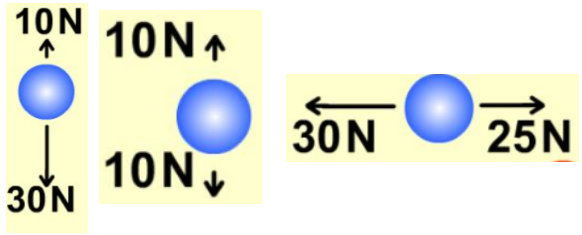
1. Why is it harder to stop larger, faster objects?
Moving objects have **momentum**. Larger and faster objects have more momentum and so it's is more difficult to stop them or change their direction.
For example, a lorry at 30mph has much more momentum than a motorbike at 10mph

2. What can forces do?
Forces are pushes pulls that are measured in Newton's (N).
Force can change an object speed, direction or shape. Forces are also required to start and stop the movement of an object.
If we apply a bigger force to an object, we will see a bigger change to it.

3. What is the name of that force?
Contact force- a force that requires contact between two objects to act
e.g., Upthrust, friction, air and water resistance
Non-contact force- a force that can act at a distance without contact
e.g., magnetism, static , weight

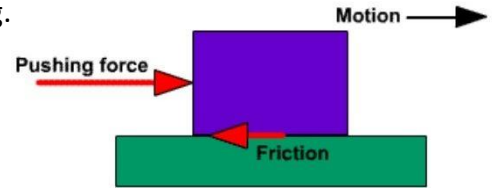
4. How can we represent forces on a diagram?
We use arrows to represent forces. The size of the arrow shows the size of the force and the direction of the arrow shows the direction of the force.



5. How big is the force?
We can measure the size of a force using a Newton meter

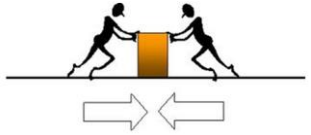
Big idea 1- Forces
Stage 1

6. What is friction?
Friction is a force that acts in the opposite direction to motion.
Friction occurs due to microscopic bumps in surfaces making it hard for objects to slide past one another.
We can reduce friction using a lubricant such as oil.
Frictional forces act on stationary objects, preventing them from moving.

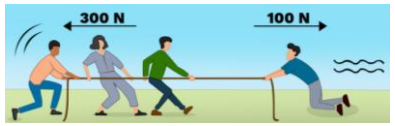


7. How many forces are acting?
Forces always act in pairs in opposite directions to each other

8. Balanced or unbalanced force?
If a pair of forces are the same size they are said to be **balanced.**

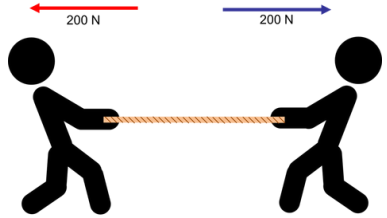


If a pair of forces are different sizes they are said to be **unbalanced.**



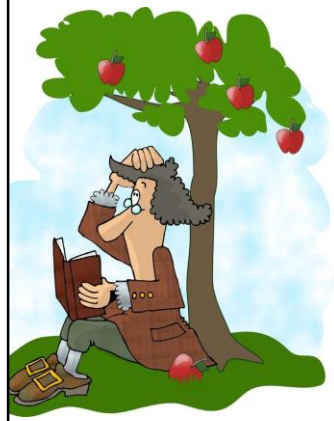
9.Resultant force is the overall force acting on a object.
Resultant force = larger force – smaller force

Resultant force = 300 – 100
Resultant force = 200N Left



Resultant force = 200 – 200
Resultant force = 0 N

10. How does the resultant force affect an object?
If the forces acting on an object are **unbalanced** it is either changing speed, direction or shape
If the forces acting on an object are balanced it is either stationary (not moving) or moving at a steady speed (a speed that is not changing.)



Big idea 2- Energy Stage 1

1. What is an energy store?

Kinetic store of energy – Contained in moving objects

Chemical store of energy – Contained in chemicals found in food, fuel and batteries

Thermal store of energy –when the temperature of a material increases, so does the amount of energy in the thermal store

Gravitational store of energy – Contained in objects that are high off the ground

Elastic store of energy – Contained in an elastic object that is stretched or compressed

2. How is energy transferred?

Energy cannot be made or destroyed but it can be transferred from one store to another.

For example.

Wind-up toy elastic store -> kinetic store of the car

Battery-powered fan Chemical store of the battery -> Kinetic store of the fan

Ball rolling down a slope Gravitational store -> Kinetic store of the ball

Hot water cooling Thermal store of the water -> Thermal store of the air/surroundings

3. How much energy is in food?

We measure the amount of energy in a store using the unit **Joules (J)**

1 Kilojoule (KJ) = 1000J

We can burn food and use the thermal energy released to heat up a set **volume** of water.

We can get an idea of how much energy is stored inside the food by measuring the temperature increase of the water with a **thermometer.**

4. How do humans use the energy that is stored in food?

Humans use the energy stored in food to do **work.**

Work is done when a force is applied to move an object a distance.

We can calculate work done using this equation

Work done (J) = Force (N) x Distance (m)

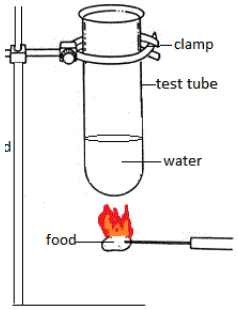
5. How is energy transferred in a spring?

Springs do work when they are stretched or compressed. Work being done on a spring results in a increase in the elastic energy store inside the spring.

The bigger the force applied to a spring the further is moves and so the more work is done.

