



SCIENCE CURRICULUM

AUTUMN 2: EYFS - YEAR 6



SCIENCE CURRICULUM INTENT

The Aims of the National Curriculum for Science:

The national curriculum for Science aims to ensure that all pupils:

- develop scientific knowledge and conceptual understanding through the specific disciplines of biology, chemistry and physics
- develop understanding of the nature, processes and methods of science through different types of science enquiries that help them to answer scientific questions about the world around them
- are equipped with the scientific knowledge required to understand the uses and implications of science, today and for the future.

Autumn 2

EYFS	Focus of Study
<p>FS 1 – Nursery</p> <p>Milestones</p> <ul style="list-style-type: none"> • FM Children will use all their senses in hands on exploration of natural materials. • FM Children will explore collections of materials with similar and/or different properties. • FM Children will be able to tell someone about what they see. 	<p>Context for study: Children will explore and investigate through planned opportunities to develop their scientific skills and enquiry.</p> <p>Knowledge Content: Children will be able to use their senses to explore both inside and outside identifying through touch, taste, smell and sight. Talk about how the outdoor environment changes and we know this by using our senses.</p> <p>Key vocab will include soft, hard, cold, warm, crunchy, chewy, fresh, sweet, smelly, loud, quiet, long, short, tall, small</p> <p>Children will partake in science experiments.</p> <p>See - What can you see outside which is taller than you/shorter than you? Welly wander out and about to use the sense sight.</p> <p>Touch - What can you feel in the box? Children will predict what might be in the box from only feeling the items.</p> <p>See - Why do we see puddles outside? On a puddle hunt children will look for puddles – if no puddles why not? If there is puddles why?</p> <p>See - Natural Materials – how easy do they blow away? Using the fan can you blow away the straw, sticks and bricks?</p> <p>Hear -What can you hear? Listen to the different thicknesses of rubber band – how is the sound changed? Which sounds are high like a mouse, which are low like an elephant?</p>

	<p>Taste – Which taste do you like? Taste the different toppings for the gingerbread man – which one do you like? How does it taste?</p> <p>Smell – When on the welly wander what can we smell? Wet grass, mud</p> <p>Working Scientifically in EYFS I can say what I feel. I can say what I smell. I can say what I see. I can say what I taste. I can say what I hear.</p> <p>Scientific Enquiry in EYFS I can identify which sense I use. I can observe what I see/hear/smell/touch and taste.</p>
<p>F2 - Reception</p>	<p>Context for study: Children will explore and investigate through planned opportunities to develop their scientific skills and enquiry.</p>
<p>Milestones</p> <ul style="list-style-type: none"> • SM Children will talk about the differences between materials and changes they notice. • SM Children will explore and talk about different forces they can feel. • SM Children will explore how and begin to understand why certain materials are better to use for different things. (Sci) • TM Children can identify that certain UK animals live in certain habitats/environments (woodland/ farm/sea/ponds) (Geog and Sci) 	<p>Knowledge Content: Children will be able to name the four seasons. Spring, Summer, Winter Autumn. Talk about how the outdoor environment looks different during each season. They will be able to compare and notice the changes. Children will be able to talk about the opposite forces push and pull. They will explore the forces during planned opportunities and begin to predict what might happen.</p> <p>Key vocab will include smell, sight, touch, senses, care, natural, nature, living, sort and features, tree, trunk, branch, roots, leaves, smooth, rough, investigate, experiment, observe, season, predict, materials, evaporate, freeze, forces, push, pull, wind.</p> <p>Children will partake in science experiments: Which part of our playground is the windiest? Children will predict what they think might happen to the windmills when they go outside. Children to observe what happens to the windmill. Children will be able to discuss their findings. What do you think will happen to the puddles when it's cold? Children will be able to talk about the puddles freezing when it is cold. They will talk about what happens to puddles over time – children will be able to explain how puddles disappear (evaporate). Children will be able to talk explain what happens to ice when it melts. What makes a bed comfy? Children will investigate 'What Makes a Bed Comfy?' They will be able to talk about why Goldilocks likes Baby Bear's bed? What makes a good bed? How do you know if a bed is good or not? Children will be able to name materials which would make a 'comfy' bed.</p>

