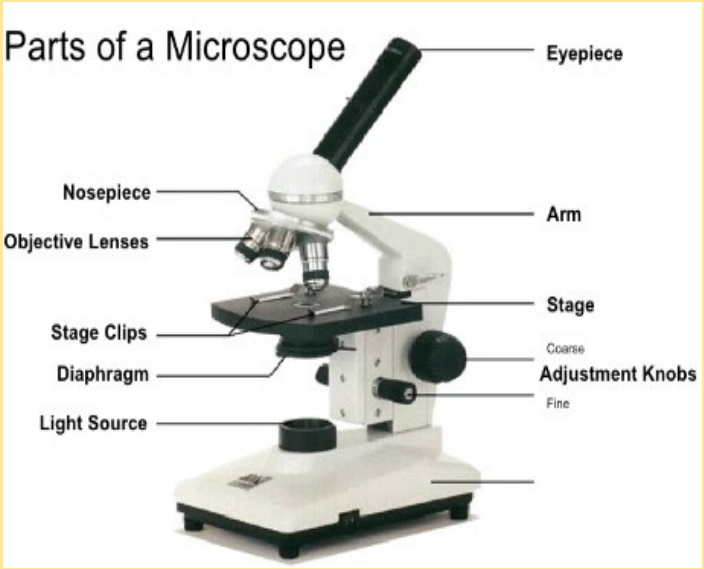
THE KNOWLEDGE Year 7 B1.1

Cells

Sentence starters:
Both plant and animal cells contain…
Some examples of specialised cells are…
Diffusion is…
A unicellular organism is… Examples include…

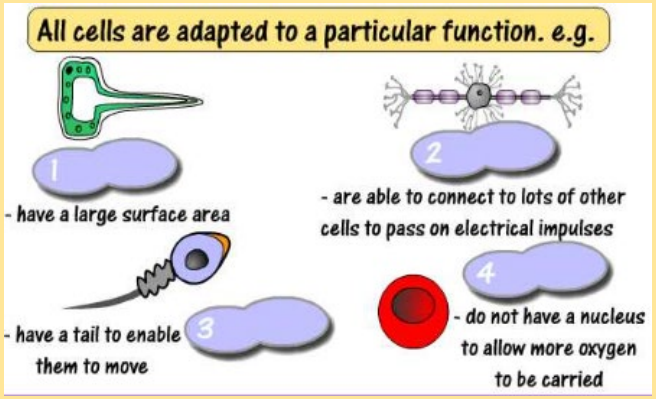
Microscope magnification
Total magnification =eyepiece lens magnification x objective lens magnification



Glossary

Organism, cell, microscope, observation
Nucleus, cell membrane, cytoplasm, mitochondria, respiration, cell wall, vacuole, chloroplast
Specialised cell, nerve cell, red blood cell, sperm cell, leaf cell, root hair cell
Diffusion, concentration
Unicellular, amoeba, euglena, flagellum

