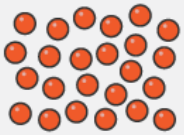
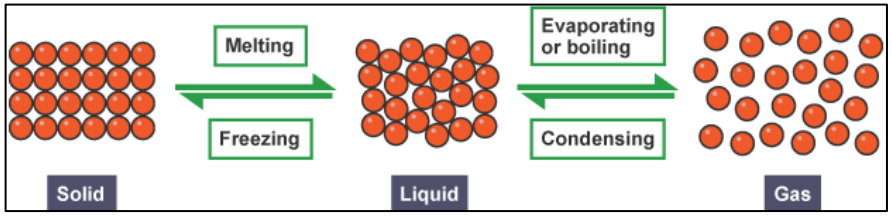
7C1 Part 1
States of Matter

States of Matter – **SOLID** **LIQUID** **GAS**

State	Solid	Liquid	Gas
Diagram			
Arrangement of particles	Regular arrangement	Randomly arranged	Randomly arranged
Movement of particles	Vibrate about a fixed position	Move around each other	Move quickly in all directions
Closeness of particles	Very close	Close	Far apart

The particles should be the same in all 3 diagrams.

Changes of State



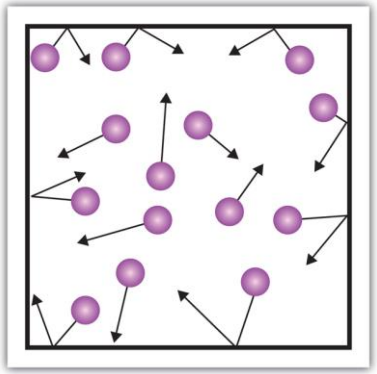
As a substance is heated it gains **energy**.
When the particles gain enough energy they overcome the **forces** between them.
Solids have the strongest forces of attraction, gases have the weakest.
Whilst a **change of state** is happening the **temperature** of the substance does not change.

Gas Pressure

Gas pressure is caused by the force of gas particles bumping into – (colliding with) the wall of their container

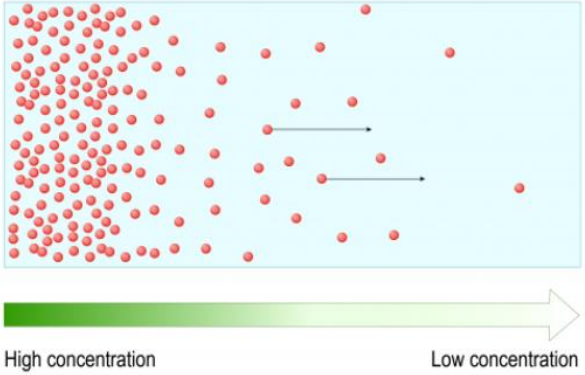
Pressure can be increased by:

- Increasing the temperature
- Adding more gas particles- e.g with a pump
- Compressing the gas into a smaller volume



Diffusion

The spreading out of particles from an area of high concentration (where there are lots) to one of low concentration (where there are fewer) caused by the random flow of liquid and gas particles



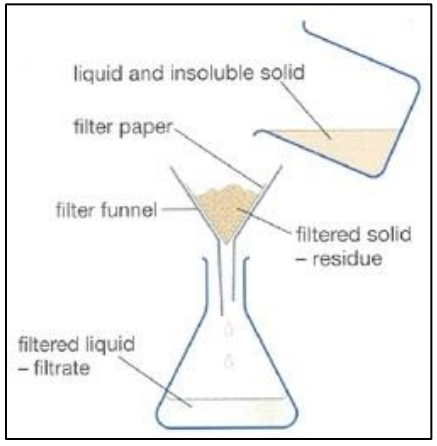
7C1 Part 2
Dissolving and Separation Techniques

All separation methods are dependent on the solubility of a substance.

Filtration

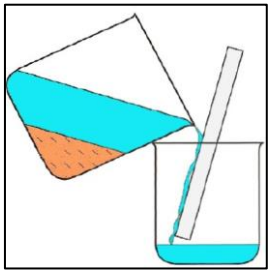
Separates an insoluble solid from a liquid.

The solid pieces are too big too fit through the holes in the filter Paper.



Decanting

Pour a liquid from the top of a settled solid or a more dense liquid.



Dissolving

When the particles in a solid spread out in a liquid.

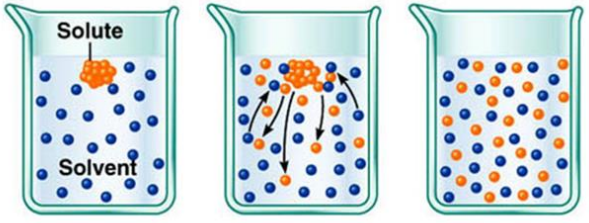
We call the liquid the **SOLVENT**

We call the solid the **SOLUTE**

We call the mixture of the solid and the liquid a **SOLUTION**.

