



The Hampshire School

C H E L S E A

**Helping you to help your
child with....
SCIENCE KS2
CONCEPTS!**



Experiments

Key Words

Fair test

Factor

Results

Data

Evidence

Compare

Supports

Predict / Prediction

Conclude / Conclusion

Observe / Observation

Table

Bar Chart

Pie Chart

Tally Chart

Venn diagram

Graph

Axis (graphs)

Key Points

- In a variety of contexts children will need opportunities to suggest questions and ideas and how to test them
- Give Children the opportunity to choose the apparatus to use and to decide what to measure.
- Ensure children are familiar with the full range of correct scientific vocabulary
- Give children opportunities to practice representing their ideas in different ways including conventional representations
- Give children practice in interpreting data from tables, charts and graphs
- Discuss the reasons for taking repeated measures in some investigations
- Explain: what they see (say how and why something happens)
- Predict: what will happen next (using common sense /real-life knowledge)
- Say whether end result support and prediction made.
- Use results to draw conclusions and make further predictions
- Find a pattern: in a set of results (teach explicitly & lots of practice)

Key Concepts

Questioning

Every experiment needs a clear aim.

Children must know what it is they are trying to find out / test

Can they work out what the test is from the details of an experiment?

Planning

Children also need to identify the dependent and independent and define the factors involved when planning and investigating.

Independent Factor = the thing you vary

Dependent Factor = what you measure or observe to see if the Independent Factor made a difference.

NB: Often in teaching materials the word 'variables or factors' can be used

Pupils would also benefit from discussing why factors/variable may be irrelevant for a fair test.

A Fair Test is where you only change ONE factor at a time.

Eg:

Testing how high a ball bounces

Factors = Size of ball, Surface to bounce on, Height of drop

Fair Test = Changing size of ball, Surface stays the same, Height of drop stays the same.

Collecting, Analysing & Interpreting Data

Tables, Graphs & Charts

Practice recording results in the different formats of tables, graphs and charts.

There are often questions with tables, which need the blanks filling in.

Encourage children to look for, and describe in words, patterns and relationships in their own and pre recorded data. Use all forms: Graphs (including Bar, Line and Venn), charts, pictures, words etc. Misreading can lose valuable points - particular care is needed with what the axis represent

Children would also benefit from opportunities to look for unlikely results that maybe inaccurate.

Tables, Graphs & Charts can also be used to predict results, it may be useful to get children to sketch a graph to predict the data they expect to get from an investigation

NB: Children need to understand that repeating measurements is to improve the reliability of their results. Many children think they do this to make it a fair test - this is incorrect.

- Fair Test = changing one factor - others remain the same
- Repeating Test = ensuring reliability of results

Technical Knowledge

Children should know the correct names for the equipment they are using as well as the units in which they measure things (see table next section)

Ensure children know exactly how to use measuring equipment eg: force meter, measuring cylinder & thermometer.

Also discuss what measurements they would need to take to get the appropriate data, what equipment they would use and which units they will record the data in

Evaluating

The conclusion is very important as it sums up what has been found out.

Children will need practice and help drawing the appropriate conclusions from the data they have collected. Encourage them to evaluate predictions and conclusions in the light of the available evidence.

Conclusions are usually comparative and refers to the factor that you have changed.

Some conclusions use two comparisons the 'more & less' or 'bigger & smaller' etc

Units of Measurement

What	Instrument Used	Unit	Symbol
Force	Force Meter / Newton Meter	Newtons	N
Length / Distance	Ruler Tape Measure	Centimetres	cm
		Metres	m
		Kilometres	km
Temperature	Thermometer	Degrees Celsius	°C
Mass	Scales	Grams	g
		Kilograms	kg
		Tonne	t
Liquid	Measuring Cylinder	Millilitres	ml
		Litres	l
		Volume	cm ³
Sound		Decibels	db
Electricity Current	Ammeter	Amps	A
Power		Watt	W
Time	Clock / Stop Watch	Seconds	sec
		Minutes	min
		Hours	h

Arrows VERY important to ensure arrow is in the right direction	Light	Pointing away from source	
	Forces	In direction of force	
	Food Chains	From producer to consumer	

Living & Non-Living

Key Words

Living non-living

Living Processes

1. Moving
2. Reproducing
3. Sensitivity / Response

4. Nutrition / Eating

5. Excreting

6. Respiration / Breathing

7. Growing

Key Concepts

All living things do the above 7 processes & this can be used to define living things

Children need to learn these - they ALWAYS come up in some form or another

They need opportunities to learn the life processes of plants and animals and relate them to particular parts of animals and plants

A good way of remembering the processes is - MRS GREN

M - moving

G - grow

R - reproduce

R - respiration (exchange gases)

S - sensitivity

E - excrete

N - nutrition

Respiration

In Animals - breathing

In Plants - exchange of gases

Senses (different animals have different senses heightened = adaptation)

Humans have 5 senses

Brain very important and complex (control centre)

Life Cycles

Children need to know the life cycles of animals, plant and humans.

Past questions have asked what an adult can do that children cannot do -reproduce - links in with the seven living processes

Investigations

Look at a variety of different living things plants & animals and identify the living process in each example

Moving & Growing

Key Words

Skeleton - bones	baby adult
Support	digestion stomach
Protection - skull spine ribcage	lungs
Joints - hinge ball & socket	Organ
Movement	Vertebrate
Muscles - stretch contract	Diet

National Curriculum Key Concepts

- Main function of skeleton
- Characteristics of bones
- Skeleton grows as we grow
- Movement depends on skeleton & muscles

Key Concepts

Humans are animals - mammals
They do the 7 living processes
Life cycle - baby child teenager adult old age

Skeleton

Skeleton has 4 key functions:

Support - standing & structure & shape

Growth - grows with us

Movement (with muscles) - Joints

- Hinge - elbow
- Ball & socket - shoulder / hip

Protection

- Skull - brain
- Spine - nerves
- Ribs - heart & lungs

Muscles

Muscles work in pairs

To move a joint one contracts (gets shorter) the other stretches - bending arm up

Digestion

Diet is what we eat (not a weight loss programme)

Humans are omnivores (eats meat & vegetables)

Food is chewed by teeth & softened by saliva then swallowed

Goes to stomach gets broken down by chemicals

Moves into intestines (small then large) they absorb nutrients & water into the blood stream

Waste excreted through anus & kidneys

Keeping Healthy

Key Words

Heart	Vessels	Healthy
Heart Beat/Rate		Diet
Pulse / Pulse Rate		Disease
Pump / Pumped		Medicine
Circulate		Micro-organism / microbe
Excercise		Virus
Lung		Bacteria
Incisor	Molar	Canine
Decay	Root	Fungi

National Curriculum Key Concepts

- Components of a healthy & varied diet
- Evidence of the effects of diet
- Recognise harmful effects of some drugs
- Blood carries oxygen and other essential materials around the body
- Heart beats faster during exercise to take blood around the body faster
- How to make careful measurements of pulse rate & why they need repeating.
- Know the names of and what different teeth do
- How to look after teeth and why

Healthy Living

Certain foods are essential for healthy living;

Good	Bad
A Balanced diet:	Smoking - lungs, heart
Carbohydrates (starches/sugars)	Fatty foods - heart
Proteins, Fats, Vitamins & minerals, Fibre & Water	Sweets - teeth
Exercise	Alcohol - liver & nervous system
Drugs - medicines	Drugs - heart, nerves & brain

Children need to know that major groups into which food is categorised and name some sources for each of these groups.