8. How much energy do appliances need?

Appliances transfer different amounts of energy from the **mains.** Each appliance has a **power** rating in **Watts (W). Power is a measure of how much energy an appliance transfers every second. Energy transferred to the device (J) = Power of the device (W) x time the device is used for(s).**



6. What is a non-renewable energy resource?

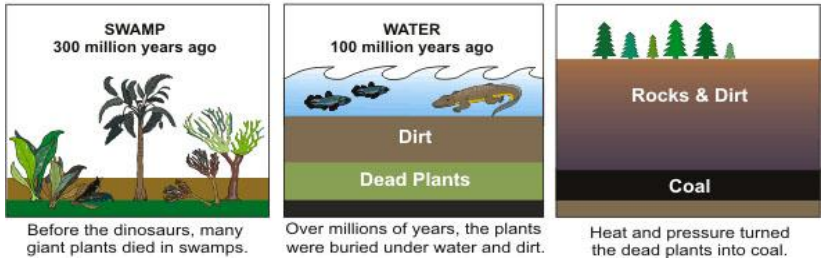
The original source for much of the energy in the home comes from **coal, crude oil, and natural gas**. These are known as **fossil fuels**. Fossil fuels are **non renewable-** this means they are used at a faster rate than they can be made and so are at risk of running out.

7. How is the energy stored in fossil fuels obtained?

Energy for the home is generated in a **Power Station.**

1. Fuel burns and used to heat water
2. Steam created
3. Steam turns turbine
4. Generator generates electricity

HOW COAL WAS FORMED



9.What is a renewable energy resource?

Renewable energy sources are ones that can be replenished. Examples include wind, solar, hydroelectric, and biomass. Each energy resource has advantages and disadvantages.

Solar and wind- unreliable, expensive to set up

Solar, wind, and hydroelectric – do not produce pollutant gases

Wind- noisy, unsightly

Hydroelectric- building dams is expensive, large areas that are inhabited by plants, animals, and humans may need to be flooded.

Biomass- requires lots of land to crop

Coal, crude oil, and natural gas – produce pollutant gases but are reliable

Crude oil- often carried in ships or pipes under the sea, if oil is spilled this affects plants, animals, and humans.

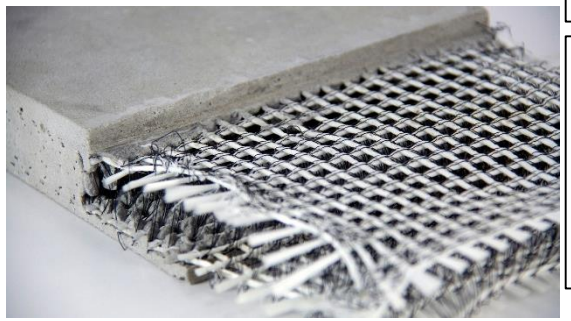
Big Idea 3
Matter Stage 1

1. What are the properties of metals?
Matter is any substance that takes up space and can be categorised as either metals or non-metals. Different materials have different properties which are characteristics that help us to identify it.

Physical properties can be observed without changing the material into something new. For example; shiny, hard, malleable, conductors of heat and electricity and density.

2. What groups of non-metal matter exist?
The 2 types of non-metal matter that need to be known are ceramic and polymers. Ceramics are made from clay and is hardened by heat. They are hard, brittle, poor conductors of heat and do not conduct electricity.
Polymers are man-made from crude oil. They are strong, poor conductors of heat and do not conduct electricity.

3. What are composite materials?
Composites are materials made up of more than one type of material. Composites are designed for a purpose and take on the properties they are made from.



4. What are the properties of matter in the solid or liquid state?
Properties of solids include:
- Fixed shape
- Cannot flow
- Cannot be compressed

Properties of liquids include:
- Take the shape of the container
- Can flow
- Difficult to compress

5. What is matter made from?
Scientists have a theory that matter is made from particles, which are tiny spheres that are too small to see. This theory is called the particle model of matter. In the solid state; particles are arranged in a regular pattern, tightly packed and vibrate in a fixed position. In the solid state, there are strong forces of attraction between the particles. This is a non-contact force.

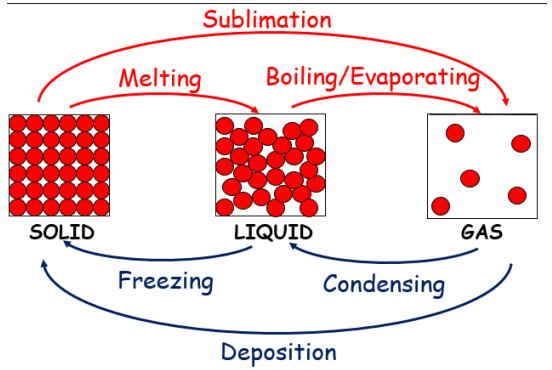
6. How does the arrangement of particles change when materials in their solid state are heated?
When a solid is heated, it melts and turns into a liquid. In the liquid state, particles are not arranged in a regular pattern, are still touching but not bound tightly and are able to move over one another.

7. Why does the arrangement of particles change when materials in their solid state are heated?
Energy is transferred when a state change occurs. When a solid is heated, the energy is transferred from the thermal store to the kinetic store of the particles. The particles vibrate more, with enough energy that they can overcome the force of attraction that hold them together. Different matter melts at different temperatures. For water, this occurs at 0 °C.

8. What happens if we continue to heat matter in the liquid state?
Matter in the gaseous state will flow to take the shape of the container, can increase in volume to fill a container and can be compressed. Gases can be compressed because there is empty space between the particles. In a gas, the particles move quickly in random directions.

As liquid matter is heated, particles gain more kinetic energy and vibrate more. The particles are pushed away from each other with a force bigger than the force of attraction holding them together. This pushes the particles away from each other.

9. What happens if we cool matter down?
State changes are physical changes. No new substance is made so it is reversible, the arrangement and movement of the particles is the only thing that changes.