<ul style="list-style-type: none"> • TM Children will notice and talk about what happens to puddles when it's cold. (Sci) • TM Children will begin to understand that when water gets cold enough it freezes and becomes ice. (Sci) • SM Children will begin to understand the need to respect and care for the natural environment and all living things. 	<p>What makes a good bridge? Children will help find what material will be the best to build the safest bridge for the Billy Goats to cross over the river. Children will be able to talk about the materials they have used for their bridge and why. Children will be able to use their sense in a Senses Treasure Hunt.</p> <p>Working Scientifically in EYFS I can talk name the seasons and some their similarities and differences. I can explain what _____ force feels like. I begin to ask simple questions about what is going on and make simple observations. I can evaluate my findings.</p> <p>Scientific Enquiry in EYFS I can identify some or all of the seasons. I can compare the changes between seasons. I can observe how puddles disappear/ evaporate over time. I can observe how ice melts over time. I can identify the material for a comfy bed. I can identify the material for a strong bridge.</p>
<p>Year 1</p>	<p>Focus of Study: Seasonal Changes</p>
<p>NC Objectives</p>	<p>Key Explicit Knowledge and Vocabulary</p>
<p>Pupils will be taught to:</p> <ul style="list-style-type: none"> • observe changes across the 4 seasons • observe and describe weather associated with the seasons and how day length varies. 	<p>Context for study: This unit follows on from work in Reception where pupils study the weather and begin to look at seasons and changes to the environment during this time as each season occurs. In year 1 they begin to learn more about the 4 seasons, including the months that fall into each season and the weather patterns they follow. They will learn about the changes to the earth's light patterns through the seasons and how the seasons affect animals and plants. This unit comes before work studied in year 2 about what plants need to grow well and when plants grow best. They review work studied in year 1 about common plants and how seasons affect deciduous and evergreen plants. Begin with a re-visit of elements of seasons from EYFS.</p> <p>Key Vocabulary: Autumn, Winter, Spring, Summer, sunny, windy, rainy, snowy, day length, sunrise, sunset, monsoon</p>

Common Misconceptions:

- it always snows in Winter
- it is always sunny in Summer
- there are only flowers in Spring and Summer
- it rains most in Winter

Knowledge Content:

Know that there are **4 seasons - Autumn, Winter, Spring and Summer**. Know that the seasons occur in a cycle and that they consist of the following months –

Autumn - September, October, November.

Spring - March, April and May.

Summer - June, July and August.

Winter - December, January, February

Know how the **environment** changes in each season.

Know the **types of clothes** associated with each season.

Autumn - Leaves change colour and fall from **deciduous** trees, **harvest** time, some birds **migrate** (e.g. swallows)

Winter - Some animals **hibernate** throughout Winter (identify these animals) water freezes to ice. Many plants stop growing.

Spring - Flowers begin to grow, associated with rebirth and growth, some baby animals are born (e.g. lambing season)

Summer - Flowers and trees are in **bloom**.

Know that the length of **daylight** varies with Winter having the **shortest daylight hours** and Summer having the **longest**. Know that in the UK the longest day is June 21st (the **Summer Solstice**) and the shortest day is December 21st (the **Winter Solstice**).

Know that there is equal daylight and night time at the **Spring Equinox** (around March 20th) and the **Autumn Equinox** (around 22nd September).

Know that the Earth orbits the Sun with one orbit constituting a year of 365/366 days (Note: The Sun and the Earth are capitalized when being discussed in an astronomical context.)

Know the **weather patterns** associated with each season -

Autumn - Temperatures start to drop from Summer, **overcast**

Winter - Coldest time of year, snow, **frosty** in the morning, **sleet, blizzard, hail**

Spring - Temperatures start to warm up

Summer - Hottest time of the year, sunshine, generally dry weather but may be

thunderstorms

Know the differences between types of precipitation - hail, rain, snow, sleet.

Know that a thermometer is used to measure temperature. Know how to read a thermometer to find out the temperature outside.

Know that we measure temperature in degrees **Celsius** which is abbreviated to **°C**.

Know that when the temperature falls below 0°C then water turns to **ice**.

Know that looking directly at the sun is not safe even when wearing sunglasses.

Know that the temperature on earth is affected by the sun.

Know how to understand a weather **forecast**. Know that a forecast is a **prediction** about **future** weather.

Know that snow is formed by water vapour in the air freezing before it turns to water. Clouds are cold and crystals are formed around bits of dirt and grow bigger.

Know that A cloud is made of water drops or ice crystals floating in the sky. There are many kinds of clouds. Clouds are an important part of Earth's weather.

Know that moving air is called wind. Winds are created when there is a difference in air pressure. You can see trees move and sway when it is windy.

Know that the sun is a star, it is a hot ball of glowing gas, it is at the heart of the solar system, it is spherical in shape and much bigger than Earth.

Working Scientifically

Know **similarities** and **differences** within the seasons.

I can **predict** what colours are hiding in my leaf.

I can **explain** what _____ feels like.

I can **record** different signs of spring using **labelled diagrams and pictures**.

I can **evaluate** my test by suggesting simple improvements

I can **ask simple questions** about what is going on and make **careful observations**.