- Growth needs - meat, fish, cheese & some vegetables (protein, vitamins & minerals)
- Energy needs - sugar, bread, pasta & rice (carbohydrates)

Other needs eg: fibre, vitamins & minerals - fruit and veg

Evidence for Healthy Living

Historical evidence

- Sailors & scurvy - deficient in Vit C - solution limes

Look at examples of a healthy diet / meal and compare to an unhealthy one

Circulation

Heart pumps blood around ALL the body

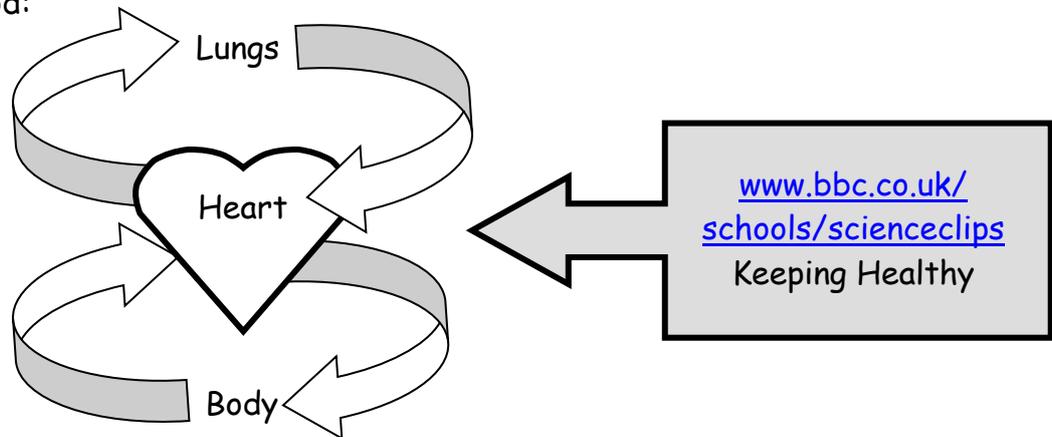
Pulse rate = N^o of beats of the heart per minute

Exercise changes your pulse rate

Run = heart beats faster = higher pulse rate (muscles need more oxygen)

Sit = heart beats slower = lower pulse rate

Flow of blood:



NOTE: The circulation looks like a figure 8 - easier for children to remember

Blood travels from:

Heart to lungs - then to heart - then to body - then back to the heart

Blood carries:

- oxygen & other essential materials to organs & muscles (all cells)
- carbon dioxide (waste) back to the heart/lungs/kidneys

Exercise

Exercise is important as it makes the body fitter and therefore more able to fight disease and more efficient in its use of food. Also makes the heart stronger and the body less prone to weight increase.

Hygiene

Personal cleanliness is important to keep you healthy and prevent spread of infection

- Washing hands before eating will kill micro-organisms which may spread disease.

Teeth

Humans have 3 types

Incisors - cutting /slicing

Canines - tearing/ gripping

Molars - chewing / grinding

Tooth Care

Decay is caused by micro-organisms which feed on sugar to form plaque

To prevent decay: Brush 2x a day: AFTER breakfast & LAST thing at night - Flossing - not too many sweet foods - visit dentist

Babies no teeth - drink milk

Humans have 2 sets of teeth

Milk teeth - small for small mouths

Permanent teeth - follow milk teeth

Micro-organisms

Sometimes called microbes

NB: Germ is an everyday name not used scientifically

Very small organisms - often so small they can't be seen

They feed, grow & reproduce like any other organism

They have different effects some good some not:

BAD: Cause illness - common cold, infection - viruses & bacteria

BAD: Decay - compost heaps, mouldy food - bacteria

GOOD: Food production - bread - yeast (fungi) & yoghurt - bacteria

Illness

One way disease can be passed on is by micro-organisms

ie: colds, upset stomach

Medicines - good drugs - help cure disease or needed to help the body to function properly (asthma pump or aspirin for heart problems)

Vaccines -reduce the chance of you getting diseases

Historical evidence to illustrate the effects of microbes - Edward Jenner & Louis Pasteur

Investigations

Q: Does exercise affect your heart rate?

Pulse Rate Test: Take pulse sitting in chair and record

Run round playground for 2-3 min take pulse again

Sit still for 5 min take pulse again

Compare results to determine effect exercise has on the heart

Green Plants

Key Words

Root Stem Leaf Flower

Petal

Stamen Anther Filament Pollen

Carpel Stigma Style Ovary Sepal

Seeds

Attracts produces receives

New Plant Material = Food

Photosynthesis (leaf)

Germination

Pollination - insect wind

Fertilisation

Seed dispersal - wind animal explosion & human

National Curriculum Key Concepts

- Name & function of some parts of the flower
- Explain the processes & stages of the plant life cycle
- That living things need to reproduce to survive

Key Concepts

Plants (green plants) to grow well need:

Light - no light / too little - plant goes yellow or doesn't grow

Water - too much / little - plant dies

Space - too little - roots can't spread to get water - plant small or dies Air (carbon dioxide)

Plants (flowering plants) have:

Roots

- anchor plant
- take in water
- take in nutrients (Nutrients are NOT food)

Stem

- hold plant up
- transfer water from roots to leaves & flower
- transfer matter & nutrients around plant