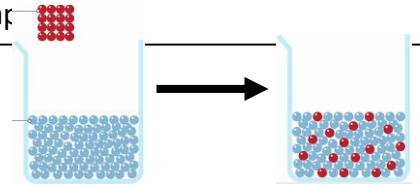
10. In which state is matter the densest?
Mass describes how much matter something is made from and is measured in kilograms (kg). When there is a state change, the volume of a substance changes. Density is a measure of how heavy something is for its size, where solids are the densest as there are more particles packed in a smaller volume.

11. Are all particles the same?
The smallest type of particles that exist are called atoms. There are 118 different types of atoms found on the periodic table. Atoms have names and symbols, usually 1 or 2 letters linking to the atoms name. The first letter is always a capital. Everything is made up of atoms.

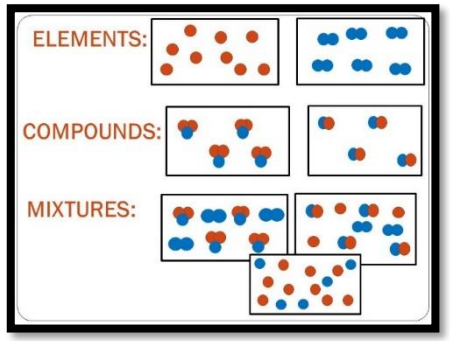
Big Idea 4 Chemical Reactions Stage 1

1. Are there different types of particles?

A **physical change** is when the particles themselves do not change only their arrangement. Examples of a physical change are dissolving and evap



Particles are made up of atoms. An **element** is made up of one type of atom. A **molecule** is more than one atom joined together. A **compound** is when different types of atom are joined together. A **mixture** is two or more substances not joined together.



4. How do we show what's happening in a chemical reaction?

New substances are formed in a chemical reaction. The starting materials are known as **reactants** and the chemicals formed are known as the **products**. When we write chemical equations they are wrote as so:

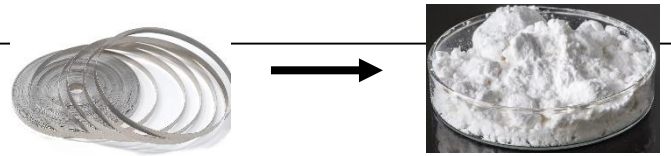
Reactants → Products

If there is more than one reactant or product, we write them with a + between them as they are coming together. We also use an arrow instead of an equals because an arrow shows that something new is forming.

5. What is combustion?

When we burn something, we cannot get what we started with back. It is **irreversible**. The 3 requirements to burn something are **oxygen, fuel and heat**. Burning is an important chemical reaction in everyday life.

The scientific term for burning is combustion. When something reacts with oxygen, a chemical reaction can be observed because there is a colour change. Oxygen reacts with the reactant to create something new.



Before Combustion | **After Combustion**

2. What happens in a chemical reaction?

When carrying out chemical reactions, we must remember the risks and hazards we could encounter. Observations are made when a chemical reaction takes place such as:

- Colour change
- Heat loss or production
- Bubbles

In physical changes, particles themselves are still the same but they have a different arrangement. In a chemical reaction, the **rearrangement** of particles to form a new substance.

3. What happens to mass?

During a chemical reaction, there are the same number of particles at the start and the end of a reaction, they have just rearranged themselves. Therefore the **mass** stays constant.

This means we can work out unknown masses in a chemical reaction by looking at how much of each substance we have.

6. What are the products of combustion?

Combustion word equation:

Fuel + Oxygen → Carbon Dioxide + Water

If there are impurities, other products may form. When we burn something, mass may appears to increase because the substance has reacted with oxygen in the air

7. What is thermal decomposition?

Combustion produces heat which can be used to break other substances down. This is called thermal decomposition

.

E.g. Calcium Carbonate → Calcium Oxide + Carbon Dioxide

The mass appears to decrease because a gas is formed. **Limewater** can be used to test for carbon dioxide as it goes cloudy.

Particles in a chemical reaction

Chemicals reacting

10g Magnesium | 4g oxygen

Chemicals forming

14 g Magnesium oxide

Big Idea 5 Organisms Stage 1

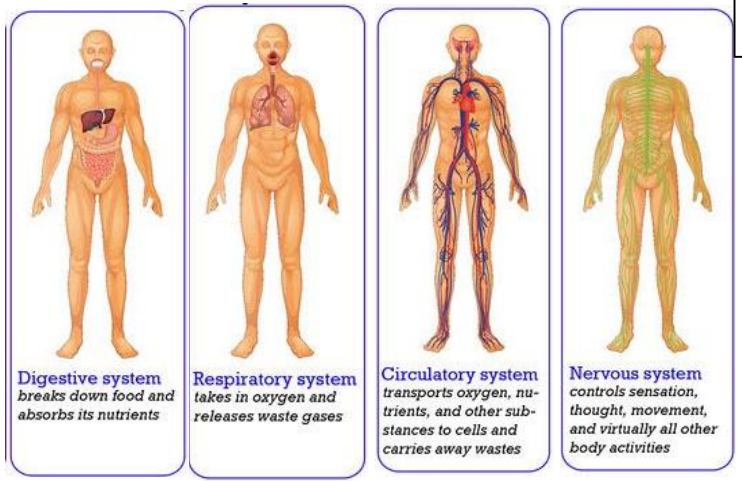
1. What is an organism?

Organisms are living things and microorganisms are very small living things.
The 7 life processes can be remembered using MRS GREN; movement, respiration, sensitivity, growth, reproduction, excretion and nutrition.

Don't forget; breathing is when animals take in air and respiration is a chemical reaction that released energy from food.