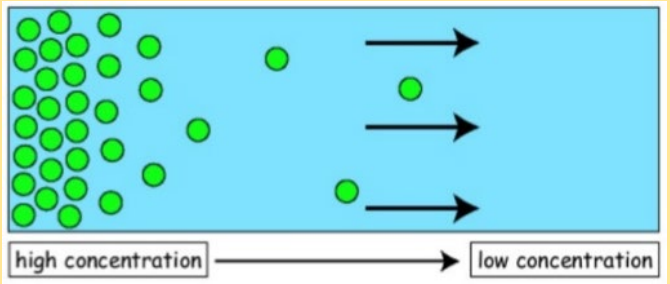
Specialised cells



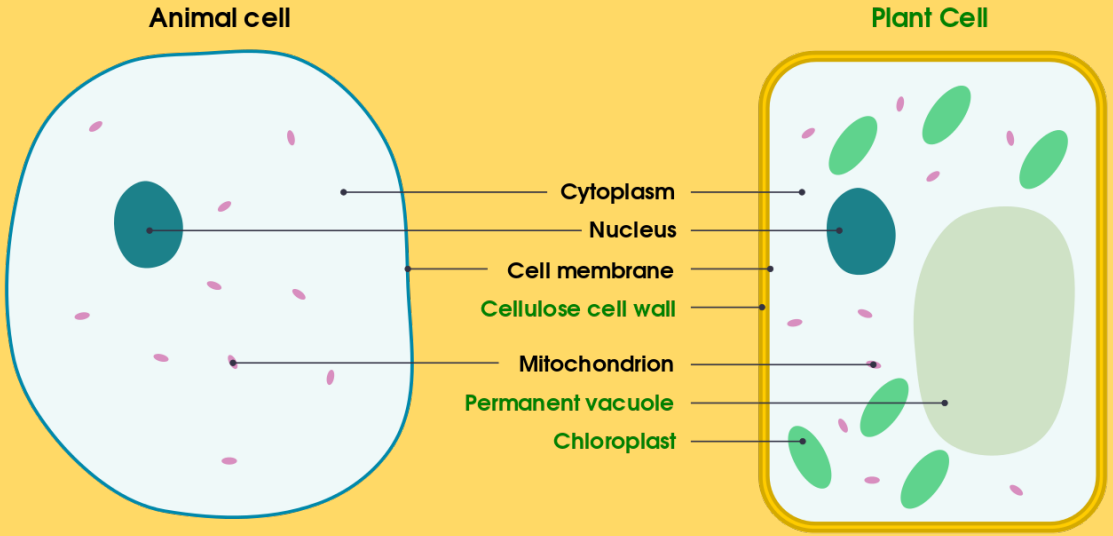
Specialised cells have a different shape and structure from typical animal and plant cells.
1 root hair cell
2 nerve cell
3 sperm cell
4 red blood cell

Diffusion

Diffusion is the movement of particles from an area of high concentration to an area of low concentration.

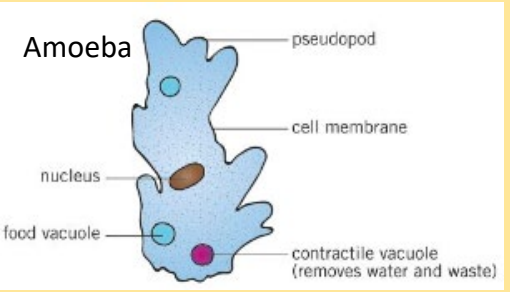


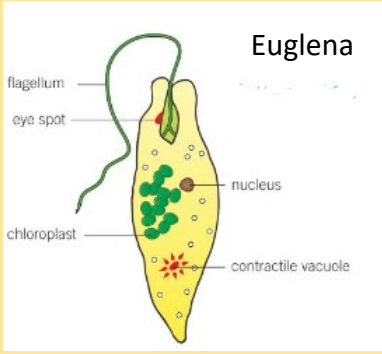
Examples:
Oxygen moving into cells from the blood
Water moving into the plant through root hair cells



Unicellular organisms

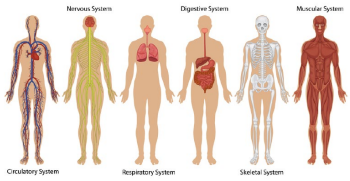
Made up of one cell.





THE KNOWLEDGE Year 7 B1.2
Structure and Function of Body Systems

Sentence starters:
The hierarchy of an organism consists of....
The respiratory system is needed for....
When we inhale/exhale...
The role of the skeleton is to...



Levels of Organisation

Multicellular organisms are made up of many cells. There is a hierarchy of organisation in the body and some other organisms.

