types of Microscope



Light microscope:

- ✓ Can view living specimens
- ✓ Can view in colour
- X Low resolution
- X Low magnification

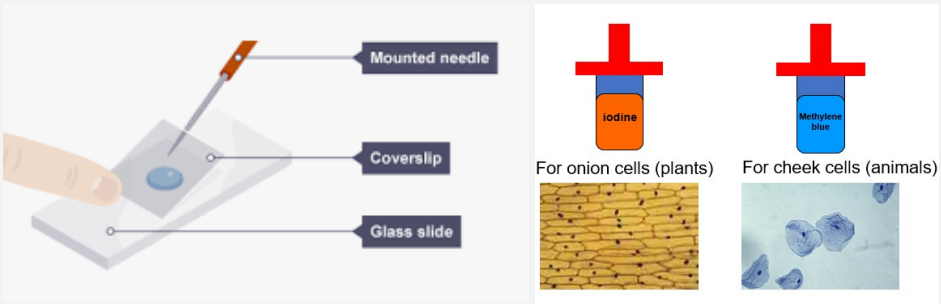


Electron Microscope

- ✓ High magnification
- ✓ High resolution
- X Expensive
- X Specimens are non-living
- X Black and white images

5. Microscope PAG

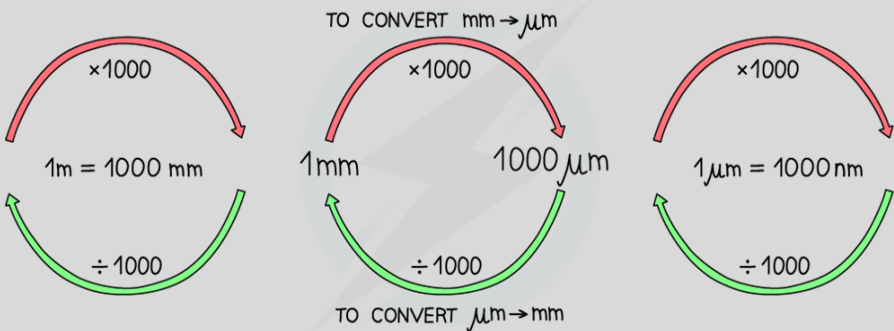
Plant epidermis	A thin layer of tissue covering the outside of the plant body.
Mounted needle	Small needle with a wooden handle; used to lower the coverslip onto the microscope slide.
Coverslip	Very thin, square-shaped piece of glass used to affix the specimen in place.
Stain	A chemical used to colour specimens to make them more visible and allow organelles to be seen.



2. Microscopy Calculations

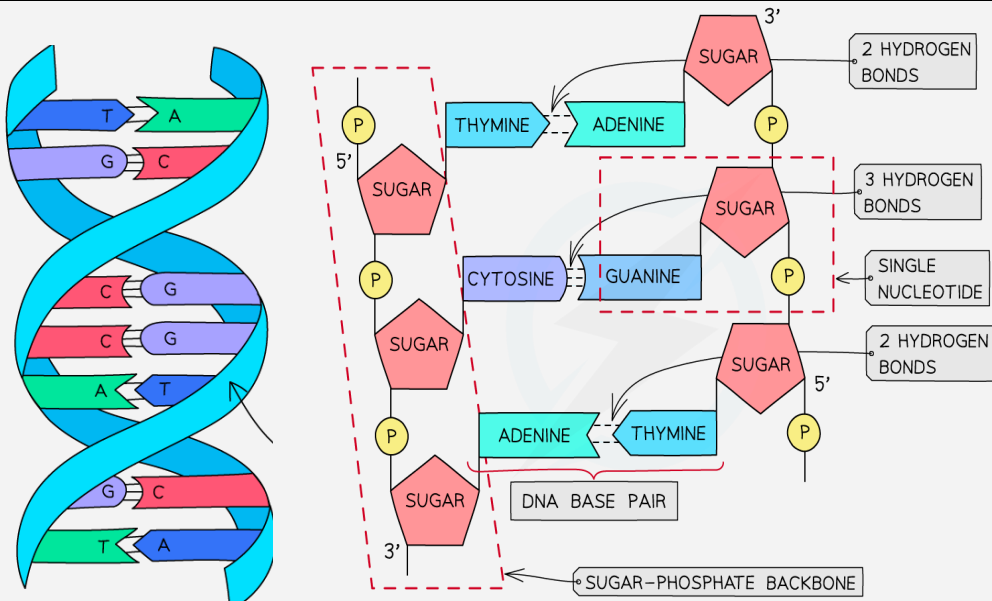
Magnification	The number of times larger the image is compared to the actual object.
Resolution	The smallest separation at which two separate points can be distinguished. Produces a more detailed image.