2. How do we carry out the life processes?

Organisms are made up of **organ systems**. Organ systems are a group of **organs** that work together to carry out a common function. **Organs** are made up of **tissues.** Examples of organ systems are below

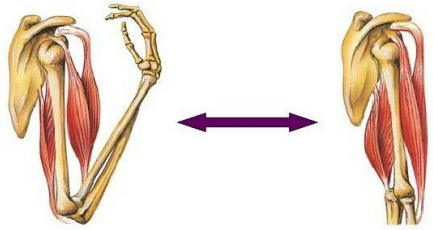


3. What is the role of the skeleton?

The function of the **skeleton** is to support our body, protect our organs and allow movement. Bones are alive as they are able to grow and repair themselves and contain **bone marrow**, which is a jelly like substance that creates new blood cells. **Joints** are where two bones are joined.

4. What is the role of muscles?

Muscles are attached to bones by **tendons**. **Muscles** cause movement of the body by pulling the bones in different directions. When a muscle contracts, they become shorter and when they are relaxed, they are become longer. Muscles always work in pairs called **antagonistic** pairs.



- Biceps muscles contract.
- This pulls the forearm up.
- Triceps muscles are relaxed.

- Triceps muscles contract.
- This pulls the forearm down.
- Biceps muscles are relaxed.

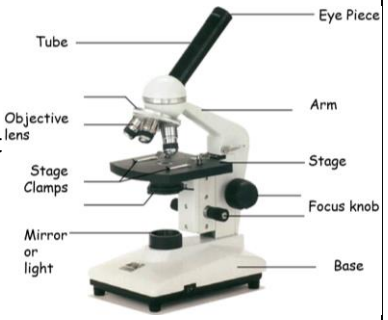
5. How can microscopes be used to view very small structures?

Microscopes allow us to see very small structures we cannot see with the naked eye. The **lenses** magnify the specimens so we can see what they look like.

Image size = actual size x magnification

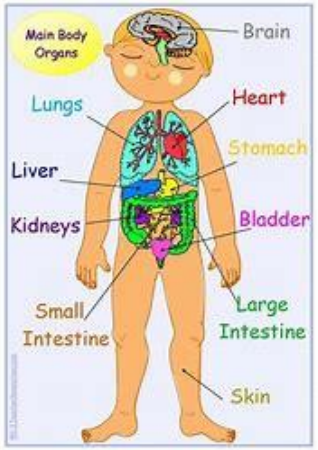
How to use a microscope:

- Place the specimen on the stage
- Secure it with the clips
- Turn to the lowest magnification first
- Move the stage as close to the lens as you can
- Look down the eye piece
- Turn the focus knob until the
- image comes into focus
- Change to a higher magnification if desired
- You may need to refocus



9. How are organisms organised?

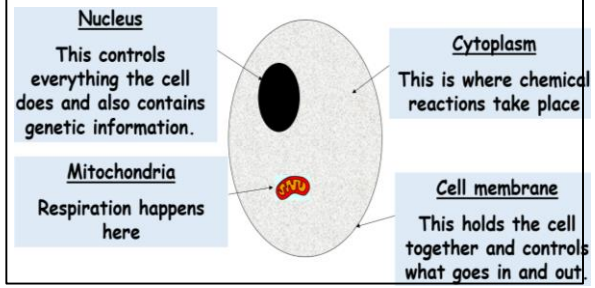
Organisms are organised in the following way: cells make up tissues; tissues make up organs; organs make up organ systems and organ systems make up organisms.

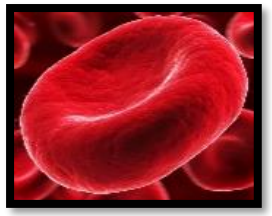


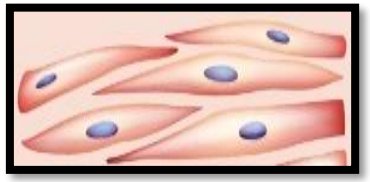
6. What are tissues made of?

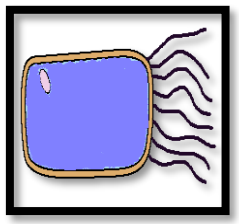
Tissues are made up of small structures called **cells**.
Cells contain organelles, small structure that have specific functions in the cell.

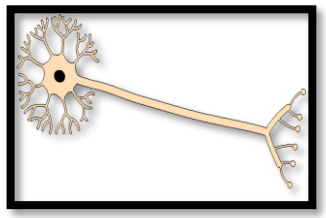
7. What are animal cells like?











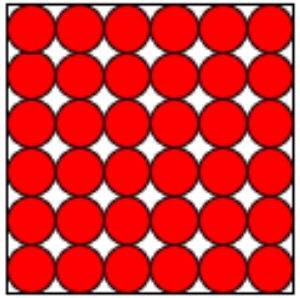
8. What are specialised cells?

Specialised cells are cells in the body that are adapted for their functions. This means they have special features that make the good at their job.
Red blood cells- Carry oxygen around the body. They have no nucleus to make extra room to carry oxygen and are flexible to squeeze through blood vessels.
Muscle cells- Contract to move the skeleton
They have lots of mitochondria to transfer lots of energy to power the contraction.
Nerve cells- Carry signals from the brain and spine to the muscles of the body-
They are long so they can connect distance parts of the body.
Ciliated cell- A cell that lines the airways and moves **mucus** (snot/flehm) away from the lungs.
They have **cilia** (microscopic hairs) on its surface that can waft backward and forward.

Big Idea 6 Sound and Light Stage 1

1. What causes sound?

Sound is caused by vibrations, which are not always seen by the human eye. The pitch of sound is how high or low a sound is and the volume is how loud or quiet it is. Louder sounds are caused by bigger vibrations, meaning the back-and-forth motion moves further. Higher pitched sounds are caused when vibrations are more frequent.



