Year 1 Term Autumn 2	Unit Title: Everyday Materials
NC Objectives	**Key Knowledge Content**
Distinguish between an object and the material from which it is made. Identify and name a variety of everyday materials, including wood, plastic, glass, metal, water, and rock. Describe the simple physical properties of a variety of everyday materials. Compare and group together a variety of everyday materials on the basis of their simple physical properties. **Non statutory:** Become familiar with the	<u>Context of Study</u> This unit is the first of five science units where pupils study materials as part of the discipline of chemistry – the study of substances that make up matter. In this Year 1 unit, pupils identify and name a variety of everyday materials, including wood, plastic, glass, metal, water, and rock. Pupils distinguish between an object and the material from which it is made including if it is 'man-made' or 'natural'. Pupils will be able to compare and group together a variety of everyday materials by describing their simple physical properties. Then in the Year 2 unit of materials pupils will compare the suitability of objects and compare how things move on different surfaces. Before learning about rocks in Year 3, states of matter in Year 4 and revisiting materials and their properties in Year 5. <u>Knowledge Content</u> Know that the study of materials is part of the discipline of **Chemistry** – the study of substances that make up matter. Know that **matter** (stuff) is made from tiny building blocks. Know that this comes in three forms - **solids, liquids and gases**. Know the solids: wood, glass, plastic, metal and stone. Know the liquids: water, blood, milk, juice and oil. Know the gas: air and that this is what we breathe. Know that an **object** is something that you can touch. Know that a **material** is what the object is made from. Know these objects and materials:

names of materials and properties such as: hard/soft; stretchy/stiff; shiny/dull; rough/smooth; bendy/not bendy; waterproof/not waterproof; absorbent/not absorbent; opaque/transparent. Explore and experiment with a wide variety of materials for example: brick, paper, fabrics, elastic and foil. Perform simple tests to explore questions, for example: 'What is the best material for an umbrella? … For lining a dog basket?	<table><tr><th>Object</th><th>Materials</th></tr><tr><td>Desk</td><td>Wood</td></tr><tr><td>Cup</td><td>Plastic</td></tr></table> Know that many materials are solid and have different **properties.** Know that water is a liquid and it can change its shape. Know that some materials are **natural** and others are **man-made**. Know that natural materials come from materials found in nature. Know that man-made materials are ones humans make. Know these materials: Natural materials: iron, gold, silver, silk, cotton, leather, wood, water and rock. Man-made materials: plastic, glass, brick, paper, concrete, rubber and some metals like steel. Know that iron, gold, silver are known as metals. Know that glass is heated sand. Know that properties help us describe materials. Know that we can group materials together based on their properties. Know these items their materials and their properties:

… For curtains? … For a bookshelf? … For a gymnast's leotard?'

Item	Material	Properties
Clothes	Fabric	Soft
Kitchen worktops	Stone, Plastic	Hard, don't scratch easily
Jewellery	Metal	Shiny
Windows	Glass	**Transparent**
Water bottles	Plastic	Waterproof
Towels	Cotton	Soaks water up easily

Know how to describe materials using their key properties:

- hard/soft
- stretchy/stiff
- shiny/dull
- rough/smooth
- bendy/not bendy
- waterproof/not waterproof
- **absorbent**/not absorbent
- opaque/transparent

Know that Ole Kirk Christiansen was a **carpenter** who made toys.
Know that he was born in Denmark.
Know that he started the LEGO company.
Know that LEGO is a Danish word that means "play well".
Know that LEGO is made of plastic.
Know that LEGO is made using a machine.

Know that they started making LEGO in 1947.
Know that LEGO is sold all over the world.
Know that the LEGO brick you play with today was first made in 1958.
Know that LEGO's motto is 'only the best is good enough'.

The LEGO story: https://www.youtube.com/watch?v=qr_dTySMl7s

Photograph of Ole Kirk Christiansen

One of Ole Kirk Christiansen's first toys

	One of the first LEGO sets  <u>WORKING SCIENTIFICALLY</u> Test a range of materials and identify which properties they have. Group materials based on similar properties.
	<u>STEAM Opportunities</u> - Go on an expedition to explore the school grounds - Create art using found materials from a beach, sand and pebble art - Using sand and water build sandcastles - Make and put up a tent or milk bottle igloo
	<u>Outcome</u> Topic Test 2 Find/sort objects
	<u>Reading Link</u> The 3 little pigs
	<u>Scientist/Inventor</u> Ole Kirk Christiansen

Approved Resources	BBC Bitesize Switched on Science CGP

<table>
<tr><th>Year 2 Term Autumn 2</th><th>Unit Title: Uses of Everyday Materials</th></tr>
<tr><th>NC Objectives</th><th>Key Knowledge Content</th></tr>
<tr><td rowspan="2">Identify and compare the suitability of a variety of everyday materials including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses.