$$\text{magnification} = \frac{\text{image size}}{\text{actual size}}$$



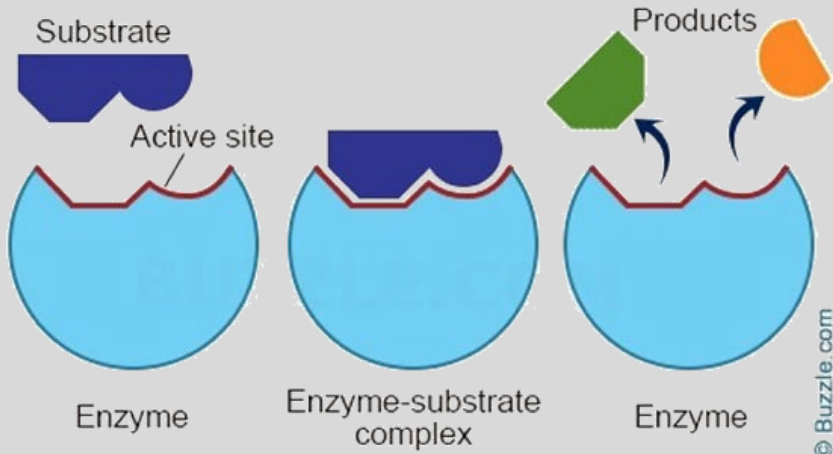
4. DNA

Double helix	The structure of DNA.
Nucleotide	Monomer of DNA. Complementary nucleotides (bases) bond together (A-T, C-G).
Sugar-phosphate backbone	Alternating chain of sugar and phosphate molecules that forms the structural framework of DNA.



6. Enzymes

Enzyme	A biological catalyst. Speeds up chemical reactions in living organisms.
Substrate	A reactant that binds to the enzyme's active site.
Active Site	Part of an enzyme that has a specific complementary shape to a substrate.
Denatured	When the shape of an enzyme's active site changes shape so the substrate cannot bind.

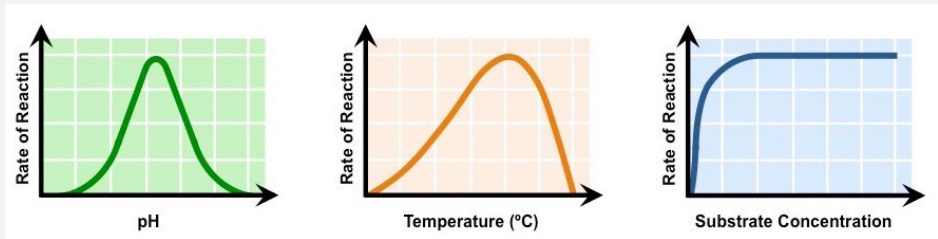


7. Factors Affecting Enzymes

Rate	How quickly something happens.
Optimum	The best conditions (e.g. temperature and pH) for the enzyme to work at its highest rate.

Factors that can affect the rate of enzyme controlled reactions

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



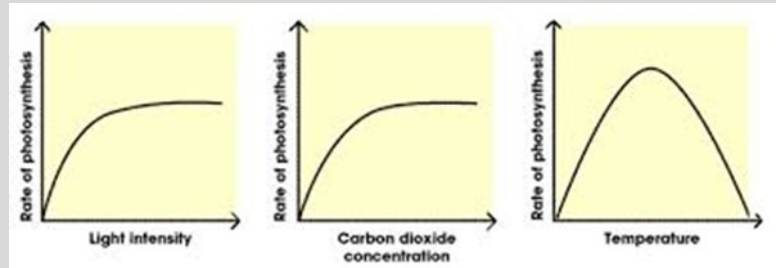
8. Photosynthesis

Photosynthesis is an enzyme controlled reaction that takes place in the chloroplast of plants to form glucose. Plants use light as a source of energy for this reaction, chlorophyll (a pigment found in leaves) absorbs light.