Leaves

- make new plant material from sunlight = Photosynthesis

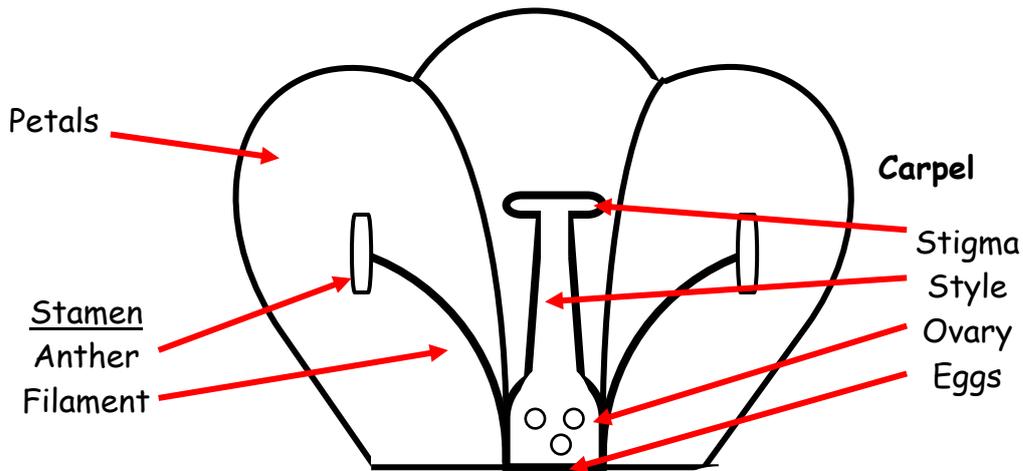
Flowers / petals

- attract insects
- make seeds
- reproduce

Photosynthesis

Children need to understand the role of Photosynthesis in producing new material for growth.

Reproduction



Petal - bright to attract insects
Nectar - sweet to attract insects

Female = Carpel = Stigma, Style & Ovary - producing eggs
Male = Stamen = Filament & Anther - producing Pollen

Pollination = getting Pollen (male) to Stigma (female)

2 methods:

- Insect (bees)
pollen sticks to insect - flies to next flower
- Wind
pollen is blown to next flower

Fertilisation = joining Pollen (male) + egg (female) = seeds

- Pollen on insect / wind sticks to stigma (sticky) - pollen travels down style to ovary & fertilises egg which becomes a seed

Seeds

Not all plants produce seeds eg: spider plants

Most however produce seeds

Seed Dispersal

Seeds need to move away from parent plant so they don't compete for space

Some methods of dispersal:

Explosion - pea pods burst open

Wind - sycamore & dandelions - blow away

Animals - fruit eaten - burrs stick to fur

Human - deliberate - sowing crops

Swimmers - coconuts - drop in the sea

Shakers - poppies - seeds shaken out of poppy head

Germination

Germination is when a seed sends out first shoot & root

Several factors affect seed germination

Eg: water & heat

Children need to know the cycle of plant growth it can come up in different forms but the basic are the same

Germination - Growth - Flowering - Pollination - Fertilization - Seed Dispersal - Germination

Investigations

Children will benefit from considering conditions that might affect germination and plan how to test them.

Q: What are the best conditions for germination?

Use several seeds to ensure accuracy. Vary one factor each time eg: some in dark with water but very cold & some in dark with water and warmth.

Q: Which type of water is best for a healthy plant?

Take five sticks of celery. Stand one in fresh water, one in salty water, one in sugary water, one in water with food colouring and one with no water.

Check at regular intervals and note any changes.

This experiment will show the capillary action of plant taking in water.

Q: Identify which part of a plant a vegetable is?

But a selection of vegetables for the children to identify

Eg: Parsnip & carrot - root

Cauliflower & Broccoli - flower

Peas & broad beans - seeds

Celery - stem

Spinach & lettuce - leaves

Q: Do plants grow as well in different light conditions?

Put identical plants in natural light, artificial light, coloured light etc Water as normal

Check regularly and record observations

Adaptation

Key Words

Habitat	Classification Key
Adaptation	Herbivores
Environment	Carnivores
Classified	Omnivores

National Curriculum Key Concepts

- How animals in two habitats are suited to the conditions
- How to use / draw keys to identify animals & plants

Key Concepts

A Habitat is where a plant or animal lives:

- Frog - pond habitat
- Cactus - desert habitat
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Adaptation is when an animal or plant develops specialised characteristics & or senses to enable them to live in certain environments.

All animals & plants are suited & adapted to their environment:

- Fish have gill & fins
- Desert plants have thick leaves 'leathery' or spines to prevent evaporation
- Plants have different root systems: aerial, subterranean & tap roots
- Lion has sharp teeth & claws
- Chameleon can camouflage themselves

These adaptations all for a purpose - to help them live, eat, survive, hide, reproduce etc

Animals can be grouped:

Vertebrates (backbone) Fish Amphibians Reptiles Birds Mammals	Invertebrates (no backbone) Insects Arachnids Molluscs
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Plants can be grouped in a variety of ways.

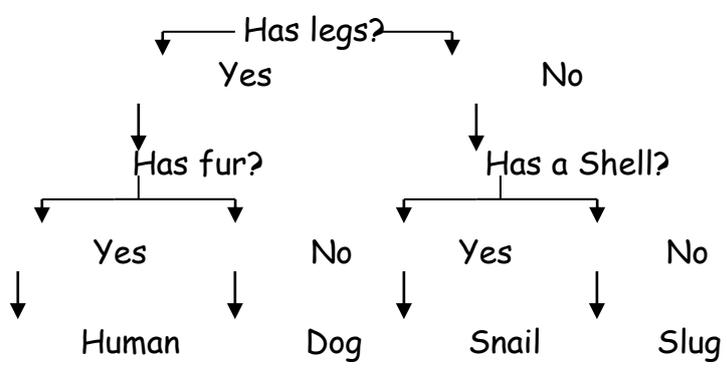
Characteristics

Mammals - Warm blooded & live young
 Birds - Warm blooded & eggs
 Reptiles - Cold blooded & eggs
 Amphibians - Cold blooded & eggs
 Fish - Cold blooded & eggs

Insects - 3 body parts 6 legs
 Arachnids - 2 body parts 8 legs
 Molluscs - Slimy foot & often a shell

Carnivores - eat meat only
 Herbivores - eat plants only
 Omnivores - eat both meat & plants

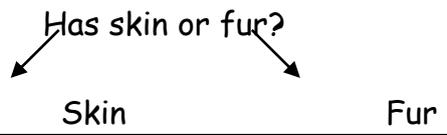
Animals & plants can be classified using classification keys



When creating classification keys:

- Always questions with Yes/No answers until only one animal/plant from group fits all questions.
- Always use observable features eg: legs, colour, wings never how old or does it like fish

NEVER questions like



Children need to be able to use classification keys and create them to sort things such as animals, plants or materials. They also need to be able to fill in partially created ones and be able to use complete ones confidently. This almost always comes up in some form or another.