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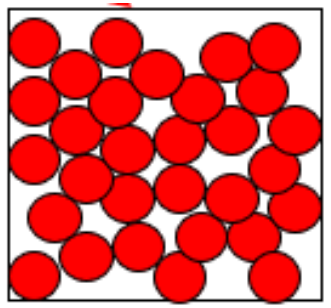

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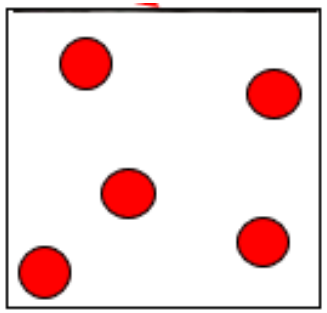


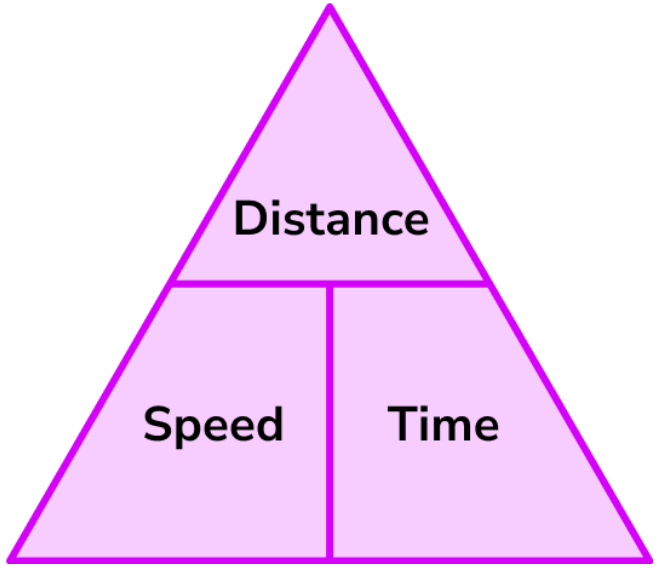
GAS

2. How does sound travel?

Energy is transferred through matter often via sound. Particles in the air vibrate and pass energy from one particle to the next so that we can hear sound. The size of the vibration is proportional to the amount of energy the particle has (a larger vibration has a larger amount of energy). When the kinetic store is full, a particle vibrates more. The ear drum is the part of the ear the vibrates and messages are sent to the brain. Microphones work in a similar way, detecting vibrations and changing them to electrical signals that can be interpreted by a speaker.

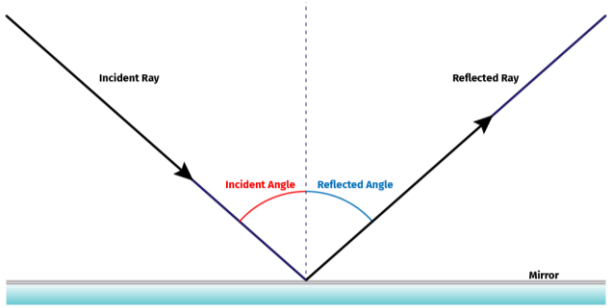
6. How do we see?

Light is necessary for us to see. Objects are either luminous, meaning they give out light or non-luminous meaning they do not emit light. The pupil is a hole that allows light to enter the eye. Light travels from a light source into our eyes so we can see. To see a non-luminous object, light must reflect off an object and into the eye. Arrows on ray diagrams show the direction light travels in.



3. How does sound travel in different mediums?

Sound travels *faster* through a solid and liquid compared to a gas as the particles are much closer together meaning the vibrations are passed along more easily. However, sounds travels *further* in gases. A vacuum is an area with no particles meaning sound cannot pass through a vacuum. An echo is when sound reflects and bounces back off a smooth, solid surface in a similar way to how water waves bounce off a surface. Using the speed, distance, time equation, we can estimate the speed of sound in air. Speed = Distance ÷ Time



4. How does light travel?

Light rays' travels through air in straight lines and cannot be seen. A beam of light contains many rays. When light is blocked, a shadow forms.

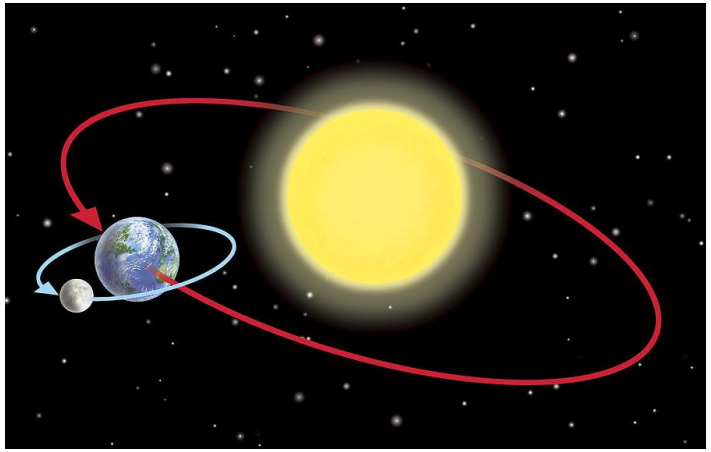
5. What happens when light hits a surface?

Transparent materials allow light to be transmitted through. Translucent materials allow some light to be transmitted through. Opaque materials do not allow light to be transmitted through. Light can be reflected from most surfaces, but shiny, smooth materials are the best reflectors. The law of reflection states that the angle of incidence is the same as the angle of reflection.

Big Idea 7 Earth in Space Stage 1

1. What is a year?

A year is 365 days long. This is because it takes the Earth 365 days to **orbit** the sun. Well, it actually takes 365 and a quarter days, we add these quarters up and every 4 years have a **leap year** with an extra day.



2. Why do we have seasons?

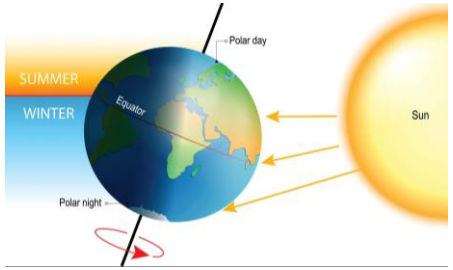
The **equator** is an imaginary line around the middle of the Earth. The area of Earth above the equator is called the **northern hemisphere** and the area below the equator is called the **southern hemisphere**.