A solid that will dissolve in a liquid is called **SOLUBLE**.

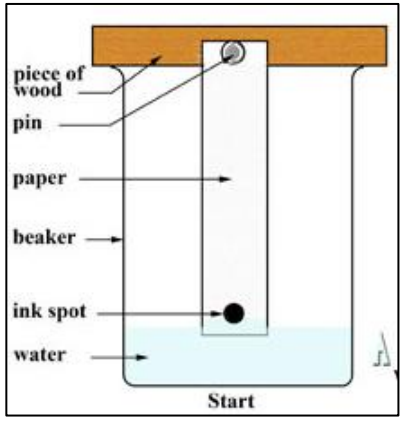
A solid that will not dissolve in a liquid is called **INSOLUBLE**.

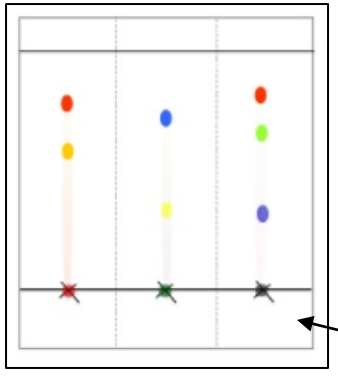


Solution!

Chromatography

Method
Draw pencil line.
Put dot of colour on line.
Hang bottom edge (below dot) in the water.
Leave until water soak up to almost the top of the paper..
Compare with known substances.



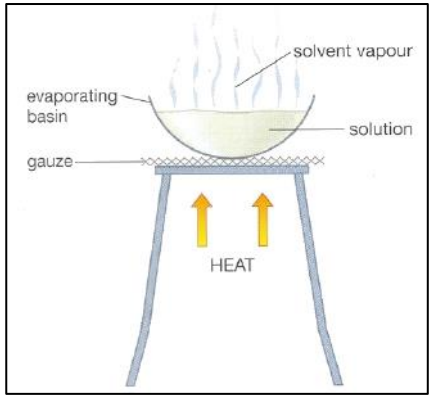


Chromatogram

Different colours contain different mixtures of inks.
The different inks move at different speeds up the paper.
This is because of different solubility.

Evaporation

Separating a soluble solid from a liquid.



Crystallisation

Heat until almost all the water has evaporated.
Leave for the remaining water to evaporate slowly to form crystals.

7C2
Substances and Properties

Formula of Common Elements and Compounds

Oxygen – O_2 Water – H_2O

Carbon Dioxide – CO_2 Sodium Chloride - NaCl

Atoms, Molecules, Elements, Compounds and Mixtures

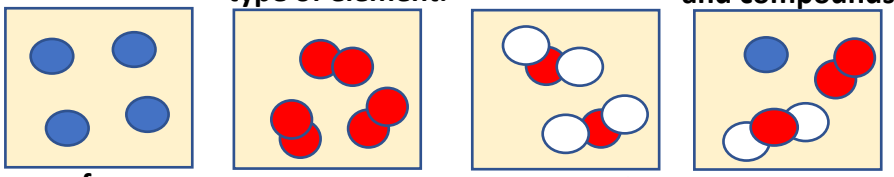
An atom is the smallest particle of any element.

Molecules form when two or more atoms form chemical bonds.

An element is a substance that contains only one type of atom.

A compound is a substance containing two or more types of atom chemically bonded together.

A mixture is a substance containing two or more elements/compounds, not chemically bonded.



Atoms of one type of element.

Molecules of one type of element.

Molecules of one type of compound.

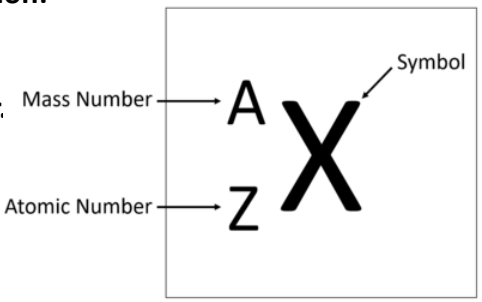
A mixture of elements and compounds.