Investigations

Q: Create a classification key to sort children or animals

Do it with Children in class:

- Has blonde hair yes/no
- Has glasses yes/no

Use groups of animal pictures

Identify animal by teeth (herbivores, carnivores, omnivores) all have different amounts of teeth (incisors, canines, molars). Look carefully at pictures, identify with questions & say which type of animal it is.

Interdependence

Key Words

Habitat	Producer
Environment	Consumer
Food Chain	Predator
Food Web	Prey

National Curriculum Key Concepts

- Feeding relationships within habitats in food chains
- Food chains begin with green plants

Key Concepts

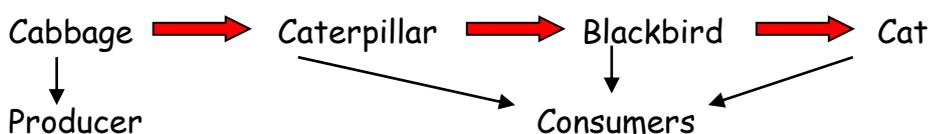
Food Chains

A food chain is a feeding relationship within a habitat.

The first thing in any food chain is the PRODUCER. It is generally a green plant because they produce their own food.

All other parts of the food chain are the CONSUMERS because they eat something else.

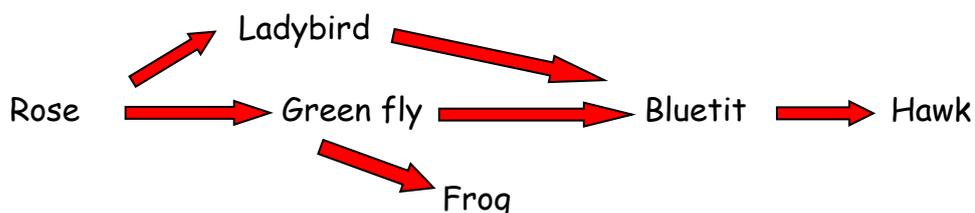
Food Chain Diagrams



 means '**energy for**' (pay attention to arrow direction)

Food Webs

When different animals share one habitat the Food Chains inter link to form a Food Web



A change to any part of a Food Chain or Food Web affects the rest of it:

Fewer Fish means:

- More Water Plants (less fish eating it)
- Less food for Seals (only Crabs now)
- Less Crabs (eaten more by seals)

Predator & Prey

Predator - an animal that kills another to eat it

Prey - an animal killed for food

Investigations

Children can draw or build their own food chains and webs

Materials & their Properties

Key Words

Natural	Man-made = Synthetic	Squash	Stretchy
Recycled	Combined	Float	Sink
Properties		Mouldable	Light Flexible Rigid
Material			
Hard	Strong		Electrical Conductor
Absorb - Absorbent - Absorbency			Electrical Insulator
Permeable	Impermeable		Thermal Conductor
Waterproof			Thermal Insulator
Transparent	Opaque		
Translucent			

National Curriculum Key Concepts

- Identify naturally occurring materials
- Identify uses of some common materials
- Why materials are suitable for certain objects
- Identify materials that make good insulators and conductors

Key Concepts

Children will associate the word material with fabric. Children will need to be reminded that in science 'material' also refers to things like glass, rock, metal and water etc.

All materials can be sorted into 2 main types of material - NATURAL & MAN-MADE (Synthetic)

Natural eg:

- Wood
- Cotton
- Metal - Iron
- Rubber
- Clay

Man-made eg:

- Plastic
- Nylon
- Fibreglass
- Metal - aluminium

NB: some are natural but changed eg:

- Glass
- Paper
- China

A PROPERTY is a particular characteristic that a material has. Each material has different properties.

Objects are made of different materials because of their PROPERTIES

Drain pipes - plastic - mouldable, light & flexible

Ladder - metal - strong & rigid

Window - glass - see through

Towel - fabric - absorbent & flexible

Roof tiles - impermeable

Curtain - fabric - opaque, flexible & insulating

Saucepan - metal - strong & thermal conductor

Rocks

A waterproof rock is called impermeable - slate

An absorbent rock is called permeable - chalk

Conductors

Materials that easily let heat or electricity pass through.

Thermal Conductors - let heat through - metal - saucepans

Electrical Conductors - let electricity through - some metals - copper, iron, steel, aluminium - electrical wires. Also water - remind of **SAFETY RULES**

Insulators

Materials that do not easily let heat or electricity pass through them.

Thermal Insulators - wood, fabric, plastic & cork - oven gloves & wooden handles

Electrical Insulators - plastic, wood, glass, rubber - plastic coat on wires

Thermal insulators keep heat IN and OUT

IN - coat or polystyrene cup

OUT - cool box

BOTH - Thermos flask - cold drink = heat out hot drink = heat in

Good Insulator = Poor Conductor

Investigation

Q: Which object is the most effective insulator?

Put an ice cube in a thermos flask, a plastic cup and a paper cup with lids on.

Start a timer and check at regular intervals until the ice cubes have melted.

Record and compare results to find the most effective insulator.

Children make a prediction at the start.

Solids, Liquids & Gases

Key Words

Solid	Condense - Condensation - Condensing
Liquid	Ice Water Steam
Gas	Cloud Rain Sun Wind
Particles	Water Cycle
Solution	Water Vapour
Dilute	Temperature
Concentrate	Boiling Temperature 100°C
State	Degrees Celsius
Change of state	Thermometer
Evaporate - Evaporation - Evaporating	

National Curriculum Key Concepts

- Difference properties solids, liquids & gases
- Liquids evaporate to form gases
- Name/describe main processes associated with water changing state
- Recognise these can be reversed
- Explain the water cycle and the different processes involved including where they occur

Key Concepts

All materials can be put in 3 groups

Solids	Liquids	Gases
Saucepan Chair Brick Bread	Water Juice Mercury (thermometers)	Air (made of different gases) Helium, Oxygen & Carbon Dioxide

Solids	Gases	Liquids
<p>Particles - closely packed together (no room to move)</p> <p>Keep their shape.</p> <p>Easy to control</p> <p>Can be shaped / cut</p> <p>You can hold them</p>	<p>Particles - very spaced out (move around easily)</p> <p>Spread into any empty space</p> <p>Hard to control</p> <p>Most are invisible</p>	<p>Particles - loosely packed together (some room to move)</p> <p>Take the shape of the container</p> <p>Not so easy to control them</p> <p>Runny - move/flow downwards</p> <p>Surface stays level in container (on different slopes)</p>

Dilute

DILUTE - add water to a liquid

Squash is CONCENTRATED (strong) - very little water in it

Add water - dilute it and it becomes LESS concentrate (weaker)