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

Non statutory:
Identify and discuss the uses of different everyday materials so that they become familiar with how some materials are used for more than one thing.

For example metal can be used for coins, cans, cars and table legs. Wood can be used for matches, floors, and telegraph</td><td>Context of Study
This unit is the second of five science units where pupils study materials as part of the discipline of chemistry – the study of substances that make up matter. In this Year 2 unit, pupils explore the properties and uses of everyday materials. They will also explore how the shapes of objects can be changed by squashing, bending, twisting and stretching. Previous learning includes identifying and naming a variety of everyday materials, including wood, plastic, glass, metal, water, and rock. Comparing and grouping together a variety of everyday materials and describing their simple physical properties. Pupils continue their learning of materials in Year 3, 4 and 5. In Year 3 they will study rocks, Year 4 they develop their understanding of states of matter and in Year 5 pupils will revisit materials and their properties.</td></tr>
<tr><td>Knowledge Content

Know that the study of materials is part of the discipline of Chemistry – the study of substances that make up matter.

Revisit from Year 1:
Know that matter (stuff) is made from tiny building blocks.
Know that this comes in three forms - solids, liquids and gases.
Know that an object is something that you can touch.
Know that a material is what the object is made from.
Know the solids: wood, glass, plastic, metal and stone.
Know the liquids: water, blood, milk, juice and oil.
Know the gas: air and that this is what we breathe.

Know the following properties of materials –
• Absorbent
• Brittle
• Bumpy
• Dull</td></tr>
</table>

poles. Discuss that different materials are used for the same thing. For example spoons can be made from plastic, wood, metal, but not normally from glass. Think about the properties of materials that make them suitable or unsuitable for particular purposes. Think about unusual and creative uses for everyday materials. Find out about people who have developed useful new materials, for example John Dunlop, Charles Macintosh or John McAdam. Compare the uses of everyday materials in and around the school with materials found in other	• **Elastic** • **Flexible** • Hard • Heavy • Light • **Opaque** • **Rigid** • Rough • Runny • Shiny • Smooth • Soft • Solid • Stretchy • Stiff • Strong • Squashy • **Transparent** • **Translucent** • **Waterproof** • Weak Know the properties of these materials: • Plastic • Wood • Aluminium foil • Brick • Rock

places.

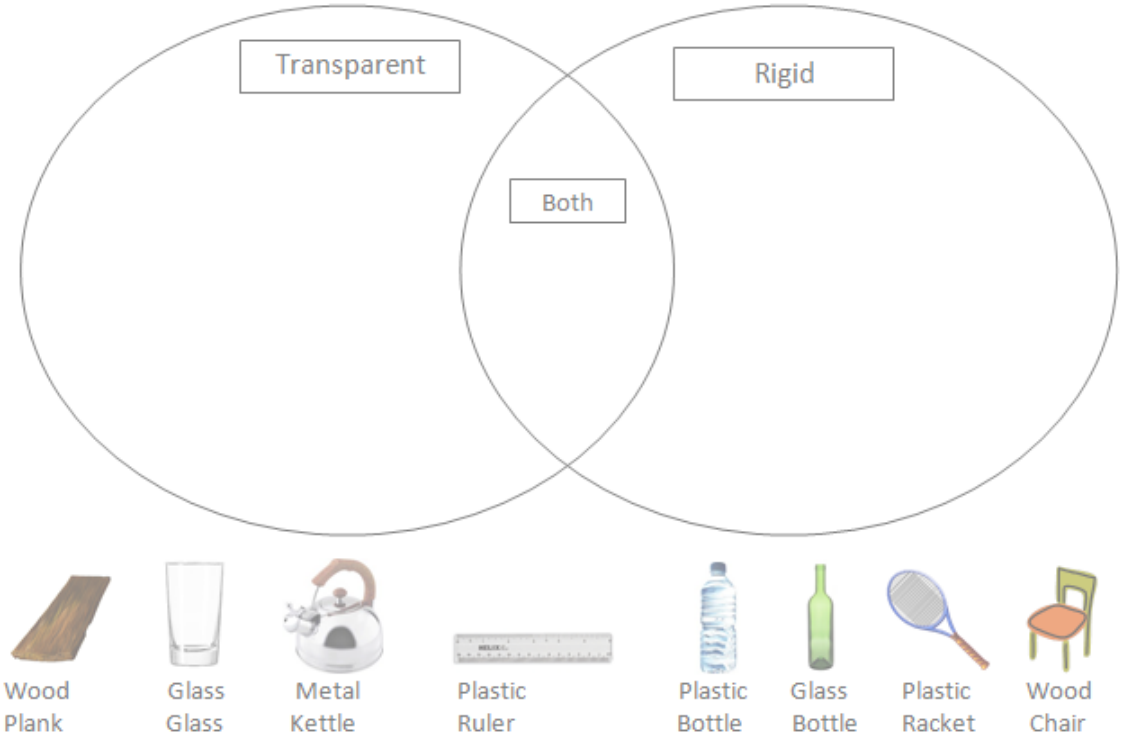
Identify and classify the uses of different materials, and record observations.