Chemical Symbols

Two important rules should be followed when writing the symbols of elements so that there is no confusion:

1. The first letter of an element's symbol is always a capital letter.

e.g. N (not n) for nitrogen



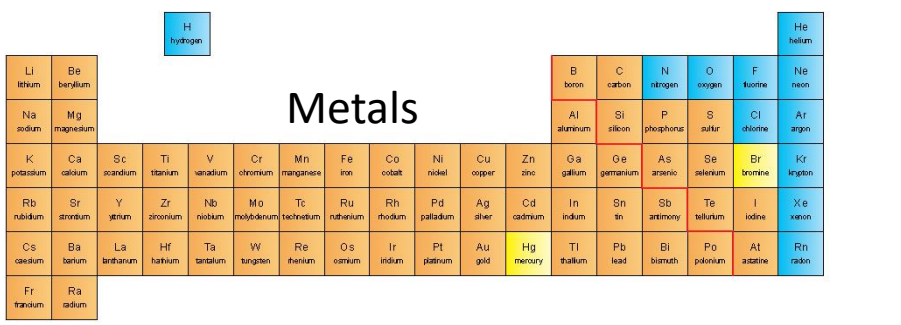
2. If there are two letters in an element's symbol, the second letter is always a small letter.

e.g. Co (not CO) for cobalt

Elements and the periodic table

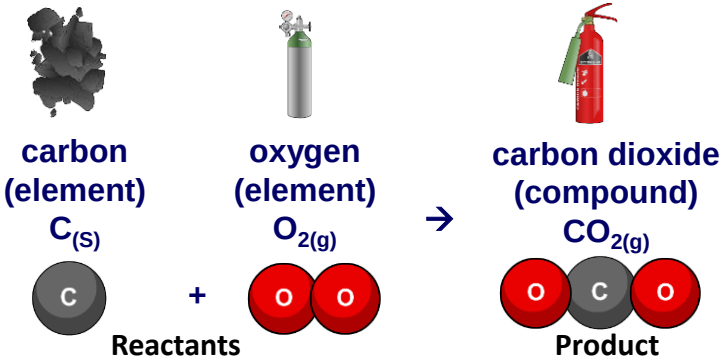
Dmitri Mendeleev created the first version of the modern periodic table. His work was unique as he left gaps for undiscovered elements. He arranged the elements based on atomic weight.

Elements are arranged into periods (horizontal) and groups (vertical) on the periodic table. Each element has a unique chemical symbol. The elements are ordered based on atomic number and placed into groups of elements with similar properties.



Properties of compounds

Compounds have very different properties to the elements from which they are made. This is because the atoms are joined together differently.



Properties of metals

Metals are good conductors of heat and electricity, have a high density, melting and boiling points. They are sonorous, malleable and ductile.

7C3 Simple Chemical Reactions

Physical reactions are reversible and involve a change of state. Chemical reactions are usually irreversible and produce new substances.

Evidence for Chemical Reactions:
- Colour change
- Bubbles of gas
- Temperature change
- Change in mass (caused by loss of gas)
- Precipitation (solid formed)

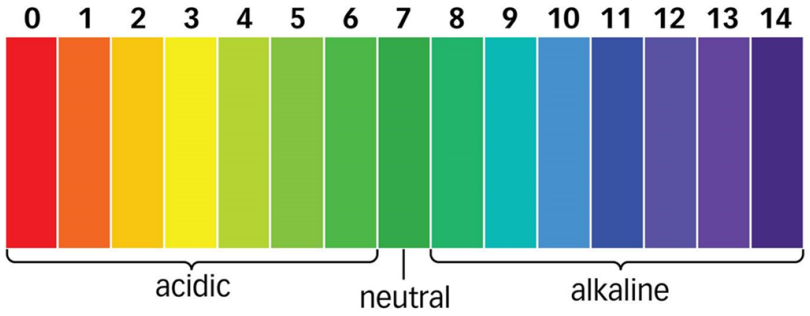
Word equations are used by Scientists to show what has happened in a chemical reaction.

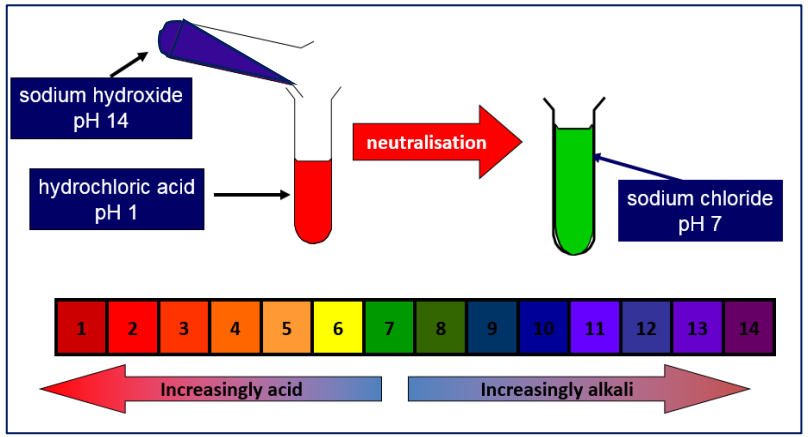
Chemical formula use symbols to show how many of each type of atom is present e.g. H_2O contains 2 Hydrogen atoms and 1 Oxygen atom.