	<p><u>Scientific Enquiry</u></p> <p>I can identify the four seasons.</p> <p>I can look for patterns with the colours found in different leaves.</p> <p>I can observe how crystals form over time.</p> <p>I can identify signs of spring.</p> <p>I can compare my results to research about rainfall in different seasons</p> <p>I can carry out a comparative test.</p> <p>I can identify different clouds and understand how they are formed.</p>
Year 2	Focus of Study: Materials
NC Objectives	Key Explicit Knowledge and Vocabulary
<p>Pupils should be taught to:</p> <p>identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for different uses (recap of material properties)</p> <p>compare how things move on different surfaces.</p>	<p><u>Context for study:</u> This unit is the second of five science units where pupils study materials as part of the discipline of chemistry - the identification of the properties a substance is made from. It is also the study of forces as part of the discipline of physics – the study of the processes that shape our world and how we use it. Pupils have a secure knowledge of the properties of a variety of everyday materials. Pupils can identify, name and describe an object in terms of the material it is made from including if it is ‘man-made’ or ‘natural’. Previous learning includes comparing and grouping together everyday materials on the basis of their simple physical properties. Pupils have studied the work of John Dunlop and ‘the pneumatic tyre.’</p> <p>This year 2 unit builds on pupils’ knowledge of materials of properties as pupils identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for different uses. New learning includes comparing how things move on different surfaces. This unit will help pupils understand how squashing, bending, twisting and stretching can change the shapes of some solid objects. This is the precursor to work studied in Year 3 rocks and soils. The knowledge acquired will help pupils in Year 4 as pupils study materials in terms of solid, liquid and gases. Year 5 pupils learn about dissolving, mixing and changes of state, and reversible and irreversible changes. Pupils also build on previous knowledge of magnetic and non-magnetic metals. Begin with a re-visit of elements of materials from Year 1.</p>

find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching

Maths N.C Statistics

objectives: Interpret block diagrams (interpret block diagrams to learn about the suitability of every day materials for different uses)

Power Maths, unit 7, lesson 6.

Common Misconceptions:

- only fabrics are materials
- only building materials are materials
- only writing materials are materials
- the word rock describes an object rather than a material
- solid is another word for hard

Key Vocabulary: **materials, suitability, properties, waterproof**, shock absorbent, reflective, squash, bend, twist, stretch, push, pull, squeeze, wood, paper, brick, cardboard, plastic, fabric, metal, rubber, glass, stone

Knowledge Content:

The study of **forces** is part of the discipline of **physics** - the study of the processes that shape our world and how we use it. It is also part of the discipline of **Chemistry** - the identification of the properties a substance is made from.

Know that matter (stuff) is made from tiny building blocks.

Know the following properties of materials - flexible, stiff, rigid, stretchy, hard, soft, brittle, strong, weak, absorbent, heavy, light, solid, runny, smooth, rough, opaque, transparent and translucent. Know which materials have these properties (include plastic, brick, wood, paper, cardboard, fabric, metal, rubber, glass and stone

Know that a chair can be made of wood because wood is **strong and rigid**. Plastic would also be good for a chair because it is **strong, flexible and smooth**. Glass is a good material for a window because it is **transparent and rigid**. Fabric would be a good material for a jumper because it is **flexible, soft and strong**. **Know why some materials are not appropriate** e.g. Why is glass not appropriate for a chair? Why is wood not appropriate for a window?

Know that **resistance** is 'a force which slows down a moving object'.

Know that when objects move across a surface there is **friction** when they rub against each other and that sometimes this friction is larger or smaller.

To know that the **smoother** the surface of the material, the **less resistance** it has and will travel further. Know that the **rougher** the surface, the **more resistance** it has and the less it will travel.

Know that materials **can change shape** when properties are **flexible and soft** but they **can't change shape** when the properties are **rigid, hard and stiff**.

Know that applying forces to objects can change their shape.

Know that **John McAdam** was an engineer who experimented with using new materials to build roads.

Know that **John Dunlop** was an engineer who made rubber devices and invented the pneumatic tyre

Know that **Charles Macintosh** was the inventor of waterproof fabric. The Macintosh raincoat is named after him.

WORKING SCIENTIFICALLY

I can **identify** and **classify** materials.

I can draw **labelled diagrams**.

I can draw **basic conclusions**.

I can carry out simple **comparative tests**.

I can predict the best material - test how an item moves on different surfaces - **sandpaper, carpet, paper, plastic** and **bubble wrap**. Make predictions and test items made from different materials against 4 forces - **squashing, bending, twisting** and **stretching**

I can **evaluate** findings of tests

Scientific Enquiry

Know how to **compare** and **group** materials - Know how to use a Venn diagram to sort a set of materials (e.g., one circle labelled 'flexible' and the other circle labelled 'opaque')

I can **identify** materials

I can use **research** for understanding.

I can carry out **comparative tests**.

I can **notice patterns** between materials.

Year 3	Focus of Study: Animals inc. humans
NC Objectives	Key Explicit Knowledge and Vocabulary

Pupils should be taught to:

identify that animals, including humans, need the right types and amount of nutrition, and that they cannot make their own food; they get nutrition from what they eat.

identify that humans and some other animals have skeletons and muscles for support, protection and movement.