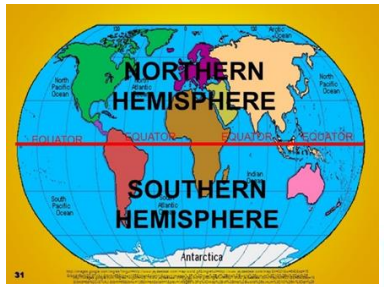
The northern and southern hemispheres have opposite seasons so when it is summer in the north it is winter in the south and vice versa.

As the Earth rotates on its **axis**, it is **tilted.**

This leads to the geographical north/south pole not being directly at the top/bottom of the Earth.

When the northern hemisphere is tilted towards the Sun, it is summer in the north and winter in the south.





3. Why is it warmer in the summer?

In the summer that part of the Earth is **tilted** towards the Sun and therefore spends a longer time in the 24 hour day facing towards the Sun this leads to warmer weather and longer days

4. What a galaxy?

Stars are made from hydrogen and helium gas. Chemical reactions that occur in the Sun transfer energy from the chemical store of the Sun to the Earth via heat and light.

The Sun is the same as all the other stars that can be seen in the night sky but these stars look much smaller than the Sun as they are much further away.

Most stars have at least one planet orbiting them but that they are more difficult to see as they are **non-luminous** unlike the stars that are **luminous**.

A group of stars is called a **galaxy** and our galaxy is called the **Milky Way**. The Milky Way contains at least 100 billion stars. Scientists estimate there are at least 100 billion other galaxies and that all the galaxies together make up the **universe**

5. How big is space?

Space is very, very big its hard to imagine how big it actually is.

A kilometer is 1000 meters, the symbol of kilometers is **km.**

The Sun is very, very far away from us (15 million kilometers). It would take around 180 days for a person to count to 15 million aloud.

Other **stars** and **galaxies** are much further away from Earth than this.

A km is not an appropriate way to measure these very large distances and so instead **astronomers** (a scientist who studies space) use a unit of distance called a **light year.**

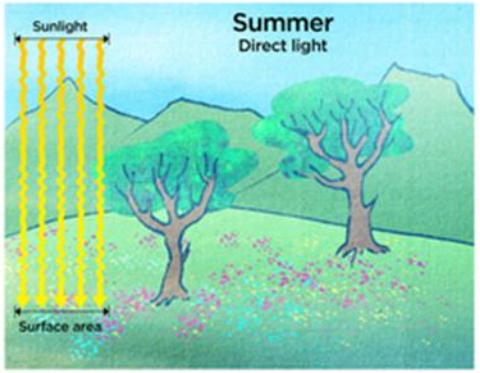
A light year is a measure of distance rather than time.

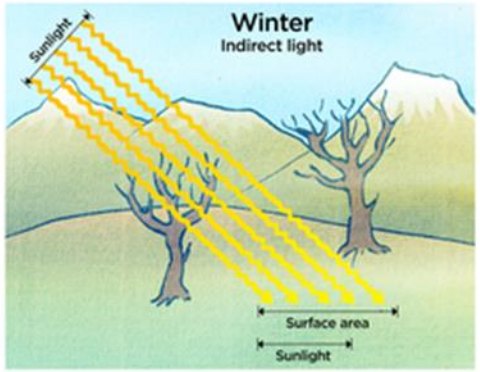
A light year is the distance that a ray of light can travel in a year.

Due to distance from earth, some space objects can only be observed using special **telescopes** from Earth and in space.

There are likely to be many areas in the universe that we are unable to study as technology has not yet been invented that can see this far.

We are confident that there is no other life in our solar system but we cannot be sure about the whole universe.

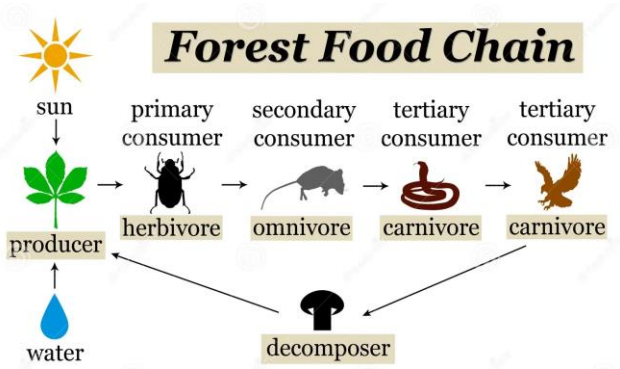




Big Idea 8: Energy for life (Stage 1)

1. What does a food chain show?

All energy within a food chain is originally provided by the Sun. This energy is transferred to Earth as light which plants then use to make a **compound** called **glucose ($C_6H_{12}O_6$)** which is a type of sugar. The arrows in a food chain show the transfer of energy from one organism to another. Food chains represent **populations** of a species rather than individuals. In biology a **community** is a group of different species in an area that interact and so a food chain shows a community.



2. How do toxins build up through a food chain?

Humans use **toxic** chemicals to kill organisms that cause them problems. Examples of this could be mice in a person's kitchen, insects feeding on a farmer's crop, weeds growing on your drive. **Insecticides** are chemicals used to kill insects, **herbicides** are chemicals used to kill weeds, **pesticides** are chemicals used to kill pests.

Some chemicals cannot be **excreted** by organisms and so remain in their bodies leading to **bioaccumulation.** This is when organisms lower down the food chain consume small amount of the toxins.

Organisms higher up the food chain eat multiple preys all containing toxins, this results in the toxins accumulating. Eventually in animals higher up the food (often the top predator) the toxins accumulate in high enough levels to kill them.