Indicators change colour to identify whether a substance is acid, alkali or neutral. For example Litmus paper is red in acid and blue in alkali.

The pH scale

It measures the acidity or alkalinity of a solution





Neutralisation – what happens.

When a base and an acid react together, this equation is followed:

Base + Acid → Salt + Water

An example reaction

sodium hydroxide + hydrochloric acid → sodium chloride + water

(A SALT)

Each acid will make its own family of salts.

Acid	Salt formed
hydrochloric acid	chloride
sulfuric acid	sulfate
nitric acid	nitrate

Neutralisation Example:
Indigestion occurs when acid from the stomach moves into the oesophagus and causes pain. This can be treated with antacid, which contains alkali.

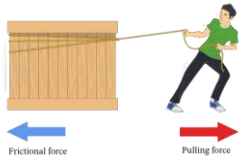
Year 7 Knowledge organiser: Forces

What is a force?

- A **force** can be a **push** or a **pull**
- A force is measured in **Newtons (N)**
- We measure forces with a **newton meter**
- Forces explain why objects **change speed** and **change direction**

Resistive forces

- Resistive forces act in the **opposite direction** to the movement off an object.
- Resistive forces make it **more difficult** for objects to move.
- When resistive forces are the **same size** as the force causing an object to move, the object moves at a **constant speed**.
- **Air resistance, friction** and **drag** are all examples of resistive forces.



Mass and Weight

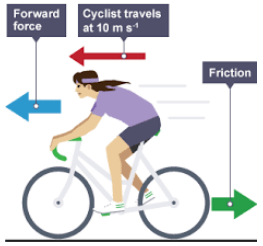
- Weight (in Newtons) is the force that **acts on mass due to gravity**. It always acts towards the centre of the Earth.
- Gravity changes depending on the planet/object you are stood on. For example, as Jupiter has a larger mass than the Earth the strength of gravity is larger.
- The strength of gravity affects an objects weight. So on Jupiter objects weigh more than on Earth. On the moon they weigh less.
- Gravity does not affect the mass of an object (in kg)

Weight (N) = mass (kg) x 10 (on Earth)

Speed

- Objects travel at a **constant speed** if the forces on the object are **balanced**.

$$Speed\ (m/s) = \frac{Distance\ (m)}{Time\ (s)}$$



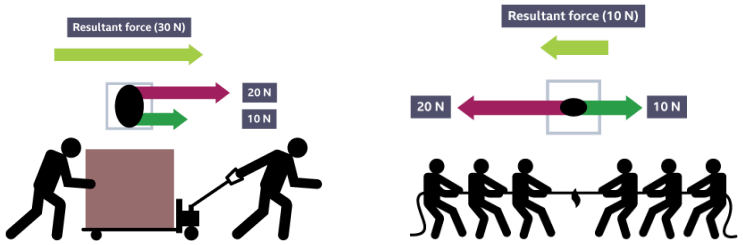
Acceleration

- **Acceleration** is when objects **get faster** in a given time.
- **Deceleration** is when objects **get slower** in a given time.
- Both acceleration and deceleration are measured in **m/s²**.
- Acceleration and deceleration are caused by **unbalanced forces**. The acceleration or deceleration is always in the direction of the bigger force.

$$Acceleration\ (m/s^2) = \frac{final\ speed\ (m/s) - initial\ speed\ (m/s)}{time\ (s)}$$

Resultant forces

- The resultant force on an object is the is the **overall force** that acts on the object.



Year 7 Knowledge organiser: Energy

Energy Basics

- Energy is measured in **Joules**
- Energy cannot be created or destroyed, only transferred between stores

Stores and Transfers

Stores	Transfers
Chemical	Light
Thermal	Sound
Kinetic	Electrical
Gravitational	Thermal
Elastic	

GPE and KE

- Whenever something is high up and not moving, it has GPE.
- When it's moving, it has KE.
- As it moves down, GPE turns into KE!

Thermal Energy

Energy transfers always waste some energy, often thermal energy.

This energy is dissipated into the surroundings

Efficiency

Efficiency is a measure of how much energy is transferred usefully, rather than being wasted or dissipated.

Useful Equations

$$\boldsymbol{GPE\ (J) = mass\ (kg) \times g \times height\ (m)}$$

Remember, g = 10 N/kg on Earth

$$\boldsymbol{Efficiency = \frac{useful\ output\ energy}{total\ input\ energy} \times 100}$$

Year 7 Knowledge organiser: Light and Sound

Light

- We see objects because light **reflects** off of them into our eye
- Straight lines indicate light's path; arrowheads indicate direction
- Light travels at 300,000,000 m/s
- **Law of reflection**: Angle of Incidence = Angle of Reflection

Colour

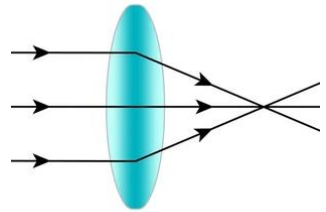
- There are 3 primary colours (in science): **red**, **blue** and **green**
- Light that is not reflected is **absorbed**. We only see the colours that are reflected.