Common Misconceptions:

- certain whole food groups like fats are 'bad' for you
- certain specific foods, like cheese are also 'bad' for you
- diet and fruit drinks are 'good' for you
- snakes are similar to worms, so they must also be invertebrates

Context for study: This unit is the fourth of eight science units where pupils study animals, including humans, as part of the discipline of **biology** - the study of living **organisms**. Pupils have a secure knowledge of life cycles and what animals, including humans, need to survive and the importance of a healthy lifestyle. Pupils can identify and name a variety of animals. Pupils know the names of animals native to the sea, rivers and canals and the features that help them to live there. Pupils can use classification keys to help group, identify and name a variety of living things in their local and wider environment.

In this Year 3 unit, pupils learn that animals, including humans, need the right types and amount of nutrition, and that they cannot make their own food; they get nutrition from what they eat. Pupils further develop their knowledge of what humans need to thrive by learning about a balanced diet, including how sugar can cause tooth decay and obesity, the food groups and their role in human development. New learning includes how humans and some other animals have skeletons and muscles for support, protection and movement.

This unit is the precursor to work in year 4 as pupils learn about the digestive system, teeth and food chains. The knowledge acquired in this unit will help pupils in Year 5 as they learn about puberty and gestation periods of animals before studying the circulatory system and dental structures in year 6.

Begin with a re-visit of elements of animals inc. humans from Year 2.

Key Vocabulary: vertebrate, **bones, skeleton**, backbone (spine), **muscle, healthy, exercise, hygiene, disease, balanced diet**

Knowledge Content:

The study of animals, including **humans** regarding **nutrition, skeletons** and **muscles** is part of the discipline of **biology** - the study of living **organisms**.

Animals, including humans, need food, water and air to survive.

Know that humans need a balanced diet, water, air, exercise and good hygiene to be healthy.

Know the characteristics of living things – movement, respire (breathe), sensitive to their environment, nutrients, excrete, reproduce, grow.

The arrows on a food chain show the direction that the energy travels.

- invertebrates have no form of skeleton.

Know that all animals are **consumers** (they eat food but cannot create it themselves) and rely on a **balanced diet** to maintain their health. Consumers eat plants and some also eat other **consumers**. Know that plants are the only organisms that can make food for themselves using the sun's energy. The food that animals eat gives them **nutrients** for body health and maintenance. Know that nutrients are **substances** that help plants and animals to grow.

Know that different food types provide different **benefits** for humans. **Fruit and vegetables** provide **fibre, vitamins** and **minerals** to keep body parts working properly and maintain health. Know that **fibre** consists of the parts of plants or seeds that your body cannot **digest**.

Fibre is useful because it makes food pass quickly through your body.

Know that **vitamins** are substances that you need in order to remain healthy which are found in foods. Know that vitamins are known by letters and know the following information about vitamins

Vitamin	Food	Main Role
A	Milk, Cheese, butter	Healthy vision and skin
C	Orange, Lemon, tomatoes	Prevent infection
D	Milk, Cheese, Fish	Helps bone development

Meat, fish and eggs provide **protein**, which is needed for healthy **muscle development** and **maintenance**. **Milk, cheese and yoghurt** provide **calcium**, necessary for good **bone and tooth development**. Know that fibre/vitamin rich food should be 50% of each meal, protein around 30% and calcium around 20%.

Know that high fat and sugary food does not provide any nutritional value, and can be harmful to health.

Know for example, that a lack of vitamin D leads to a disease called **Rickets**.

Know that tooth **decay** is caused by an **excess** of sugar.

Know that excess fat from fatty foods such as butter and cheese - and created in the body from excess calories - builds up in the body and can cause **obesity**.

NB: some food groups are difficult to afford for some families so sensitivity is required when teaching this area.

Know what a human skeleton looks like. Name key parts: skull/cranium, rib cage, spine, pelvis, collar bone, spine, vertebra, patella/knee cap, cartilage

Know that there are three types of skeleton: endoskeleton (inside the body and as the animal grows so does the skeleton), exoskeleton (outside the body, they shed their skeleton and grow a new one), hydrostatic skeleton (doesn't consist of bones, all invertebrates and they have fluid filled compartments in their body)

Know that mammals have skeletons and that a human is a type of mammal.

Know that **birds, fish, amphibians** and **reptiles** also have skeletons, and that skeletons are designed to keep bodies the correct shape and help movement, as well as offer **protection** of **organs**, such as the **skull** protects the **brain** and the **rib cage** protects the **heart** in humans.

Bird bones are hollow, making them lighter, enabling birds to fly.

Know that humans have muscles. Know the name and location of the following **skeletal** muscles in the body - **abdominal, pectoral, bicep, tricep, hamstrings, calves.**

Know that the heart is a special type of muscle called **cardiac** muscle.

Know that **muscles** are attached to the bones, and are **responsible** for **movement**. Know that when muscles **contract** and **relaxing**, that this is what causes **movement**.