Cell	Nerve cell, muscle cell, root hair cell	Smallest functional structure of a living thing
Tissue	Muscle, epithelial (cover bodily surfaces), glandular (produces hormones and enzymes)	A group of cells with a similar structure and function
Organ	Intestine, heart, flower, leaf, brain	Made up of a group of tissues working together to perform a particular job
Organ system	Respiratory, digestive, reproductive	Made up of a group of organs working together to do a particular job
Organism	Human, oak tree, lion, shark	An individual living thing

Glossary

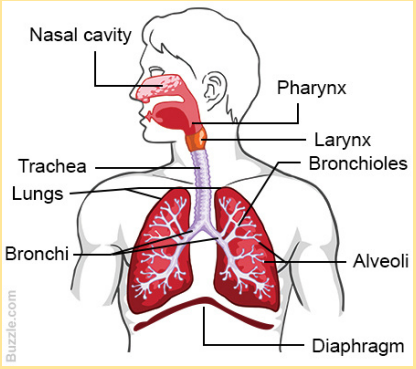
Multicellular organism
Cell, Tissue, Organ, Organ System

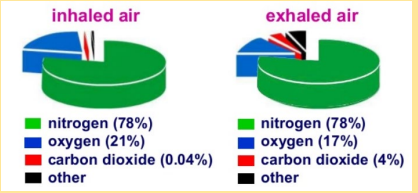
Gas Exchange, Lungs, Ribcage, Respiratory System, Trachea, Alveolus, Inhale, Respiration, Exhale, Condense, Contract, Diaphragm, Lung volume

Bone, Skeleton, Support, Protect, Bone marrow, Biomechanics, Joint, Cartilage, Ligament, Newtons, Tendon, Antagonistic muscles

Gas Exchange and Breathing

Air enters the body through your mouth and nose. → Air moves down the trachea (windpipe) → Air moves down a bronchus → Air moves through a bronchiole → Air moves into alveolus → Oxygen then diffuses into the blood.





Breathing

Inhalation

- The muscles between your ribs contract.
- Ribcage moves up and out.
- Diaphragm contracts, moves down.
- Volume inside chest increases
- Pressure decreases.
- Air moves inside lungs.

Exhalation

- The muscles between your ribs relax.
- Ribcage moves down and in.
- Diaphragm relaxes, moves up.
- Volume inside chest decreases
- Pressure increases.
- Air moves out of lungs.

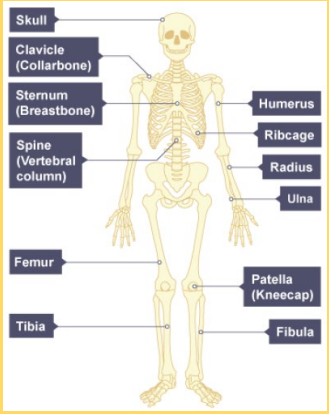
The function of Body Systems

Circulatory system	Heart and blood vessels	Transports substances around the body
Nervous system	Brain, spinal column, nerves	Transmits nerve impulses around the body
Respiratory system	Lungs, trachea, nose, mouth	Provides oxygen needed for respiration
Digestive system	Oesophagus, stomach, intestines, liver	Extracts nutrients from food
Skeletal system	Bones	Holds the human body up
Muscular system	Muscle	Responsible for movement of the human body

Skeleton

Why?

Support body: framework and holds organs in place.
Protect vital organs: Skull protects brain, Ribcage protects heart and lungs, Backbone protects spinal cord.
Help move: Muscles are attached to bones. Skeleton moves at joints such as knee.
Make Blood Cells: Soft tissue called bone marrow produce red and white blood cells.



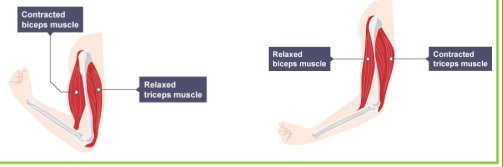
Movement: Joints and Muscles

Joints - Bones are linked together by joints which allow different parts of the skeleton to move. They are called **synovial joints.**
The bones cannot move on their own - they need muscles for this to happen.