- Paper
- Cardboard
- Steel
- Iron
- Ceramic
- Glass
- Wool
- Cotton
- Milk
- Rubber

Know the definitions:

Vocabulary	Definition
Absorbent	Able to soak up liquid
Brittle	Hard but easily broken
Bumpy	Uneven and raised
Elastic	Springs back once stretched
Flexible	Can be bent easily without breaking
Opaque	You cannot see through it
Rigid	Unable to be bent or forced out of shape
Rough	Uneven, irregular surface
Shiny	Reflects light and has a smooth surface
Smooth	An even and regular surface
Stiff	Does not bend easily
Squashy	Easily crushed or squeezed
Transparent	You can see through it
Translucent	Some light can pass through it
Waterproof	Repels water and liquids

	Know that a chair can be made of wood because wood is **strong and rigid.** Know that a chair can be made of plastic because it is **strong, flexible and smooth.** Know that a window is made of glass because it is **transparent and rigid.** Know that a jumper is made of fabric because it is **flexible, soft and strong**. Know that metal can be used to make many things like coins, cars, cans and table legs. Know that wood can be used to make many things like tables, telegraph poles, matches and floors. Know why some materials are not **appropriate** For example: Why is glass not appropriate for a chair? Why is wood not appropriate for a window? Know how to use a **Venn diagram** to sort a set of materials using the properties

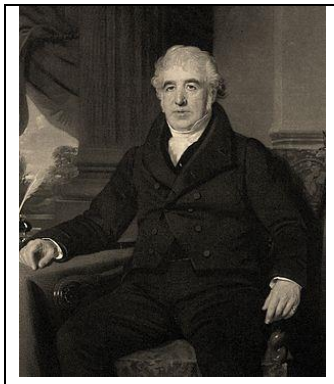


Know that materials can change shape when properties are flexible and soft.
Know that materials can't change shape when the properties are rigid, hard and stiff.
Know that materials can change shape by **bending, twisting, squashing and stretching**.

Know that these materials can change their shape by bending, twisting, squashing or stretching:

- Cotton
- Wool
- Pipe cleaners

	• Dough • Socks • Paper • Card • Sponges • Tights • Fabric • Wire • Wool • Plastic <u>Charles Macintosh</u> Know that when it is raining, people wear special wet weather clothes Know that the clothes that people wear to protect them from the rain are waterproof. Know that waterproof fabric was invented by a scientist called **Charles Macintosh**. Know that raincoats are called Mackintoshes, or macs. Know that Charles Macintosh was born in 1766 in Scotland. Know that some materials are waterproof. Know that if the water drips through into the beaker, the material is not waterproof. Know that if the water stays on top, the material is waterproof. Know that a Macintosh needs to be waterproof and flexible. Photograph of Charles Macintosh



Picture of a Macintosh

<u>WORKING SCIENTIFICALLY</u>

Make predictions and test items made from different materials against 4 forces - squashing, bending, twisting and stretching.

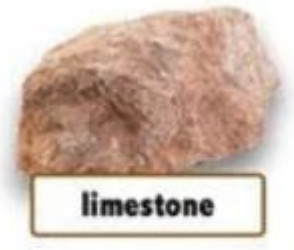
Know that applying forces to objects can change their shape.

Record the results to see which can be changed or not by each force.