Know that joints occur where two bones meet and are able to move together e.g. knee, elbow

Know that sitting up straight is good for your **posture**

WORKING SCIENTIFICALLY

Locate and label the bones in the body

I can **answer questions** about the uses of our bones.

	<p>Record using labelled drawings and scientific language.</p> <p>I can evaluate my design and suggest improvements.</p> <p>I can make careful observations to sort animals into groups.</p> <p>I can make predictions from questions raised.</p> <p>I can use scientific language to discuss ideas.</p> <p>I can record my results in a table.</p> <p>I can record my results in a bar chart.</p> <p>I can evaluate my learning using scientific language.</p> <p>Scientific Enquiry</p> <p>Research the bones in the skeletal system.</p> <p>I can identify and classify parts of the skeletal system.</p> <p>Identify bones in the body and the hand.</p> <p>I can look for patterns in how each part of the hand moves and make adjustments.</p> <p>I can identify and classify animals into vertebrate and invertebrates.</p> <p>I can look for patterns in results.</p> <p>I can use secondary sources to find out about muscles.</p> <p>I can research the nutritional values of foods by reading data.</p> <p>I can look for patterns and compare nutritional values.</p> <p>I can identify and classify foods.</p>
Year 4	Focus of Study: Electricity
NC Objectives	Key Explicit Knowledge and Vocabulary
Pupils should be taught to:	Context for Study: This unit is the first of two science units where pupils learn about electricity as part of the discipline of physics - the study of the processes that shape our world and how we use it. Children will have

identify common appliances that run on electricity

construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers

identify whether or not a lamp will light in a simple series circuit, based on whether or not the lamp is part of a complete loop with a battery

recognise that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit

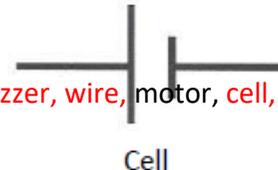
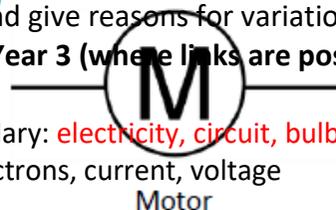
recognise some common conductors and insulators, and associate metals with being good conductors.

limited prior knowledge before studying this unit. During this Year 4 unit, pupils identify common appliances that run on electricity and construct a simple series electrical circuit, identifying and naming its basic parts. Pupils investigate whether or not a lamp will light in a simple series circuit, based on whether or not the lamp is part of a complete loop with a battery. Pupils recognise that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit. They recognise some common conductors and insulators, and associate metals with being good conductors.

The knowledge acquired in this unit will help pupils to compare and group together everyday materials on the basis of their properties, in terms of conductivity, in Year 5. This is the precursor to work studied in Year 6 when pupils use recognised symbols when representing a simple circuit in a diagram. Pupils investigate the brightness of lamps or the volume of buzzers with the number and voltage of cells used in the circuit. Pupils compare and give reasons for variations in how components function. **Begin with a re-visit of elements of light from Year 3 (where links are possible)**

Begin with a re-visit of elements of light from Year 3 (where links are possible)

Key Vocabulary: electricity, circuit, bulb, mains, plug, buzzer, wire, motor, cell, battery, conductor, insulator, symbol, electrons, current, voltage



Knowledge Content:

The study of electricity is part of the discipline of **physics** - the study of the processes that shape our world and how we use it.

Know that electricity is **dangerous**, and know how to be **safe** using it.

Know that electricity can produce light, sound, movement and heat

Know how **electricity** travels through a **circuit**, and the various **components** that create a circuit (**Battery, cell, open and closed switches, buzzer, lamp, motor, wire and voltmeter.**)

Note: all batteries are cells, but not all cells are batteries. A cell is a power source, a battery is a power source that uses chemical reactions to **generate power**.

Know that a circuit is complete when electrons can flow around it.

Know the correct **symbols** to use when drawing circuits

Common Misconceptions:

- electricity flows to bulbs, not through them
- electricity flows out of both ends of a battery
- electricity works by simply coming out of one end of a battery into the component.

Know **appliances** that run on electricity in school and at home and those that do not.

Identify the **hazards** that might be faced in the home.

1. **Overloaded** plug extension **sockets**,
2. **Exposed** wires,
3. Damaged **sockets**,
4. Wires left along the carpet for people to trip over,
5. Electrical **appliances and wires** near water,
6. Placing metal into electrical appliances or open sockets,

Know how to prevent these hazards and know not to touch anything they feel is unsafe.

Know how to create simple circuits using a battery, a bulb and a switch.

Know that an open switch will not complete the circuit and that a closed switch will complete the circuit.

Know that electricity must be able to flow around the circuit for components to work

Know the difference between mains electricity and battery powered electricity.

Know that the word **current** describes the flow of electricity in a circuit

Know that Thomas Edison invented the **incandescent** electric light bulb in 1879 in New Jersey,

USA.