Type of joint	Example	Movement allowed
Hinge joint	Knee, elbow	Same as opening and closing a door, no rotation
Ball and socket joint	Hip, shoulder	Backwards and forwards in all directions, with rotation

Antagonistic muscles
Muscles are attached to bones by strong tendons, they can only pull and cannot push. E.g. your elbow joint has two muscles that move your forearm up or down.

- to raise the forearm, the biceps contracts and the triceps relaxes
- to lower the forearm again, the triceps contracts and the biceps relaxes



THE KNOWLEDGE Year 7 C1.1

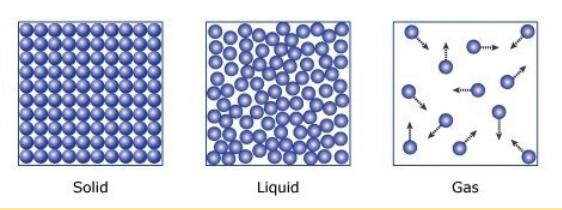
The particle model

Sentence starters:

- **In a solid/liquid/gas the particles are …**
- **When a solid melts, the particles …**
- **The boiling point of a substance is …**
- **When a substance condenses, it …**
- **Diffusion happens in liquids and gases only because …**
- **Gases exert a pressure on surfaces because …**

Particles

- **Materials** are made up of tiny **particles**, which are too small to see.
- Some materials are **mixtures**, but some are made up of just one **substance**.
- In a substance, every particle is the same.
- The **properties** of a substance describe what it **looks like** and **how it behaves**
- The properties depend on:
  - what its particles are **like**
  - how the particles are **arranged**
  - how the particles **move around**.

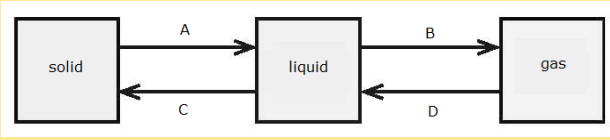


States of matter

- The three **states of matter** are **solid**, **liquid** and **gas**.
- The **particles** of a substance are the **same** in each state.
- The **arrangement** and **movement** of the particles are **different** in each state.
- The particles in a **solid** are **close together** and **do not move around**. This means that solids have a fixed shape and **cannot be compressed**.
- The particles in a **liquid** are also **close together**, but are **moving around**. This means that liquids **cannot be compressed**, but they **flow** and have **no fixed shape**.
- The particles in a **gas** are **far apart** and **moving very fast**. This means that gases are **easy to compress** and will **spread out**.

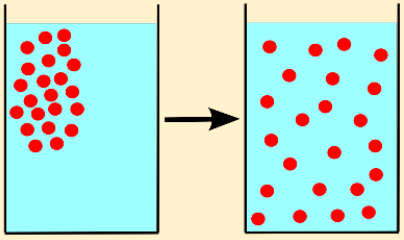
Changing state

- Substances can change state when they are heated or cooled.
- When the temperature changes, the **arrangement and movement of the particles** changes, causing a change in **properties**.
- The change of state from solid to liquid is **melting**. The opposite change is **freezing**.
- The change from liquid to gas is **boiling**. The opposite is **condensing**.
- Substances can also change from liquid to gas by **evaporation**.
- **Sublimation** is the change of a solid straight to gas (without becoming liquid).



Diffusion

- **Diffusion** is the random **moving and mixing** of particles in gases and liquids.
- It happens because the particles are moving around.
- Diffusion **cannot happen in solids** because the particles cannot move around.

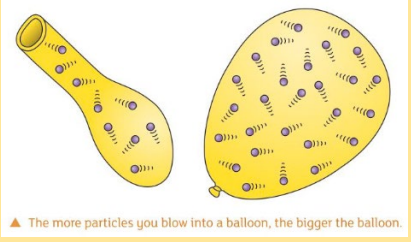


Glossary

material	**melting**
particle	**freezing**
substance	**boiling**
property	**condensing**
solid	**evaporation**
liquid	**sublimation**
gas	**diffusion**
states of matter	**collide**
	gas pressure

Gas pressure

- The **particles of a gas** are moving very fast, and **collide with the surfaces** of the container it is in.
- These collisions **exert a force** on the surface.
- The **force on each square metre** of surface is called the **gas pressure**.
- If the gas is **heated**, the particles **move faster**, and gas pressure **increases**.
- **Cooling** the gas will **reduce** the gas pressure.