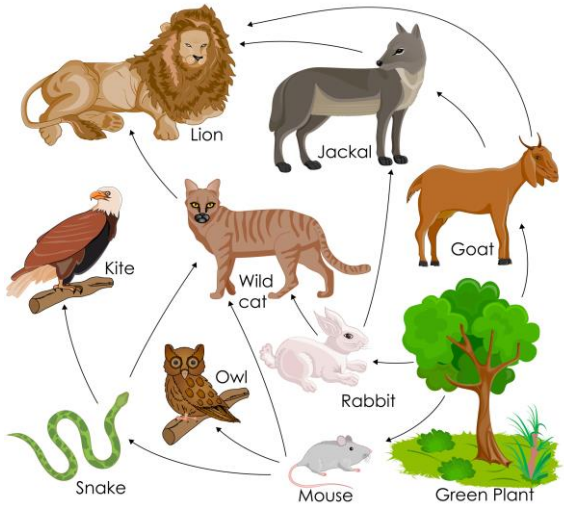
3. What is a food web?

In nature animals rarely have one source of food or are preyed upon by one species and so the feeding relationships we see in food chains are not so simple in real life. **Food webs** show multiple interconnected food chains that exist in a community. Changes in one population can affect many other populations in the same community.

For the food web below

- If the rabbits population decreased the wild cat and the jackal population would also decrease as they would have less food.
- If the mouse population increased the population of owls and snakes would increase as they would have more food.

Populations of organisms in a habitat are continually changing but it would be rare that a population would completely die out.



4. What is the role of microorganisms in food chains?

When organisms die, their remains **decompose/decay** this means **break down.**

Decay is a process that is carried out by **microorganisms**, specifically **bacteria and fungi.** The general term for microorganisms that cause decay is **decomposers.**

Organisms are made of **compounds** and during decomposition microbes break these compounds down into the **elements** that they are made from. The amount of these elements on Earth is fixed and so decay is very important as it releases these elements so that they are available for use by other organisms. Some of these elements form minerals in the soil, these minerals are then taken through the roots of plants and passed along the food chain as consumers feed.

5. How do non-living factors affect populations?

An **ecosystem** is all the living things in an area and their surroundings.

The surrounds in an ecosystem are **non-living factors**. Examples of non living factors in the desert are the sand, the lack of water, the hot temperatures and the rocks. Examples of non living factors in the rainforest are the warm temperatures, low light intensity on the forest floor and heaving rainfall. Changes in non living factors in an ecosystem can affect the populations of the organisms that live there .

For the food web below

-If the weather became too hot the plant population could decrease, this could lead to a decease in rabbit and mouse populations as they would have less food.

6. How can we measure the impacts of non-living factors on populations?

In most **ecosystems** the **populations** are too large to count to overcome this, ecologists use a method called **sampling** to **estimate** population size. In sampling, ecologists count the number of individuals in a small part of the habitat. They may use a **quadrat** if they are sampling plant populations.

Sampling a plant population

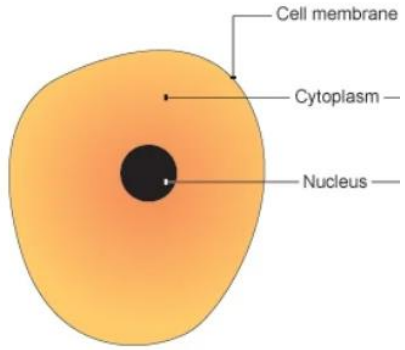
1. Use a marked-out grid of the habitat
2. Use a random number generator to select the area of the habitat you will sample
3. Place the quadrat in the selected part of the habitat and count the number of individuals in the quadrat
4. Sample multiple times (at least 10) and then calculate the mean.

Big Idea 9: Diversity of life (Stage 1)

1. What is in the nucleus of cells?

One of the **organelles** found in both plant and animal cells is the **nucleus.** Inside the nucleus of the cell is where we find the DNA. DNA is the instructions for all the **internal workings** of the organism and the **external features**. Apart from identical twins, every individual has their own unique DNA.

Every cell of an organism contains the same DNA. The entire DNA of an organism is called its **genome.** The DNA is a code made of 4 different types of chemicals called **bases** the bases are **A,T,C and G**. The human genome is very long (around 3 billion bases) and different sections of the DNA codes for different **traits.** A section of DNA is called a **gene**. 50% of an organisms genes come from their mother and 50% from their father**.**



Animal Cell

2. What is variation?

A **species** is a group of organisms with similar **characteristics**. There are differences in characteristics within a species, these differences are called **variation.** Some variation is caused by differences in **genomes** between individuals and some variation is caused by differences in the **environments/lifestyles of individuals.**

We all have genes that may **predispose** (increase our chances) of having certain features such as high intelligence, being overweight, having heart disease but that our environment/lifestyle can influence the outcomes of these genes.

Examples of variation controlled by …..		
Genes	**Both**	**Environments/lifestyles**
-Natural eye colour -Natural skin colour -Blood type -Zebra's stripes -Deer's antler size	-Height -Weight -Intelligence	-Scars -Accent -Tattoos

3. What do organisms compete for?

To survive animals require food, mates and territory and plants require light, space, water and minerals.