Know that Thomas Edison is known as one of the greatest inventors in history.

He invented the light bulb, the **phonograph** (which could record and play sound) and an early video camera called the **Kinetograph**. The films were then watched on a **Kinetoscope** which he also invented.

Know that **static electricity** can be created by rubbing a balloon on material or through brushing hair

Know if the following circuits work or not. 1. A complete circuit without switches. 2. A circuit with wires not connected to the cell on one side. 3. A complete circuit with an open switch. 4. A complete circuit with a closed switch. 5. A circuit where the wire is not connected to the bulb / buzzer / motor.

Know that **conductors** allow electricity to pass through them and that **insulators** prevent the passage of electricity. Know that metals such as copper, iron and steel make good conductors. Know that wood, plastic, paper and rubber are insulators.

Identify materials that are conductors and insulators.

WORKING SCIENTIFICALLY

I can record my work using **labelled drawings**

I can make **predictions** using **scientific language**

I can **interpret** my results using my **scientific knowledge**

I can **identify** the properties of different materials.

I can **pose scientific questions**

I can **record** how electricity can help us

Scientific Enquiry

Identify electrical components and **classify** appliances.

I can **identify patterns** in my **observations**.

	<p>I can conduct a comparative test.</p> <p>I can identify the properties of materials.</p> <p>I can find out about different scientists and energy sources.</p> <p>I know how electricity has developed over time.</p>
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Year 5	Focus of Study: Properties and changes of materials
NC Objectives	Key Explicit Knowledge and Vocabulary
<p>Pupils should be taught to:</p> <p>compare and group together everyday materials on the basis of their properties, including their hardness, solubility, transparency, conductivity (electrical and thermal), and response to magnets</p> <p>know that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution</p> <p>use knowledge of solids, liquids and gases to decide</p>	<p>Context for study: This unit is the fifth of five science units where pupils study materials as part of the discipline of chemistry - the identification of the properties a substance is made from. It is also the study of forces as part of the discipline of physics – the study of the processes that shape our world and how we use it. Pupils have a secure knowledge of the properties of materials and can identify and compare the suitability of a variety of everyday materials. Pupils know how things move on different surfaces and pupils know that squashing, bending, twisting and stretching can change the shapes of some solid objects. Pupils have studied the work of John Dunlop, John MacAdam and Mary Anning. Previous learning includes knowing different kinds of rocks on the basis of their appearance and simple physical properties. Pupils know how fossils are formed and recognise that soils are made from rocks and organic matter.</p> <p>In this year 5 unit, pupils further develop their knowledge as they compare and group together everyday materials on the basis of their properties, including hardness, solubility, transparency, electrical and thermal conductivity. Pupils revise their prior knowledge of magnetic and non-magnetic metals from Year 3. New learning includes knowing that some materials will dissolve in liquid to form a solution, and knowing how to recover a substance from a solution. This unit also builds on pupils’ previous knowledge of states of matter. Pupils know that some materials change state when they are heated or cooled (e.g. evaporation and condensation in the water cycle) and associate the rate of evaporation with temperature. Pupils use their knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating. The knowledge acquired during this unit will help pupils understand that dissolving, mixing and changes of state are reversible changes. By the end of the unit, pupils will be able to explain that</p>

how mixtures might be separated, including through filtering, sieving and evaporating

give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic

demonstrate that dissolving, mixing and changes of state are reversible changes explain that some changes result in the formation of new materials, and that this kind of change is not usually reversible, including changes associated with burning and the action of acid on bicarbonate of soda.

Maths N.C Statistics objectives: Complete, read and interpret information in

some changes result in the formation of new materials, and that this kind of change is not usually reversible, including changes associated with burning and the action of acid on bicarbonate of soda. This unit is the precursor to work studied in KS3 as pupils continue to learn about states of matter. **Begin with a re-visit of elements of states of matter from Year 4.**

Key Vocabulary: **solid, liquid, gas**, transparent, soluble, insoluble, conductor, filtering, **evaporation**, condensation, **reversible**

Knowledge Content

The study of **properties and changes of materials, including dissolving** is part of the discipline of **physics** - the study of the processes that shape our world and how we use it. It is also part of the discipline of **Chemistry** - the identification of the properties a substance is made from.

Retrieval from Y4

Know that properties of a gas are that they move freely and expand to fill the space.

Know that properties of a liquid are that they have no defined shape and take the shape of the space.

Know that properties of a solid are that they have a firm shape with tightly packed molecules

Know how to compare materials based on the properties of hardness, solubility (how easily dissolvable it is), **transparency, magnetism, conductivity of thermal** (heat) and **electricity**. Know that different materials will have different purposes, based on their properties.

Hardness

Know that hardness can be measured by observing if one material can scratch another.