	STEAM Opportunities - Try weaving using recyclable materials or create a collage to make a large project in the school grounds. - Make pizza dough or bread with the class. - Visit a park, building site, housing estate or farm to look at how different materials are used and use the swings and slides. - Use a digital microscope to view different materials. - Use the web to research how materials such as glass, pottery are made.
	Outcome Topic Test 2 Choose materials to make something waterproof
	Reading Link The Queen's Knickers
	Scientist/Inventor Charles Macintosh
Approved Resources	BBC Bitesize Switched on Science CGP

Year 3 Term Autumn 2	Unit Title: Rocks
NC Objectives	**Key Knowledge Content**
Compare and group together different kinds of rocks on the basis of their appearance and simple physical properties. Describe in simple terms how fossils are formed when things that have lived are trapped within rock. Recognise that soils are made from rocks and organic matter. **Non statutory:** Explore different kinds of rocks and soils, including those in the local environment (Geography link). Observe rocks, including those used in buildings and gravestones, and exploring how and why	<u>Context of Study</u> This unit is the third of five science units where pupils study materials as part of the discipline of chemistry – the study of substances that make up matter. Pupils will be secure on identifying and naming a variety of everyday materials, including wood, plastic, glass, metal, water, and rock. Comparing and grouping together a variety of everyday materials and describing their simple physical properties. The scientists Ole Kirk Christiansen and Charles Macintosh have been studied in KS1 as part of the Everyday Materials Units. In this Year 3 unit, pupils learn about the properties and uses of rocks, the rock family, soils and finally fossils. This unit includes comparing how things move on different surfaces. Pupils will then study states of matter in Year 4 focussing on solids, liquids and gases. Then in Year 5 pupils will study the properties and changes in materials through the processes of dissolving, mixing, reversible and irreversible changes. In year 6 children will revisit fossils as part of the evolution and inheritance unit. <u>Knowledge Content</u> Know that the study of materials is part of the discipline of **Chemistry** – the study of substances that make up matter. Know that the study of rocks, fossils and soils is also part of the discipline of **Physics** - the study of the processes that shape our world and how we use it. Children already know: How to identify everyday materials including rock (Year 1) How to identify and compare everyday materials including rock (Year 2) <u>Rocks</u> Know that rock is **a natural material** that is found in the **Earth's crust.** Know that the Earth is at least 4800 million years old and the oldest rock is about 4000 million years old. Know that there are three main types of **rock formation**: **sedimentary, igneous and metamorphic.**

they might have changed over time. Use a hand lens or microscope to identify and classify rocks according to whether they have grains or crystals, and whether they have fossils in them. Research the different kinds of living things whose fossils are found in sedimentary rock and explore how fossils are formed. Explore different soils and identify similarities and differences between them. Investigate what happens when rocks are rubbed together or what changes occur when they are in water.	Know that the study of rocks is called **geology** and that people studying rocks are called **geologists.** Know that some rocks contain **crystals** and are made of more than one **mineral**. Know that pebbles are **fragments** of rock. Know that the weather can affect rocks. Know that different rocks can be identified by their properties, e.g. colour, texture, hardness and **permeability.** Know that minerals from rocks are found in breakfast cereals (iron and zinc) and in bread (limestone). Know that water contains minerals from rocks. Know that rocks come in different sizes and there are lots of everyday words used for them. Know these words for rocks: • Boulder • Stones • Pebbles • Gravel • Sand Know that many rocks have different uses. Know these uses of rock: • Slate for roofs • Marble as floor tiles • Granite for buildings, paving stones and bridges **Sedimentary Rocks:** Know that sedimentary rocks are formed from **sediment** (small pieces of rock and earth that settle at the bottom of a liquid. Know that these build up in layers. Know that as the layers build up, water is squeezed out and the sediments are 'cemented' together. Know that this is called **sedimentation**. Know that chalk, limestone, coal and sandstone are all examples of sedimentary rock.

	Know how to identify sedimentary rock from pictures: Limestone  Chalk  Sandstone  Coal

Know that sedimentary rock contains fossils.

Igneous Rocks:
Know that igneous rocks begin as molten magma (liquid rock) from inside the Earth.
Know that igneous rocks are formed from the heat of lava or magma.
Know that as the magma moves towards the surface it cools.
Know that if the lava cools slowly the crystals are larger, e.g. granite.
Know the names of igneous rocks and identify them from pictures:

Granite

Obsidian

obsidian

Know that igneous rocks do not contain fossils because the heat would have melted them.