As there is **variation** between individuals of the same species this means that some individuals have features that give them an advantage over others when it comes to obtaining resources

Features which mean an individual has a better chance of survival are called **adaptations.**

A very famous British scientists called Charles Darwin called this struggle for survival **'survival of the fittest'**

4. How are organisms adapted?

When thinking about adaptations we must be able to **describe and explain.** Describing the adaptation is saying what it is, explaining the adaptation is to say how it increases the chance of survival. The table shows some examples of variation and adaptations in different organisms

Variation	Adaptation	Explanation
Penguins have different body shapes	The more **streamlined** a penguin the better a swimmer it is	Faster swimmers can catch more prey and escape more predators
Some plants grow longer roots than others	The plant that can grow longer roots can obtain more water	Plants require water to survive
Moths have different colours of wings	Moths that are more camouflaged will blend into their environment more easily.	Camouflaged moths have a better chance of escaping predators
Male deer (stags) have different sizes/strength of antlers	Males with bigger/stronger antlers are better fighters	They can win more fights and claim more territory and so have more food to eat/more females to mate with

Streamlined- A shape that reduced air resistance and allows an object/individual to move through the air or water more easily

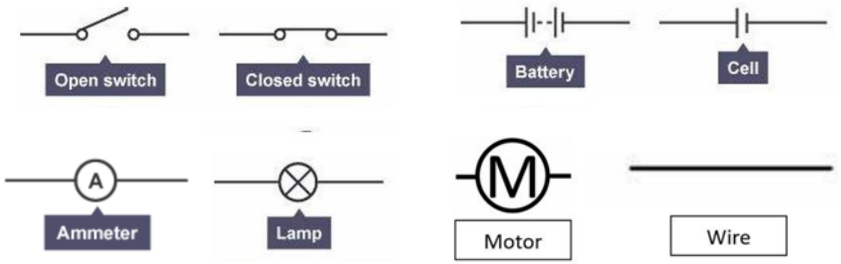
Big Idea 10: Electricity and Magnetism (Stage 1)

1. Can we build circuits?

All electrical appliances contain **circuits**. A circuit is a closed loop around which electricity can flow. Circuits must be made of **conducting material** (usually metal wires), there must be no gaps in the loop and they must be connected to a power source (often a battery) to work. Circuits usually contain other **components** such as bulbs, switched and buzzers.

2. How can we represent circuits?

We use symbols to represent the components in a circuit so that circuit diagrams can be universally understood.

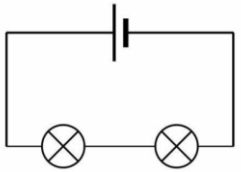


A **cell** is a single unit that can provide energy to a circuit, **batteries** usually contain multiple cells working together.

Motors are found in circuits for devices that have moving parts such as a fan or blender. The motor spins when the circuit is switched on. A motor **transfers energy** from the **chemical store** of the battery to the **kinetic store** of the moving part.

Rules for drawing circuit diagrams

-Use a sharp pencil and a ruler for every straight line in a circuit symbol.
-All circuit symbols are correctly drawn.
-There are no gaps in the circuit diagram.
-Every wire exactly touches each component.
-The corners of the circuit exactly touch.
-The diagram is drawn with a rectangular shape



3. What is current?

Metals contain extremely tiny particles called **electrons.** These electrons are able to move through the metal when it is attached to a battery. Electrons carry an **electric charge.** The battery applies a force which pushes the electrons and the electric charge they are carrying around the circuit. **The flow of electric charge around a circuit is called the current**. As the electrons flow around the circuit they transfer energy from the battery to the components in the circuit.

The units for current are amps (A). Current can measured at a certain point in a circuit using an **ammeter.**

- Current is not used up in a circuit
- Current is the same at all points in the circuit

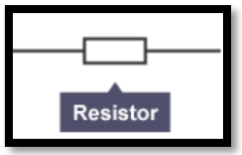
4. What is resistance?

Resistance is a force that opposes the flow of electrical current.

The wires and the components add resistance to a circuit.

When resistance is bigger the current is smaller. If we add more bulbs to a circuit the resistance increases, the current decreases and the bulbs become dimmer.

We can reduce the current in a circuit by adding **fixed resistors**. These are components which provide a set amount of resistance. To the circuit and so reduce the current. We might find these in a circuit which needed a dimmer bulb or a quieter buzzer.



5. Which materials are magnetic?

Magnets have two ends that we call **poles:** a **north pole and a south pole.** If two of the same poles **(like poles)** are brought close to each other, they **repel**. If two **opposite poles** are brought close to each other, they **attract**.

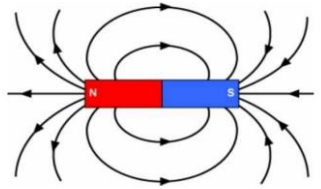
If you put a magnet next to some plastic, nothing happens. This is because plastic is not magnetic. If you put a magnet next to a piece of iron, the piece of iron will be attracted to the magnet. This is because the iron is magnetic, it isn't a magnet itself, but it can still be attracted to magnets. Nickel and cobalt (and steel, which is a type of iron) can also be attracted to magnets. A material is classed as a **permanent magnet** if it can attract and repel other magnets. Materials that can only be attracted are called **induced magnets.**

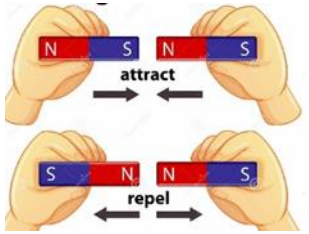
6. What is a magnetic field?

The area around a magnet, where magnetic force can act, is called the **magnetic field.**

We cannot see magnetic fields but if we could we would see that they have lines, these lines show us how the magnetic field works, they always go from north to south. The closer together the magnetic field lines the stronger the magnetic force.

The magnetic field around a bar magnet is shown below.





7. How does a compass work?

The Earth also has a magnet field around it, this magnetic field is caused by the iron that we find in the centre of the Earth.

A compass can indicate which direction is north or south. A compass contains a tiny permanent magnet that is free to rotate, the tiny magnet inside the compass is affect by the Earth magnetic field and it will align with the magnetic north and south pole of the Earth.

If we place a permanent bar magnet near to a compass, the compass no longer aligns with the magnetic field of the Earth. Instead the compass aligns with the magnetic field around the permanent bar magnet. We can use a very small compass called a plotting compass to plot the magnetic field around a bar magnet.