Water can exist in all 3 states

Solid, Liquid & Gas

Temperature is measured with a thermometer

Temperature is measured in Degrees Celsius $^{\circ}\text{C}$

Practice accurate reading of thermometers

The Three States of Water

Solid - Ice	Liquid - Water	Gas - Steam
Water freezes at 0°C	Materials dissolve in it	Water boils at 100°C
It expands when it freezes	It dilutes liquids	NB: can scald you
It can float - icebergs	Forms droplets	
	Water vapour - tiny droplets in the air (rain in a cloud)	

When water heats up it evaporates - it changes state

When Water Vapour hits a cold surface it condenses back into water

Steam from kettle + cold window = CONDENSATION

Breath + cold mirror = Condensation

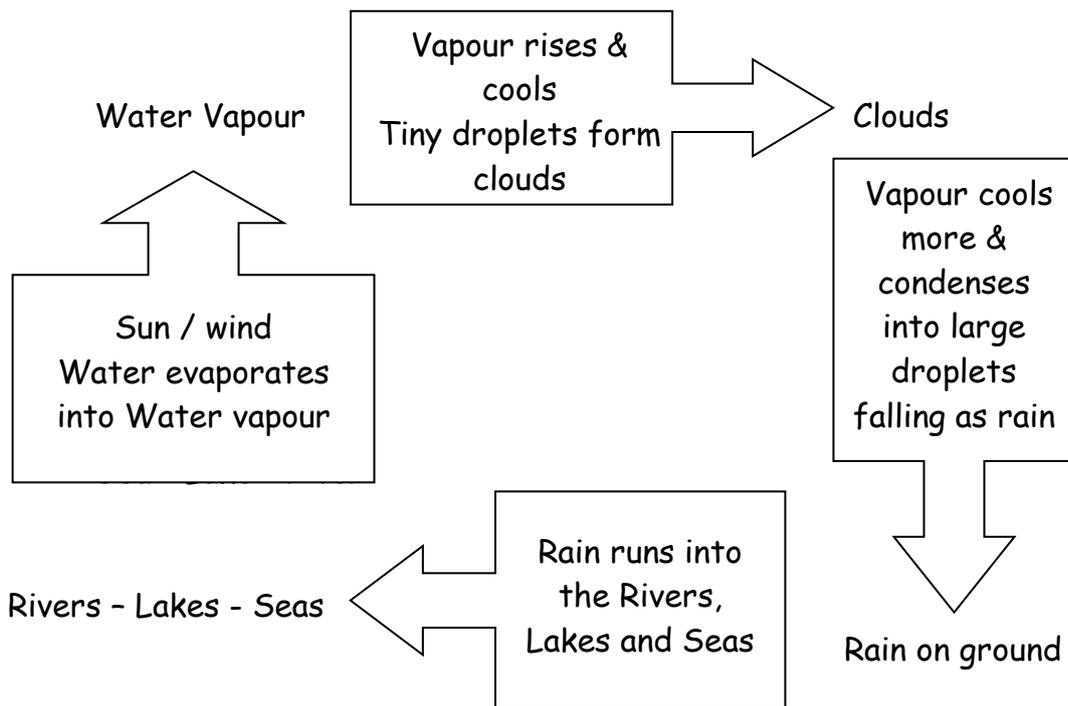
Water Cycle

Liquid - Heats up & Evaporates = Gas - Cools down & Condenses = Liquid

Water  Steam  Water

Water Cycle

In nature it takes place all the time



Investigation

The best example of solid, liquid & gas is water as many children will be aware it can exist in all three states naturally.

Make an ice cube watch it melt then heat the water to turn it into a gas.

Fill a bowl with boiling water from a kettle and hold a cold plate above it.

Watch as the water evaporates as steam, hits the cold plate and condenses back to water forming droplets on the plate.

Changing & Separating Materials

Key Words

Material	State
Physical Changes	Solid Liquid Gas
Chemical Changes	Freeze / Freezing
Reversible	Melt / Melting
Irreversible / non-reversible	Solidification / Solidify
New Material	Hardens Softens
Separate	Soluble / Solution
Filter Sieve	Dissolve / Dissolving
Condense / Condensation	Water Vapour
Evaporate	

National Curriculum Key Concepts

- Describe & give examples of melting & dissolving
- Things that will / not dissolve in water
- Dissolved solids are still there even if invisible
- Dissolved solids can be recovered by evaporation (reversible)
- Factors that affect rate of dissolving
- Understand & explain the process of filtering
- Classify changes as reversible & irreversible
- Irreversible change often make new materials
- Recognise hazards of burning materials

Key Concepts

Dissolving

Some solids when mixed with a liquid DISSOLVE

This is called a SOLUTION

- Sugar dissolves in tea - a sweet solution
- Tablet dissolves in water - a medicine
- Instant Custard dissolves in hot water - solution of custard

Factors that affect the rate a solid dissolves:

Stirring and hot water / heating

NB: The solid is still there it DOES NOT disappear - common misconception

The solid is SOLUBLE if it dissolves completely - sugar

The solid is INSOLUBLE if it does not dissolve - sand

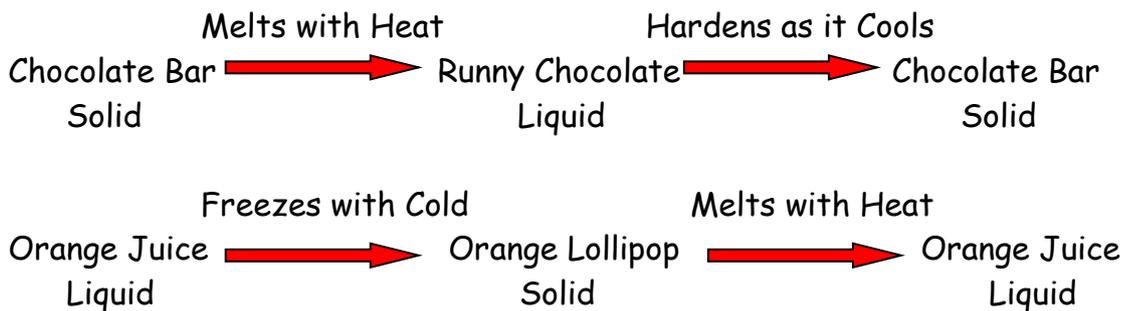
Materials can be changed in 2 ways

Physical Changes & Chemical Changes

Some materials change STATE when they are changed

Physical Changes

These are temporary changes and can be REVERSED (changed back)



When a liquid hardens into a solid this is known as solidification

Chemical Changes

These are permanent changes that are generally IRREVERSIBLE (cannot be changed back)

The materials breakdown and often create a new material.

A change of colour frequently occurs with an irreversible change.