Know that a common scale for doing this is Moh's Hardness Scale developed in 1812

Solubility

Know that solubility is the ability of a substance to dissolve

Know that dissolving is when a solid material mixes with a liquid and is no longer visible.

Know that materials dissolved into liquid will create a **solution**: salt water, sugar water.

tables (This could relate to the properties of every day materials) **Power Maths, unit 4, lesson 1 and 2**

Common Misconceptions:

Lots of misconceptions exist around reversible and irreversible changes, including around the permanence or impermanence of the change. There is confusion between physical/chemical changes and reversible and irreversible changes. They do not correlate simply. Chemical changes result in a new material being formed. These are mostly irreversible. Physical changes are often reversible but may be permanent. These do not result in new materials e.g. cutting a loaf of bread. It is still bread, but it is no longer a loaf. The shape, but not the material, has been changed.

Some children may think:

- thermal insulators keep cold in or out
- thermal insulators warm things up

Know that there is a limit to how much material can be dissolved in a given liquid. This is called **saturation point**. After this no more material will be dissolved it will be visible.

Know that the hotter the solution the faster the dissolving process occurs.

Know that stirring a solution can speed up the dissolving process.

Know that to get the salt or sugar back (**the substance**), the solution can be heated to evaporate the water from the substance. (Using a cold surface above the heat will catch the vapour and return it to liquid water)
Observe the process and record findings.

Transparency

Revise vocab from previous year - **transparent, translucent, opaque**

Magnetism (retrieval from Y3)

Revise vocab from Y3 unit - north and south pole, magnetic field, attract, repel.

Magnetic Materials	Non-Magnetic Material
1. Iron	1. Aluminium
2. Steel	2. Copper
3. Nickel	3. Gold
	4. Silver

Know how to use a magnet to test for magnetism.

Thermal Conductivity

Know that the term **thermal** refers to heat

Know that a **thermal conductor** is a material that allows heat to be **transferred** easily

Know that a thermal insulator does not conduct heat well.

Know that a metal spoon heats up more quickly than a plastic one in a hot drink.

- solids dissolved in liquids have vanished and so you cannot get them back
- lit candles only melt, which is a reversible change.

Know that metal (such as aluminium and steel) conducts heat well so it is used to make saucepans so is known as a good thermal conductor.

Know that wood does not conduct heat well so is often used for handles of saucepans.

Know that plastic does not conduct heat well so is a thermal insulator.

Electrical Conductivity

Know that an electrical conductor allows electricity to flow through it.

Know that an electrical insulator does not.

Know that rubber is used for coating copper wires, as it is a poor conductor of electricity.

Know that iron is used in circuits as it will conduct electricity.

Know that silver, copper, gold and aluminium are the most effective electrical conductors.

Separating Solids and Liquids

Know that solids, liquids and gases can be separated using **filtering, sieving, boiling, condensing, evaporation and distillation**.

Know the following terms

Filtering: separates an **insoluble** solid from a liquid.

Sieving: separates solids of different sizes.

Evaporation: separating dissolved substances from liquids.

Reversible and Irreversible Changes

Know that **reversible** changes are changes that are not **permanent**. **Dissolving, mixing and altering states** are reversible changes. Water can be altered from solid to liquid, to gas and back. Butter can be melted then will **solidify**. Know that solidify means 'to become a solid'

Know that some changes result in the making of a new material, and that this is **irreversible**.

Bread, wood, paper that is burnt cannot be returned to its original state. Know that cooking an egg is an example of an irreversible change.

	<p>Know that adding acid to bicarbonate of soda results in the bicarbonate breaking down into salt, water and gas. The resulting product cannot be transformed back into its original form. Know what this looks like through teacher demonstration.</p> <p>Know that Spencer Silver invented the 'Post It Note' by mistake</p> <p><u>WORKING SCIENTIFICALLY</u></p> <p>Evaluate my test.</p> <p>I can make predictions about which materials are soluble and insoluble.</p> <p>I can use scientific language and illustrations to discuss, communicate and justify ideas.</p> <p>I can make careful observations when heating solutions.</p> <p>I can plan my own test based on how materials react with one another.</p> <p>I can record results in a table</p> <p><u>Scientific Enquiry</u></p> <p>Identify different materials and classify based on its properties.</p> <p>I can identify the properties of different materials based on whether it will dissolve.</p> <p>I can make observations over time</p> <p>I can compare how reversible and Irreversible materials act when heated and cooled.</p> <p>I notice patterns in my results.</p> <p>I learn about famous scientists and what major discoveries they have made.</p>
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Year 6	Focus of Study: Electricity
NC Objectives	Key Explicit Knowledge and Vocabulary

Pupils should be taught to:

associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit.

compare and give reasons for variations in how components function, including the brightness of bulbs, the loudness of buzzers and the on/off position of switches.

use recognised symbols when representing a simple circuit in a diagram.