Colours refract by different amounts

Lenses

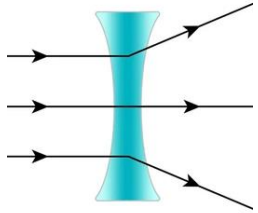
Refraction: light bends when passing from one material to another

Convex (Converging)



Corrects **long-sighted** vision

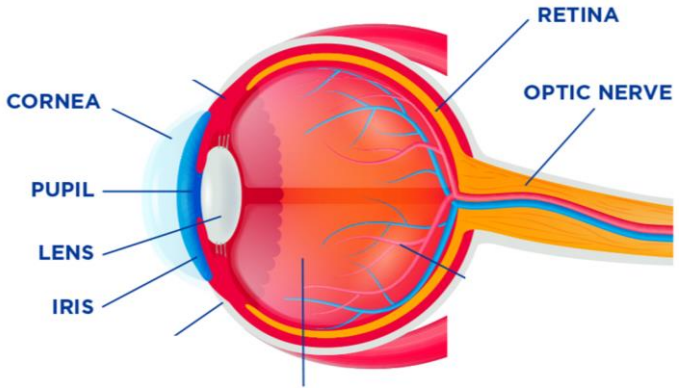
Concave (Diverging)



Corrects **short-sighted** vision

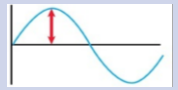
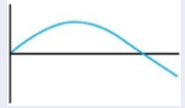
The Eye

The cornea and lens refract light, focusing it on the retina.

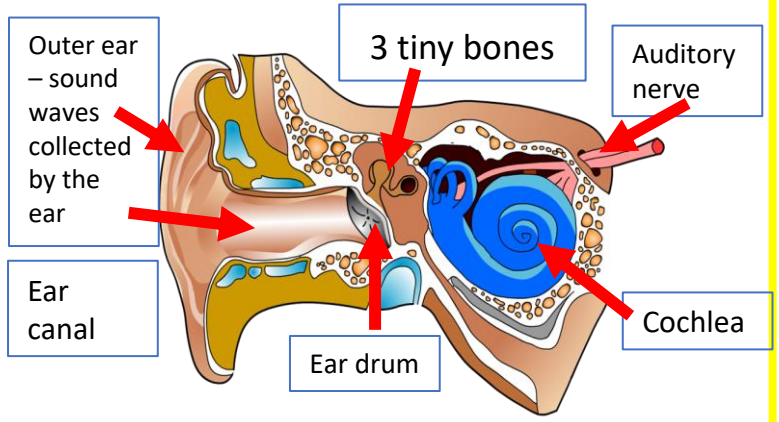


Sound

Sound is produced by *vibrating particles*

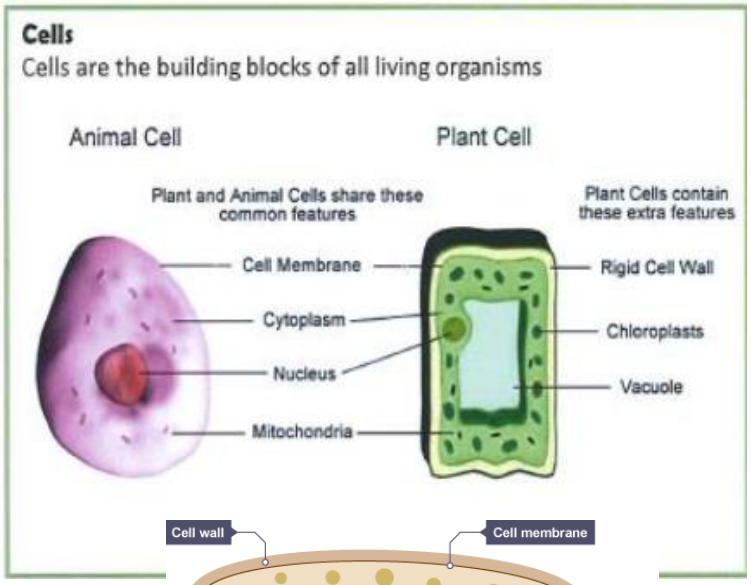
Louder sound	Larger amplitude	
Quieter sound	Smaller amplitude	
Higher pitch	Larger frequency	
Lower pitch	Smaller frequency	