- Cook - Eggs = Scrambled Eggs
- Burn - Bread = Toast
- Corrode - Water + Some Metals = Rust

Separating Mixed Materials

Main ways of separating mixed materials

- Sieving - large & small solids - Stones + soil or gravel + sand
- Filtering - Solids from Liquid - Pasta + water or sand + water
- Evaporation - Soluble Solid from Liquid - salt + water

Sieving

Different size holes in the will take out different size pieces

Colander large holes - pasta

Tea strainer small holes - tea leaves

Filtering

Removes very small solids

Filter paper / cloth allows liquid to pass catching the solids

Evaporation

Removes dissolved solids from liquid using heat (teaspoon over flame or wide dish in sun or on radiator)



Sometimes more than one process is needed
Especially if you need both the Liquid and the Solid to be kept

Eg: Sandy Salt Water

Remove the Sand - Filtering

Remove the Salt - Evaporating

To collect the water - Condensing - using a cold surface & beaker

Investigations

Physical Change

Q: How does temperature affect chocolate?

Melt a chocolate bar in a bowl over hot water. Pour it out onto a plate where it will harden again.

Chemical Change

Q: What changes take place when Bicarbonate of Soda and Vinegar are mixed?

Put Bicarbonate of Soda (start with small amounts) in a balloon. Fit the balloon over the top of a test tube $\frac{1}{2}$ full of Vinegar. Up end the Bicarbonate into the Vinegar.

Bubbles of Gas (a new material) will be produced and inflate the balloon

Dissolving

Children could try different methods of separating materials.

Water, sand and small stones (Sieving & Filtering required)

Salt from Salt Water (Evaporation)

Forces

Key Words

Force	Air/Water Resistance
Push	Friction
Pull	Upthrust Surface area
Force Meter Newtons	Floating - Sinking
Mass (Density)	Magnet / Magnetic
Gravity	Attract Repel
Pressure	Factor

National Curriculum Key Concepts

- Weight is a force measured in Newtons
- In all situations more than one force is acting on an object
- Diagrams to illustrate force/s acting on an object
- How to use a force meter
- Know factors which increase friction or air/water resistance
- Classify non & magnetic materials

Key Concepts

A FORCE is a PUSH or PULL

A force makes things speed up, slow down, change direction or change shape

FORCE METERS measure the force exerted on things

Forces are measured in NEWTONS (N)

Types of Forces:

- Friction: Occurs when 2 surfaces meet and it can occur in water or air it slows down moving objects
- Gravity: Pulls everything towards the CENTRE of the earth

Air Resistance

Air pushes against anything that is moving

The bigger the SURFACE area the more resistance - parachute

The smaller the surface area (STREAMLINED) the less resistance -sports car

Friction

Rough surfaces make it harder to move things - Wheel barrow on gravel

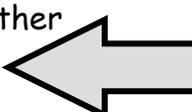
Smooth surfaces make it easier to move things - skis

Friction creates heat - rubbing hands together

Friction gives us grip - trainers

NB: Friction is a force which acts in the opposite direction to movement

In diagrams the friction arrow points the opposite way to the movement arrow.



[www.bbc.co.uk/
schools/scienceclips](http://www.bbc.co.uk/schools/scienceclips)
Forces

Gravity

Gravity pulls things down: in air, in water or on ground

Gravity is there all the time

Moon smaller so less gravity - still some but not as strong

Beating Gravity

3 ways:

- Push against it - bird flapping wings against air - opposite force
- Support yourself on something - stand on a ladder - upward force
- Floating - water provides upthrust

Upthrust

Upthrust is the force pushing up on an object in water or air

It is greater in water than air.

The greater the surface area of an object the greater the upthrust

- Rubber dinghy

If upthrust = gravity - object floats

Sometimes with objects that have the same surface area - one sinks, one floats because of the material's density

- Brick - sinks - it is heavier (more dense)
- Polystyrene - floats - it is lighter (less dense)

Balanced Forces

Things don't move when the force is balanced

- Floating - upthrust = gravity
- Tug of war - opposite pulls are equal

Movement

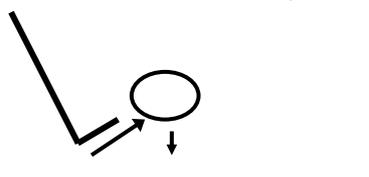
Things move when one force is greater than another force

- Ball falls to ground - gravity greater than air resistance
- Kicking a ball - push from boot greater than gravity
- Aeroplane flying - push of engines greater than gravity

Pictures

Arrows show direction of force in pictures.

Forces
acting on a
ball



Children need to know which forces are working on an object and which way each

force is pulling or pushing.

They also need to be able to draw the corresponding arrows on a picture.

This often comes up in papers

Magnetism

Magnets have two ends



S = South Pole N = North Pole

Some are stronger than others

If 2 magnets are put together

N end to S end they will ATTRACT each other



S end to S end or N end to N end they will REPEL each other



Only metals are MAGNETIC = attracted to magnets.

BUT not all metals

YES = Iron & Steel (remember - IS)

NO = Brass, Copper & Aluminium

Investigations

Floating:

Q: Does the size of the surface area of an object affect its ability to float?

Find a variety of objects of the same size and see which float and which do not, include a ball of plasticine. Flatten out ball of plasticine to increase surface area and try again - it should float

Air Resistance:

Q: Which material/size of parachute works the best?

Make a variety of parachutes out of different materials / size and test for the most effective.

Also see: QCA Unit 6E investigations

Friction:

Q: Does the type of surface affect the pulling of a box?

Pull a box with a weight in across different surfaces using a force meter to measure the pull required and therefore which surface has the most friction

Light

Key Words

Source	Natural	Shadows
Dark / Darkness		Block
Reflecting / Reflection		Transparent
Shiny	Mirror	Translucent
Straight Lines		Opaque

National Curriculum Key Concepts

- Shadow formed when light is blocked
- Shadow similar in shape to object
- Shadows formed by the sun change throughout the day

Key Concepts

Sources of Light

Natural - The Sun & Stars

Manmade - Candle Flame & Electric Bulb

NOT - Sources of Light

Anything else that seems bright is REFLECTING light from one of the above sources

- Moon - reflected sunlight
- Shiny objects - reflected sun / bulb
- Mirrors - reflected sun / bulb

Dark objects don't reflect light as well as a shiny objects

Properties of Light

- Travels in straight lines - cannot bend
- Objects block light - forming shadows
- Travels very fast