Common Misconceptions:

- larger-sized batteries make bulbs brighter
- a complete circuit uses up electricity
- components in a circuit that are closer to the battery get more electricity.

Context for study: This unit is the second of two science units where pupils learn about electricity as part of the discipline of **physics** - the study of the processes that shape our world and how we use it. Pupils are able to identify common appliances that run on electricity. Pupils have a secure knowledge of simple series electrical circuits including that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit. They know some common conductors and insulators, and associate metals with being good conductors.

In Year 6, pupils learn about the scientists Benjamin Franklin and Thomas Edison and the key role they each played in the discovery of electricity. During this unit, pupils revise and build upon their previous knowledge of electrical circuits as they use recognised symbols when representing a simple circuit in a diagram. New learning includes associating the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit. Pupils compare and give reasons for variations in how components function, including the brightness of bulbs, the loudness of buzzers and the on/off position of switches. **Begin with a re-visit of elements of electricity from Year 4.**

Key Vocabulary: **renewable, non-renewable, circuit, symbol, cell, battery**, amps, voltage, resistance, electrons

Knowledge Content

The study of **electricity** is part of the discipline of **physics** - the study of the processes that shape our world and how we use it.

Know that electricity is created by **generators** which can be powered by **gas, coal, oil, wind or solar**.

Know that the electrical energy can be converted into other types of energy such as light, heat, movement or sound. Electricity is dangerous, so be careful when using electrical appliances.

Know that renewable energy is useful energy that is collected from renewable resources which can be naturally replenished on a human timescale e.g., solar, wind, hydro and biomass

Know some common electrical hazards e.g overloading a plug extension socket, exposed wires, damaged wall sockets, wire left along the floor, placing metal into electrical appliances or open sockets and electrical appliances near water.

Discovery of electricity

Know that American scientist **Benjamin Franklin** carried out important experiments relating to electricity in the 1700s. He conducted an experiment to show that lightning was electricity. He flew a kite in a thunderstorm and tied a metal key to the string to conduct the electricity. Lightning hit the kite and Franklin received an electric shock. It was lucky he was not seriously injured but it showed that **lightning was electrical**.

Know that it took until 1879 for people to find a way to turn electrical power into light - American inventor **Thomas Edison** invented the electric light bulb in this year.

Conductors and Insulators retrieval from Y4 (if needed from analysis of pre-assessment)

Know that some materials let electricity pass through them easily. These materials are known as **electrical conductors**.

Know that many metals, such as **copper, iron and steel**, are good electrical conductors. That is why the parts of electrical objects that need to let electricity pass through are always made of metal.

Know that metal is used in plugs to allow electricity to transfer from the wall socket, through the plug, and into a device such as a radio or TV.

Know that some materials do not allow electricity to pass through them. These materials are known as **electrical insulators**.

Know that plastic, wood, glass and rubber are good electrical insulators. That is why they are used to cover materials that carry electricity.

Know that the plastic covering, that surrounds wires, is an electrical insulator. It stops you from getting an **electrical shock**.

Circuits

Know that electricity can **flow** through the **components** in a complete electrical **circuit**.

Know that a circuit always needs a power source, such as a battery, with wires connected to both the **positive (+) and negative (-) ends**. A battery is made from a collection of cells connected together. Know that on one end of the battery is an anode and the other end is a cathode.

Know that a circuit can also contain other electrical components, such as **bulbs, buzzers or motors**, which allow electricity to pass through.

Know that electricity will only travel around a circuit that is complete. That means it has no gaps. You can use a **switch** in a circuit to create a gap in a circuit. This can be used to switch it on and off.

Know that when a switch is open (off), there is a gap in the circuit. Electricity cannot travel around the circuit. When a switch is closed (on), it makes the circuit complete. Electricity can travel around the circuit.

Know that a circuit always has a battery (cell) but it can also contain other electrical components, such as bulbs, buzzers and motors.

Know that when drawing circuit diagrams, rather than drawing detailed components, we use simple symbols to represent the different components.

Know various symbols for drawing circuit diagrams

Know that electricity **flows** through a **circuit**, with the **volt** being the **push** that moves **electrons** along the wires.

(Additional information can be found here - <https://www.bbc.com/bitesize/topics/zq99q6f/resources/1>)

Know which symbols to use when drawing a circuit (Revision from previous year 4 unit)

Know that the more volts there are in a circuit, the more power there is travelling through it.

Understand that the higher the volts, the brighter a lamp and the louder a buzzer.

Know that light is measured in lux

Know that voltage is measured in volts using a volt metre

Know that the current is measured in amps

Know that Watt is a unit of power (rate of which energy is consumed)

WORKING SCIENTIFICALLY

Answer questions by investigating

Take **accurate measurements**

Develop predictions

Present results in line graph.

Use diagrams to support explanation

Scientific diagrams

Scientific Enquiry

Identify electrical components.

Notice patterns in my investigation.

Comparative tests.

Fair test

Using **research**

Identify components