The Ear

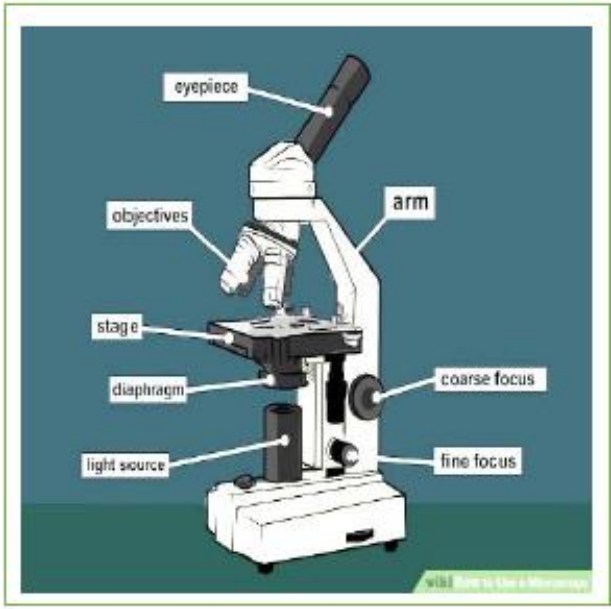


Ear defenders contain foam to absorb vibrations, decreasing the sound's amplitude.

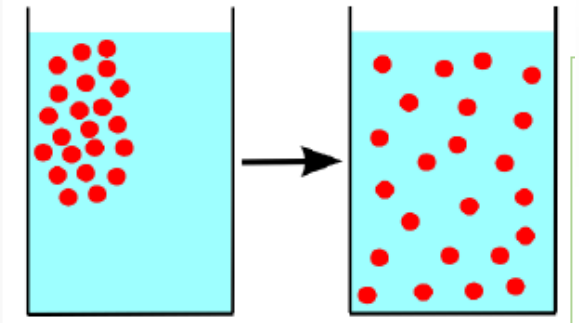
Year 7 – B1 Cells and Microscopes



Part of the Cell	What Does it Do
Nucleus	Controls the activities of the cell/ Stores DNA
Cell Membrane	Controls movement into and out of the cell
Mitochondria	Where respiration takes place
Cytoplasm	jelly like substance where chemical reactions happen
Ribosome	makes proteins for the cell
Chloroplast	absorbs light energy for photosynthesis
Vacuole	filled with a solution called cell sap



Key Terms	Function
Stage	Area where specimen is placed
Clamps	Hold the specimen still whilst it is being viewed
Light source	Illuminates the specimen
Objective lens	Magnifies the image of the specimen
Eyepiece lens	Magnifies the image of the specimen
Course/fine focus	Used to focus the specimen so it can be seen clearly
Revolving nosepiece	Holds 2 or more objective lenses



Diffusion is the movement of particles **from a high concentration to a low concentration**.

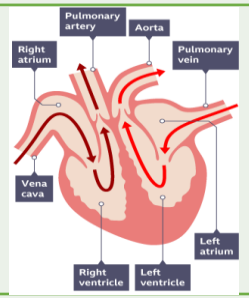
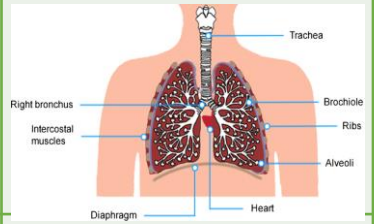
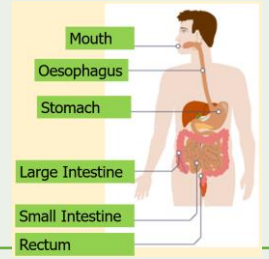
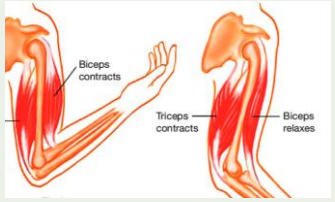
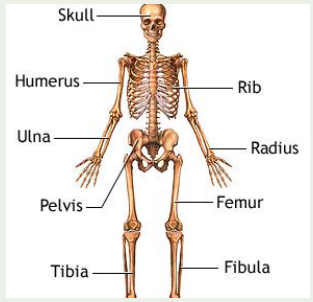
Movement
Respiration
Sensitivity

Growth
Reproduction
Excretion
Nutrition

MRS GREN

Word equation for photosynthesis

carbon dioxide + water $\xrightarrow[\text{chlorophyll}]{\text{sunlight}}$ glucose + oxygen

System		Main Organs	Function
Circulatory		Heart, blood vessels (arteries, veins, capillaries)	Transports blood, oxygen, nutrients, and waste around the body.
Respiratory		Lungs, trachea, bronchi	Takes in oxygen and removes carbon dioxide.
Digestive		Mouth, oesophagus, stomach, intestines,	Breaks down food into nutrients the body can absorb.
Muscular		Skeletal muscles	Allows movement of body parts.
Skeletal		Bones	Supports and protects the body; works with muscles to enable movement.