▲ The more particles you blow into a balloon, the bigger the balloon.

THE KNOWLEDGE C1.2 Year 7
Elements, atoms and compounds

Sentence starters
A compound is a substance…
Elements are made up of….
Chemical formula shows the….

Elements

An **element** is a substance that cannot be broken down into other substances.
There are 92 elements that exist naturally.
The **periodic table** lists the elements.
Every element has its own **chemical symbol**, which consists of one or two letter code for the element.

Name of element	Chemical symbol
carbon	C
nitrogen	N
nickel	Ni
chlorine	Cl
gold	Au
iron	Fe
tungsten	W

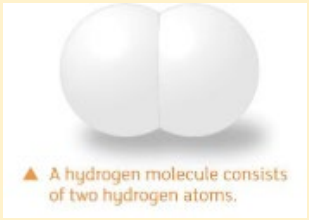
Glossary

Element
Atom
Compound
Molecule
Chemical formulae
Chemical symbol
Periodic table

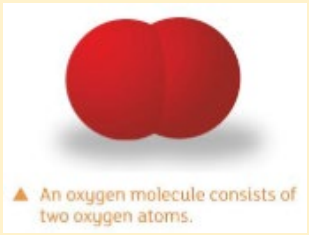
Compounds:

A **compound** is a substance made up of atoms of two or more elements. The atoms are strongly joined together. The properties of a compound are different to the properties of the elements it is made up of. A **molecule** is a group of two or more atoms strongly joined together.

Hydrogen is a gas at room temperature and is a molecule made up of two hydrogen atoms.

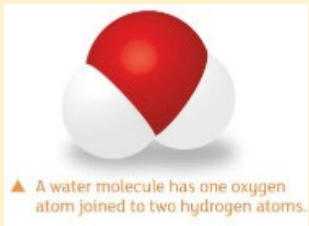

▲ A hydrogen molecule consists of two hydrogen atoms.

Oxygen is a gas at room temperature and is a molecule made up of two oxygen atoms.


▲ An oxygen molecule consists of two oxygen atoms.

Water exists as molecules, the molecules are made up of atoms of two elements.

Water has different properties to hydrogen and oxygen.

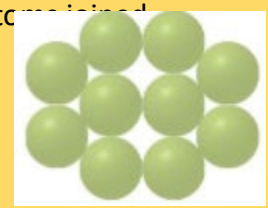

▲ A water molecule has one oxygen atom joined to two hydrogen atoms.

Atoms

An **atom** is the smallest part of an element that can exist.

Every **element** is made up of one type of atom. The atoms of one element are different to the atoms of all other elements.

One atom on its own doesn't have the properties of the element. The properties of an element are the properties of very many atoms joined together.



Chemical formulae

What is a chemical formula?

A **chemical formula** shows the relative number of atoms of each element in a compound. **Relative number** means how many of one type of atom there are compared to another.

Elements in compound	Name of compound
aluminium and oxygen	aluminium oxide
zinc and oxygen	zinc oxide

Compounds made up of oxygen and another element have two-word names. The second word is oxide.

The **chemical formula** of carbon dioxide is CO_2 this shows that there is one carbon for every two oxygen atoms.

The chemical formula of carbon monoxide is CO this shows that there is one carbon for every oxygen atom.

When you write chemical formulae the numbers should be:

- To the right of their **chemical symbol**, just below the line.
- Smaller than the chemical symbol.