Word equation: Water + Carbon Dioxide → Glucose + Oxygen

Balanced Symbol Equation: 6H₂O + 6CO₂ → C₆H₁₂O₆ + 6H₂O

Limiting factor: A factor that limits the rate of the reaction.



Light is the source of energy for the reac-

CO₂ is a reactant of the reaction.

The reaction is controlled by enzymes that are denatured at high temperatures.

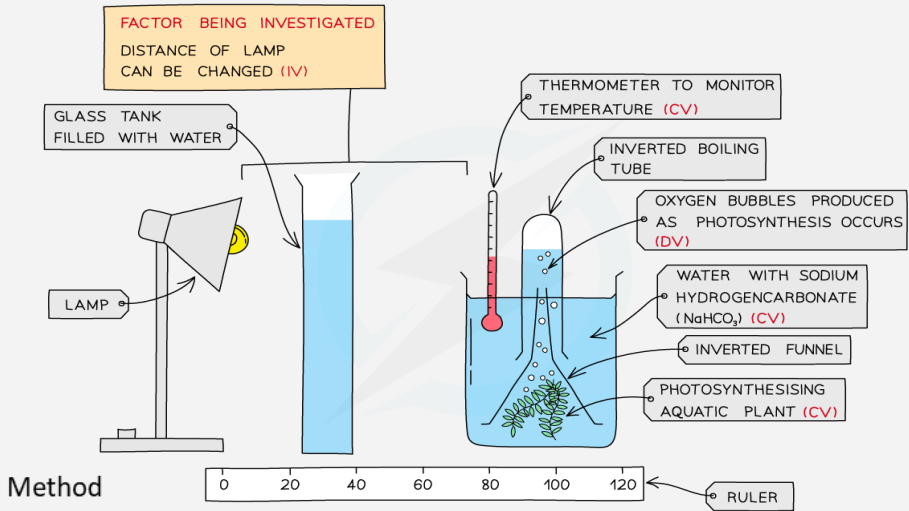
9. Biological molecules

Monomer	A small molecule which can join together to form polymers.
Polymer	Long chained molecule made up of many repeating monomer units.



Biological molecule	Monomer	Reagent in test	Positive result
Starch	Glucose	Iodine	Blue/black
Carbohydrate	Sugars	Benedict's (warm)	Brick red
Lipid	Fatty acids + glycerol	Ethanol and water	Cloudy
Protein	Amino acid	Biuret	Purple

10. Photosynthesis PAG



Method

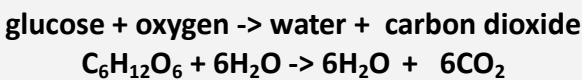
1. Fix a ruler to your desk so that you can easily move your plugged-in lamp along it.
2. Place the boiling tube rack (and plant) at 0cm along the ruler
3. Place the lamp as close as you can to 0cm so that it's shining on the leaves
4. Allow the plant to adjust to this light
5. Count the number of bubbles escaping from the cut end in one minute
6. Record your data and repeat until values are concurrent.
7. Repeat the experiment for all of the distances you decided, starting with the shortest distance and getting further away from the lamp

11. Respiration

Respiration is an **exothermic** chemical reaction that **releases energy** from glucose. This energy is stored as ATP and used for biological processes, e.g. movement, digestion, reproduction and control of

Aerobic Respiration

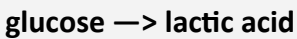
Takes place in the **mitochondria** and requires **oxygen**. Produces **38 ATP** molecules.



Anaerobic respiration

Takes place in the **cytoplasm** and does **not require oxygen**. Produces **2 ATP** molecules.

In animals:



In plants and fungi (known as fermentation):



12. Testing for Starch

Starch	Polymer of glucose
Iodine	Stain used to detect starch. Turns blue/black if starch is present.

Method

Step 1: Put a leaf in boiling water for about 5 minute, until it is soft.



To break down the cell walls so chemicals can enter the cell.

Step 2: Put the leaf in a test tube with ethanol for a while.



To remove the green pigment (chlorophyll). This is for us, to more clearly see a colour change when we add iodine.

Step 3: Rinse the leaf in water.



To make it soft again.

Step 4: Spread the leaf out on a white tile/saucer/petri dish.



To stain any starch, if present. Turns blue/black if starch is present. Stays yellow/brown if no starch is present.