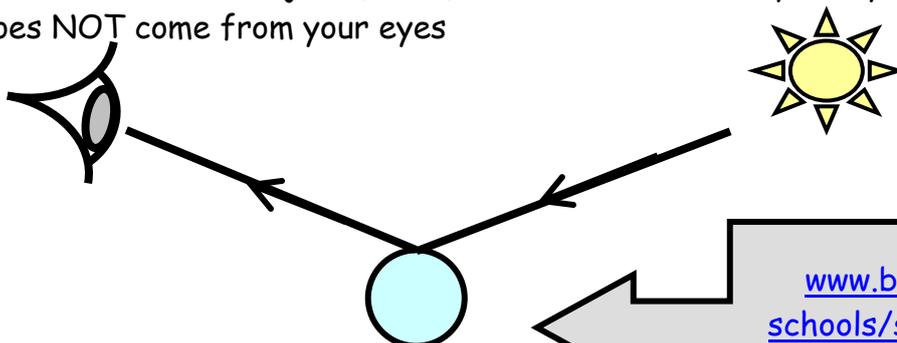
Seeing

Light can travel directly from the light source into your eyes

Or

Light can bounce off an object (a ball) and then travel into your eyes

Light does NOT come from your eyes



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How we see things

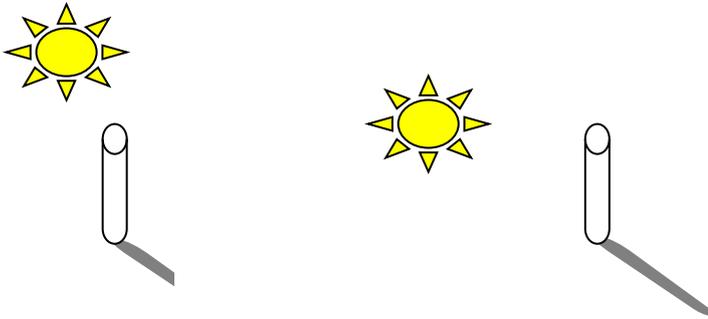
NB: Pay attention to arrow direction as children often reverse it.

Shadows

Shadow are formed when an object **BLOCKS** the light

The more **DIRECTLY** overhead the light source the **SHORTER** the shadow

The **LOWER** the light source the **LONGER** the shadow



The **CLOSER** an object is to the light source the **BIGGER** the shadow

The **FURTHER AWAY** from the light source the **SMALLER** the shadow

Children may also benefit from being introduced to when shadows are formed by an artificial light sources ie: OHP

Shadows & the Sun

The sun rises in the East and sets in the West

Shadows formed by the sun are **LONGER** in the morning and afternoon and **SHORTER** in the middle of the day.

The sun appears to be lower in the sky in the morning and afternoon than at noon when it appears over head.

Shadows are formed on the opposite side of the object from the sun and move round the object during the daytime.

Identify which materials cause shadows to form.

Some materials lets different amounts of light through

- Transparent materials - all light - glass
- Translucent materials - some light - tissue paper/smoked glass
- Opaque materials - no light - wood



Mirrors

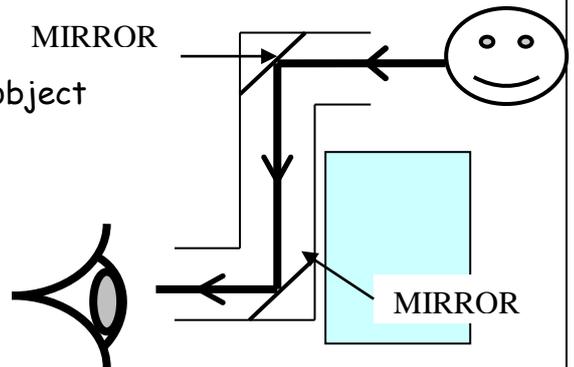
Mirrors reflect light at the *SAME* angle as the light hits it

Arrows show direction the light travels from the light source

COMMON ERROR: arrows going the wrong way

Periscopes use a pair of mirrors to look round an object

Bent mirrors distort shapes and images



Sound

Key Words

Sound	Volume
Waves Echo	Hard Loud
Vibrating / Vibrations	Soft Quiet
Ear Drum	Decibels
Pitch High Low	Pluck Blow Bang Scrape

National Curriculum Key Concepts

- Sound is produced when something vibrates
- How to change the pitch and loudness
- Sound travels through solid, water & air
- What happens to sound as the distance from source changes

Key Concepts

Sound is created by something **VIBRATING**

It travels in **WAVES**

Sound travels slower than light - we see a firework before we hear it

The further you are from the source of the sound the fainter the sound

Sound can bounce off of things and can get distorted.

When a sound bounces off a surface and comes back it is called an echo

Practical uses include: Sonar (finding things at sea)

Bats fly use sonar

Hearing

Object Vibrates  Air Vibrates  Ear Drum Vibrates

Our brain uses nerves to pick up the vibrations of the ear drum and interprets them.

Sound **CAN** travel through

liquids, solid & gases

Sound **CANNOT** travel through

a vacuum - nothing to vibrate - eg: space

Sounds can be created in many different ways: banging, scraping, blowing, plucking etc.

Some materials absorb sound better than others - fabric - used as soundproofing

HARD bang on drum = **LOUD** noise

SOFT bang on drum = **QUIET** noise

Pitch

Pitch is how high or low a note is (NOT loud or quiet)

The **BIGGER/LONGER** the vibrating object the **LOWER** the pitch (note)

The **SMALLER/SHORTER** the vibrating object the **HIGHER** the pitch

- Big drum = low note
- Small drum = high note

NOTE: Sometimes it is the air that is vibrating not the object - so the pitch depends on how much air is vibrating

- Big amount of air = low note
- Small amount of air = high note

With strings (guitar) the tighter the string the higher the note

The loudness of a sound is measured in Decibels

Investigations

Q: How does changing the length of a ruler affect the pitch?

Vibrate rulers on the edge of a desk - changing the length of the ruler to change the pitch.

This could be done also by plucking different length elastic bands.

Q: How does the amount of air in a bottle affect the pitch?

Part fill a bottle with water and blow across the top - change the amount of air in the bottle by adding or taking away water to change the pitch.

Q: Which type of material is the best at soundproofing?

Get a loud ticking clock or a metronome - set it ticking. Wrap it / put it in different materials to test for soundproofing. Eg: tin foil, paper, thin fabric, thick fabric etc.

Get children to predict most effective.