THE KNOWLEDGE

Year 7 Acids and Alkalis

- When a substance dissolves in water it makes a solution.
- Solutions can be sorted by whether they are acidic alkaline or neutral.
- Acidic solutions are made by acids such as hydrochloric acid or sulphuric acid.
- Alkali solutions are made by alkalis such as sodium hydroxide.
- Neutral solutions like water are neither acidic nor alkaline.
- A number expressing the acidity or alkalinity of a solution is known as its pH.
- pHs in a pH scale range from 1 (very acidic) to 14 (very neutral) .

Sentence starters

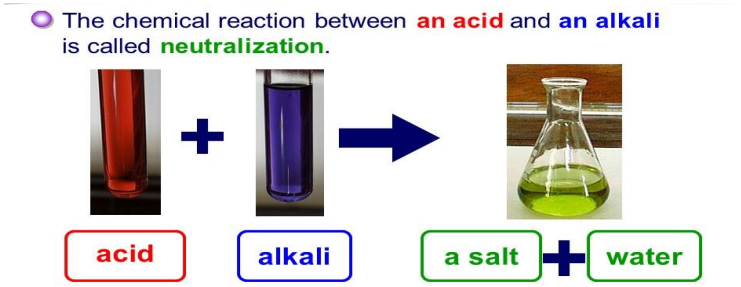
Solutions can be …….
An acidic solution is….
An alkali solution …….
Water is a…….
Neutralisation is the process in which ……..
The pH of a solution give us an idea of……..

Glossary

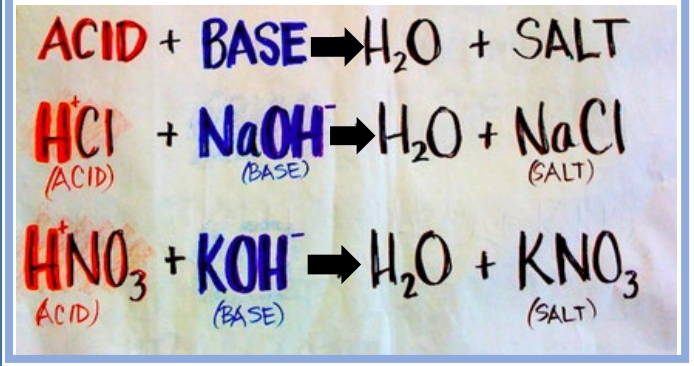
- Acid
- Alkali
- Neutral
- Neutralisation
- Salts
- pH
- Universal indicator
- Red cabbage

What do you think happens when an acid and an alkali are mixed?
They neutralise each other in a reaction known as 'neutralisation.
Neutralisation in every day life.

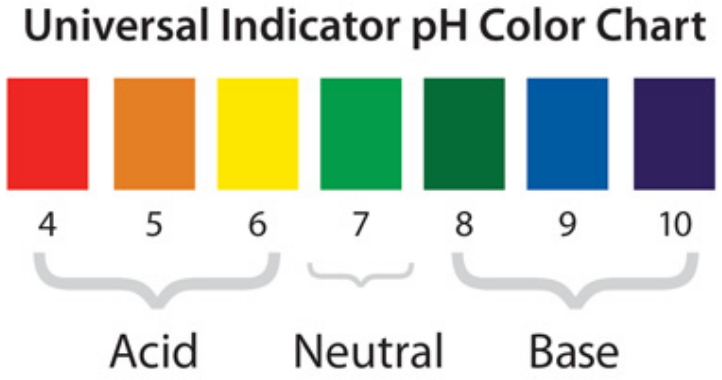
- School laboratories use neutralisation to make some salts for demonstrations and titrations (to know the concentration of an unknown solution).
- In cases of accidents such as the spillage of acid on surfaces.
- In farming by using lime (calcium oxide) to neutralise acidic soils that would otherwise slow plant growth.
- The acidic sting of a bees can be neutralised by using baking powder.
- We use antiacid tablets containing bases such as magnesium carbonate to neutralise the excess of hydrochloric acid produced by the stomach, excess that causes indigestion.