What are Body Systems?
Groups of organs that work together to perform a major function in the body.

Examples: Circulatory system, respiratory system, digestive system, nervous system.

Important Concepts
Organs: Structures made of tissues that perform a specific job.

Tissues: Groups of similar cells working together.

Cells: The basic units of life.

Antagonistic pairs: Muscles work in pairs where one contracts and the other relaxes to move bones.

How Systems Work Together
Respiratory system supplies oxygen to blood in the circulatory system.

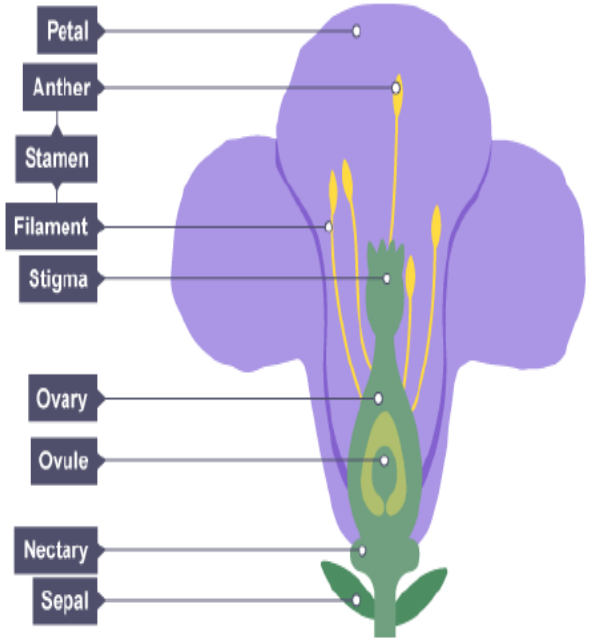
Circulatory system delivers oxygen and nutrients to cells and removes waste.

Digestive system provides nutrients absorbed into the blood.

Plant reproduction Knowledge organiser

1. Structure of a flower

The flower is the reproductive organ of many plants



Structure	Function
Sepal	Protects the flower when it is a bud
Petal	These are often colourful to attract insects
Stamen	The male part of the flower (anther and filament)
Anther	Produces male sex cells (pollen)
Filament	Supports the anther
Ovary	Produces female sex cells (ova)
Stigma	Collects pollen grains, this is the top of the female part of the flower

2. Methods of pollination

Feature	Insect-pollinated	Wind-pollinated
Petals	Large and brightly-coloured – to attract insects	Small, often dull green or brown – no need to attract insects
Scent and nectar	Usually scented and with nectar – to attract insects	No scent or nectar – no need to attract insects
Number of pollen grains	Moderate - insects transfer pollen grains efficiently	Large amounts – most pollen grains are not transferred to another flower
Pollen grains	Sticky or spiky - sticks to insects well	Smooth and light – easily carried by the wind without clumping together
Anthers	Inside flower, stiff and firmly attached - to brush against insects	Outside flower, loose on long filaments – to release pollen grains easily
Stigma	Inside flower, sticky - pollen grains stick to it when an insect brushes past	Outside flower, feathery – form a network to catch drifting pollen grains

3. Seed dispersal methods

Water dispersal

- Some seeds are quite spongy so can float.
- They fall off a plant and into water. They are carried by the current to somewhere else and then wash up, allowing them to grow.

Coconut seeds float so are dispersed by water.

Explosions

- Certain seeds are contained in pods. Some of these pods shrivel and become too tight, causing the seeds to burst out of them.
- Others may explode at the slightest touch. When this happens, the seeds are dispersed in different directions.

Pea plants have pods which burst open when ripe, throwing the seeds away from the plant.

Animal dispersal

- Some seeds are sticky or have small hooks on them to allow them to attach to the skin/fur of animals and get transported.
- Some seeds are held within tasty fruit (the grown ovary) so the animal eats it and the seed passes out at a later date.

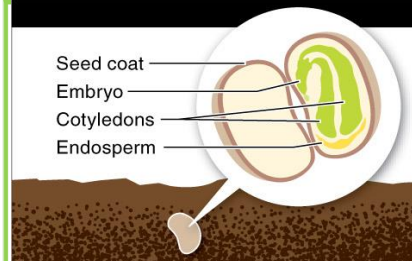
Raspberry fruit is eaten and burdock seeds stick to animal fur.

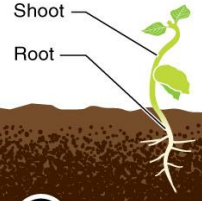
Wind dispersal

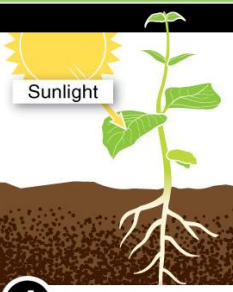
- Other seeds are attached quite loosely to the plant.
- With a bit of wind, they become detached and are carried by the wind far away from the parent plant. When they settle, the seed can grow away from the parent plant.