Electricity

Key Words

Electricity	Mains	Battery / Cell
Source	Switch	
Conductor	Bulb	
Insulator	Motor	
Circuit	Short Circuit	
Circuit Symbol	Circuit Diagram	Buzzer
Switch open = off	Wire	
Switch closed = on	Diagram	

National Curriculum Key Concepts

- How to make a complete circuit
- Ways of changing the brightness of a bulb
- How to draw circuit diagrams
- Construct circuits from diagrams
- Know the conventional circuit symbols
- To know some electrical conductors & insulators
- Understand the effects of adding different numbers of components and make comparisons

Key Concepts

Sources of Electricity

- Mains
- Batteries - store a limited amount

www.bbc.co.uk/schools/scienceclips
Changing Circuits

Electric Circuits

Main Components & Symbols

Circuit Symbols			
Battery		Switch off	
2 Batteries		Switch on	
Bulb		Buzzer	
Motor		Wire	

Children will find it easier to understand how circuits work if they have had a number of

opportunities to construct them.

They must know the purpose of each part eg: batteries provide the power

VERY IMPORTANT

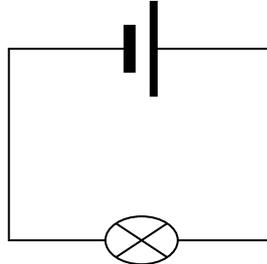
These always come up in some form or another and children must master drawing circuits.

All drawings must be accurate and COMPLETE (all symbols joined to each other)

Circuit = electricity travelling from a power source (battery) through conductors (wires etc) via a bulb or motor and back to the source

All Circuits must

- have a power source
- and be complete



At KS2 children do not need to know about series and parallel circuits

Conductors

Allow electricity to pass through them - See materials & properties section

Most metals are conductors.

Make a simple circuit and insert different materials to test which are or are not conductors

Insulators

Do not allow electricity to pass through them.

Wires are covered in plastic which insulates them.

A battery has a + end and a - end wires must connect to each end NOT the same end

Switches

Switches control the flow of electricity

Switch open = gap - electricity CANNOT flow round circuit

Switch closed = no gap - electricity CAN flow round circuit

Changing Circuits

Changing components in the circuits have different effects

- Number of Batteries - More = brighter bulb (NB: too many bulb blows)
- Number of Bulbs - More = dimmer bulbs (electricity shared out)
- Length of Wire - Longer = dimmer bulbs
- Number of Motors - More = slower they go

Do practical tests to prove these facts.

NB: It is easier not to use buzzers at all as some have polarity and won't work if in the wrong way round.

Investigations

Q: Investigate if the number of bulbs in a circuit makes a difference to the brightness of the bulbs

Build a simple circuit (battery, wire & bulb) recording brightness of bulb.

Add a second bulb record results

Add a third bulb etc

Earth in Space

Key Words

Orbit	Seasons
Planet Star Moon	Spring Summer
Gravity	Autumn Winter
Poles North & South	Day
Spins / Rotates / Revolves	Month
Axis	Year
Spherical	North South East West

National Curriculum Key Concepts

- The Earth, Sun & Moon are spherical
- The Earth's rotation causes shadows to change
- Why the Sun appears to move across the sky
- Why we have daylight and night
- The orbits of the Earth and Moon and their relation to time (day, month, year)

Key Concepts

Orbit = the route an object travels round another object in space

Gravitational Pull keeps the Moon orbiting the Earth & all 9 planets orbiting the Sun
The Sun does NOT orbit anything
The Sun is a Star made of gases - it produces light and heat

Planets

9 planets in our Solar System all orbiting the Sun
Children do not need to know the names for KS2 SATs

The Earth orbits the Sun = $365 \frac{1}{4}$ days = 1 year
Every 4 years we have a Leap Year to make up for the $\frac{1}{4}$ days = 366 days

The Moon orbits the Earth = 28 days -Luna Month

The Moon

We see the moon because it reflects the Sun's light
The moon appears to change shape because we cannot always see the part of the moon which is reflecting the sunlight

As the Moon orbits the Earth we see different parts

- Full moon (completely round) - we can see all the side that is reflecting sunlight
- Half moon (semi circle) - we can only see half the side that is reflecting sunlight
- New moon (nothing) - we cannot see the side reflecting sunlight at all

Moon cycle in 28 days = New moon, Half moon, Full moon, Half moon

The Earth has 2 poles - North & South
It Spins/Rotates on its axis (North/South)
Axis = imaginary line through the middle of an object around which it spins
1 full spin = 24 hours = 1 day

Daytime - England facing the sun
Night time - England facing away from the sun
Sun does NOT move across the sky - Earth SPINS

[www.bbc.co.uk/
schools/scienceclips](http://www.bbc.co.uk/schools/scienceclips)
Earth, Sun Space

Seasons

The Earth is tilted

Tilted = one pole nearer the sun
than the other

During a year as the Earth orbits
the sun first one pole will be near to
the sun then the other.

South Pole Nearer = Summer in Australia - Winter in England
North Pole Nearer = Summer in England - Winter in Australia

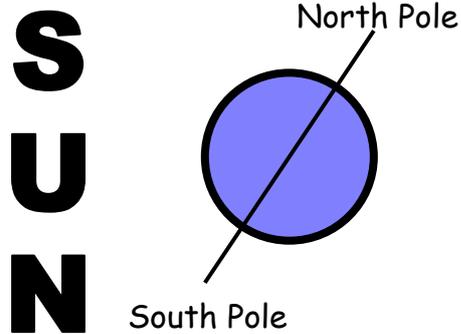
Seasons affect height of sun

Summer - highest

Autumn / Spring - medium

Winter - lowest

This means shadows in winter are LONGER than shadows in SUMMER



Investigation

Q: What happens to the shadow of an object throughout the day?

Put a large object in the playground in the morning, draw round the shadow cast with chalk and measure it.

Repeat at different times during the day including noon.

Compare results.

BBC Science Clips

www.bbc.co.uk/schools/scienceclips

Children can do virtual investigations by changing the factors in an experiment to see the results or label plants etc. Really useful with interactive whiteboards as well as groups.

Covers all topics -some are highlighted within this booklet.

BBC ReviseWise Website

<http://www.bbc.co.uk/revision>

The BBC web site that provides:

Games, activities, fun facts and revision quizzes. All KS2 topics

CGP Key Stage Two SCIENCE 'Study Book'

Includes:

Covers the whole curriculum in topic based sections

CGP Key Stage Two SCIENCE 'The Question Book'

Includes:

Questions for the children to answer on all the science curriculum

CGP Key Stage Two SCIENCE 'The Important Bits'

Includes:

Covers the key points of the whole curriculum in topic based sections

Woodlands Junior School

<http://www.woodlands-junior.kent.sch.uk/>

Interactive online activities for all areas

Coxhoe School

<http://www.coxhoe.durham.sch.uk/>

Interactive on line activities for all areas

Science Bootcamp

<http://www.compare4kids.co.uk/learn.php>

Interactive on line activities for all areas