Some typical neutralisation reactions expressed as symbol equations



Universal indicators are used to measure the pH of substances. *Did you know that you can do your own pH indicator using red cabbage juice?* The pigment anthocyanin contained in the juice changes colour in the presence of an acid or base.



Everyday use substances run from very acidic to very alkaline passing through neutral.

Once you finish reading this organiser, do a research on some other substances of everyday use in your home such as toothpaste and oven cleaner.
Do you dare to explain how do they work?

Some chemicals and household materials and their pH in water
ammonia pH 11
bleach pH 12
calomine lotion pH 8
common salt pH 7
fizzy citrus drink pH 4.5
limewater pH 12.5
sodium hydrogencarbonate .. .. baking soda, 'bicarb' pH 7.5
toothpaste pH 9
vinegar pH 3
washing soda pH 11.5
wine pH 6

Rules for naming salts

The first part of the salt's name depends on the alkali used. The second part on the acid used.
Dare to work out the name of the reactants for the salt Copper chloride.

THE KNOWLEDGE

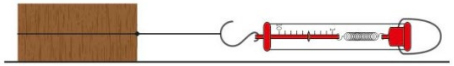
Year 7

P1.1 Forces

Sentence starters:
A force can …….
Mass is the amount of ……..
If forces are unbalanced ……..

Forces

Forces are pushes or pulls, measured in Newtons using a Newtonmeter.



Forces exist when objects interact and this produces an interaction pair.
Forces can deform objects, change their speed, or direction of motion.

Contact and non-contact force

Contact forces occur when objects are touching while non-contact ones occur when objects are not touching.
Gravitational, electrostatic and magnetic forces are non-contact ones.

Glossary

contact force
non-contact force
newtonmeter
compress
deform
Hooke's law
linear
elastic limit
field
weight
mass
gravitational field strength
balanced
unbalanced
equilibrium

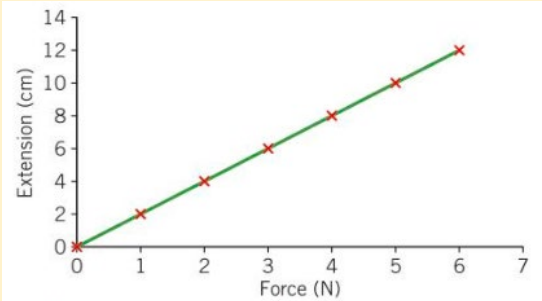
Forces at a distance

A field is a region where an object experiences a force.
In a gravitational field, a mass experiences a force.
Weight is a force and depends on the gravitational field strength.
Mass is the amount of matter something is made up of.
Weight (N) = Mass (kg) x gravitational field strength (N/kg)

Balanced and unbalanced forces

When the forces acting on an object are equal in size and acting in opposite directions they are balanced. The object is in equilibrium.
If the forces are not balanced, the object will speed up, slow down, or change direction.

Hooke's law

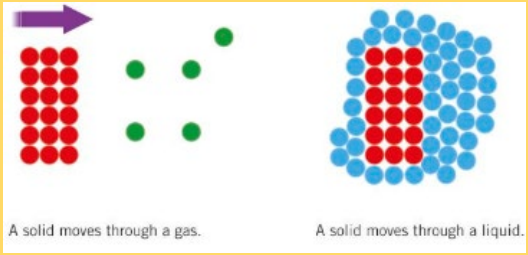


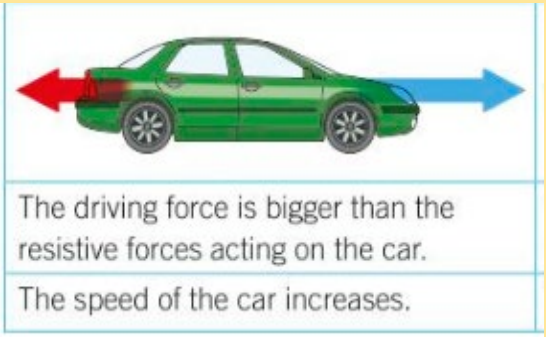
▲ This graph shows how the extension of a spring changes as you pull it.