Sycamore and dandelion seeds are dispersed by the wind.

SEED GERMINATION





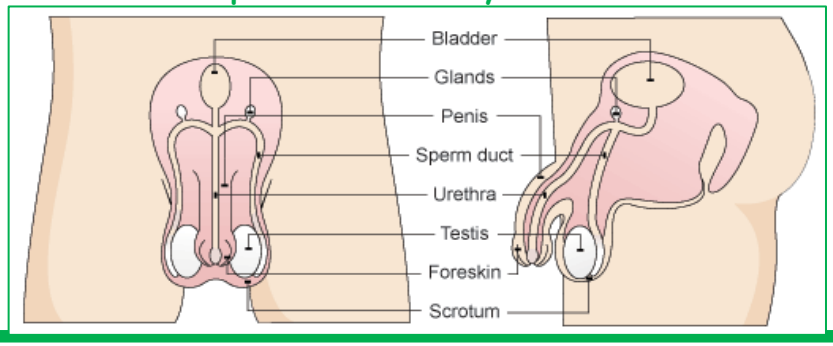


1. A seed, containing an embryo and a supply of nutrients, begins to grow when the conditions for life are just right.
2. Water is absorbed, increasing the size of the embryo and causing the seed coat to burst.
3. The plant first sends a root downward and then sends the shoot upward, each with an apical meristem near its tip.
4. The leaflets then begin photosynthesis, providing even more energy for the plant to grow.

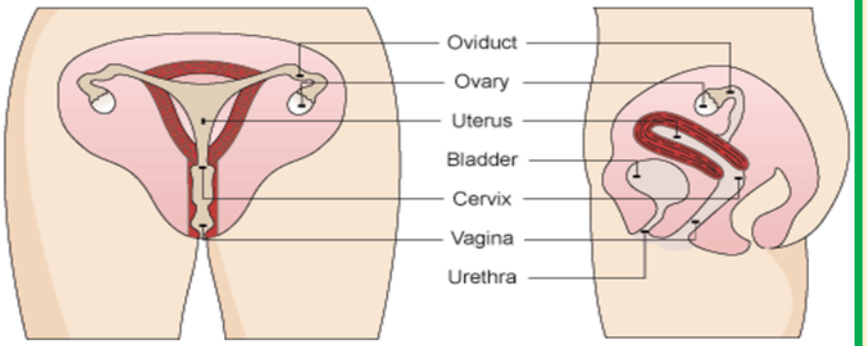
Human and plant reproduction - Knowledge Organiser

Key term	Definition
1) Cervix	The neck of the **uterus**
2) Uterus	A new baby will develop here
3) Vagina	**Sperm** are placed here during **sexual intercourse**
4) Ovary	Makes the female's **eggs**
5) Fallopian tube	The tube the **sperm** travels to reach the **egg**
6) Egg cell	The female sex **cell**
7) Penis	Puts **sperm cells** into the female during **intercourse**
8) Scrotum	A sac of skin which holds the **testes**
9) Sperm cell	The male sex **cell**
10) Gland	Releases **fluid** for the sperm to survive in
11) Sperm tube	Carries sperm from the testes to the penis
12) Testes	These make sperm cells

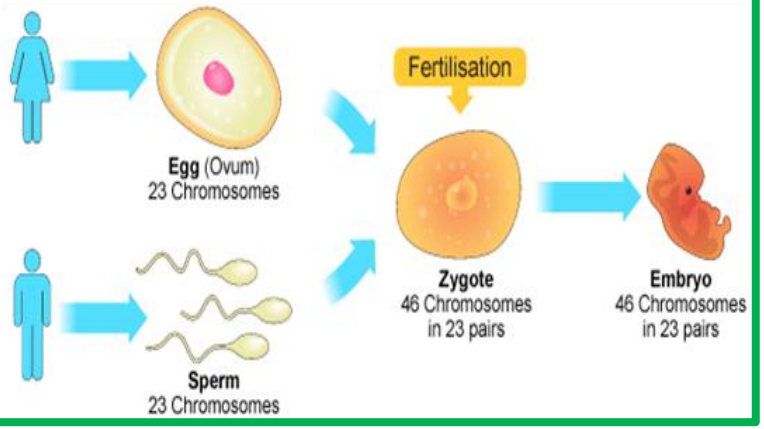
13. Male Reproductive System



14. Female reproductive system



15. Fertilisation



Pathway to success!

- Redraw and label the male and female reproductive systems from memory
- Create a story board showing the journey of a sperm cell, the development of an embryo and the birth of a baby
- Revise the differences between animal and plant cells from year 7