The extension is directly proportional to the force provided the elastic limit has not been exceeded.

Drag forces and friction

Air resistance and water resistance are examples of drag forces. Drag forces just like friction slow an object down.
Friction can be reduced by lubrication.
Air resistance and water resistance can be reduced by streamlining.

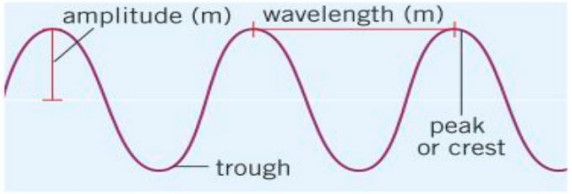




THE KNOWLEDGE Year 7
P1.2 Sound

Sentence starters:
All waves are oscillations or vibrations that have …….
Sound waves are longitudinal waves which means ……
An echo is ……

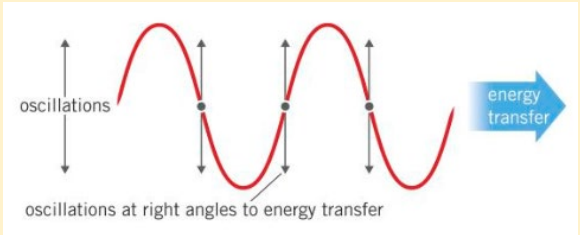
Waves
A wave is an oscillation or vibration that transfers energy.



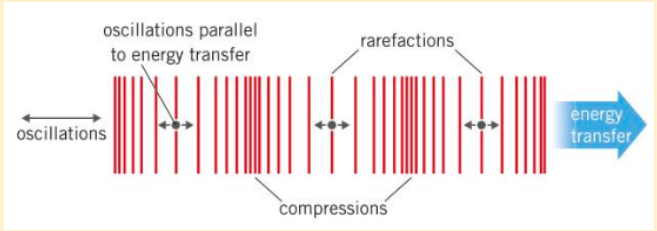
All waves have three important features:
Amplitude:- The height of a wave, measured from the middle.
Frequency: The number of waves per second.
Wavelength: The distance between two neighbouring peaks (or troughs).

Transverse Waves and Longitudinal Waves

In a **transverse wave**, the oscillation is at **90º** to the direction of the wave.



In a **longitudinal wave** the oscillation is **parallel** to the direction of the wave.



Glossary
Oscillation
Vibration
Amplitude
Frequency
Wavelength
Peak
Crest
Trough
Longitudinal
Compression
Rarefaction
Reflection
Superpose
Hertz
Oscilloscope
Echo

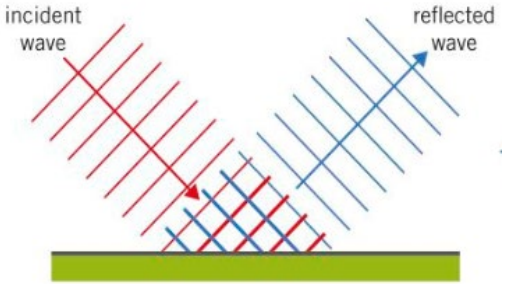
How fast is sound

Sound needs a **medium**, like a solid, liquid or a gas to travel through. The speed of sound in air is 340 m/s, but it is much faster in liquids and solids.

How loud is sound?

Sound intensity is measured in **decibels** (dB). Silence is 0 dB, normal conversation is 60 dB and a jumbo jet is 140 dB!! This is so loud it would damage your hearing.

Reflecting Waves
When waves bounce off a surface it is called reflection. The wave moving towards the surface is called the **incident wave**, and the wave bouncing off the surface is called the **reflected wave**.



The Ear
The ear detects sound waves…. You should try to remember all of the steps involved. The vibrations travel from the **pinna** to the **cochlea**, where they are converted to electrical signals which are sent down the **auditory nerve** to the brain.