Metamorphic Rocks:

Know that metamorphic rocks are rocks that have been changed by heat or pressure.
Know that metamorphic rocks are formerly igneous or sedimentary rocks.
Know that the word morph means change.
Know that the rocks are heated by magma.
Know the names of metamorphic rocks and identify them from pictures:

Marble

Slate

	Know that metamorphic rocks usually do not contain fossils. Know how to use a magnifying glass to identify features of the rock types Know how to identify if the rocks have grains or crystals. <u>Soils</u> Know that soil is a mixture of air, water, broken down rock matter and other **organic** material (**dead or living animal tissue**) . Know the names of common soil types: **sand, clay and silt.** **Sandy Soil** Know that sandy soil has the largest **particles**. It feels dry and gritty and water drains through it quickly. **Silty Soil** Know that silty soil is richer in **nutrients** and smoother to the touch. It has smaller particles (a tiny piece of matter) and it can retain water for longer but will eventually start to lose this. **Clay Soil** Know that clay soil has very small particles which can hold water. It is sticky to the touch when wet, but smooth when dry. Know that clay soil contains the most nutrients as they cannot escape in water. Know that topsoil is dark in colour and high in organic matter. Know that subsoil usually appears to be lighter in colour and has a sticky texture. Know that bedrock is the solid rock in the ground which supports all the soil above it. Know that soil helps to support plant life by providing plants with nutrients, water and air. Know that soil helps to keep plant roots in the ground. Know that different plants grow better in different types of soil. Know the diagram:

<u>Fossils</u>

Know that fossils are the prehistoric remains of plants or animals that have been preserved.
Know that they are formed by being buried under layers of mud or sand which are then changed into sedimentary rock.
Know that fossils are only found in sedimentary rock.
Know that it is very rare for living things to become fossilised.
Know that usually after most animals die their bodies just rot away and nothing is left behind. However, under certain special conditions, a fossil can form.
Know what a fossil looks like:



Know the sequence of fossil formation as:
1. Animal dies and is buried by **sediment**
2. Soft parts of the animal **decay** or **decompose**
3. More sediment builds up around the animal and is **compressed** to form rock
4. Bones start to be **dissolved** by water underground
5. Minerals in the water then turn to rock

Know that fossils can also be made when animals and plants are frozen in ice or become stuck in tree resin that hardens to form amber.
Know that a **palaeontologist** studies fossils and **palaeontology is the study of fossils**.
Know that by studying fossils palaeontologists can learn a lot about the environment in which the plant or animal lived and their relationships with other living things.
Know that they can see how living things have evolved. (Evolution and Inheritance to be studied in Year 6)

<u>WORKING SCIENTIFICALLY</u>

Know how to test a range of rocks for:
Density (use **comparative** weight of similar sized rocks)
Permeability (waterproof - pour a small amount of water and observe if it is absorbed or runs off)
Strength (hard or soft - use a coin or similar object to scratch the rock and observe whether particles are easily **dislodged**).
Then decide which rock group the rock belongs to based on its properties.

	<u>STEAM Opportunities</u> - Use a digital microscope to view rocks - Watch an animated video to show how fossils are formed - Draw rocks using a hand lens or computer microscope - Visit a local museum - Role play and hot seating about relevant people
	<u>Outcome</u> Topic Test 2 Properties of rocks
	<u>Reading Link</u> The pebble in my pocket
	<u>Scientist/Inventor</u> William Smith
Approved Resources	BBC Bitesize Switched on Science CGP

Year 4 Term Autumn 2	Unit Title: States of Matter
NC Objectives	**Key Knowledge Content**
Compare and group materials together, according to whether they are solids, liquids or gases. Observe that some materials change state when they are heated or cooled. Measure or research the temperature at which this happens in degrees Celsius (°C). Identify the part played by evaporation and condensation in the water cycle. Associate the rate of evaporation with temperature. **Non statutory:** Explore a variety of everyday materials and develop simple	<u>Context of Study</u> This unit is the fourth of five science units where pupils study materials as part of the discipline of chemistry – the study of substances that make up matter. Pupils already have a secure knowledge of the properties of materials and can identify and compare the suitability of a variety of everyday materials. Previous learning includes comparing how things move on different surfaces, comparing and grouping different kinds of rocks based on simple physical properties. As part of this unit in Year 4, children will build on their knowledge of properties of matters by learning about states of matter. They will compare and group materials together, according to whether they are solids, liquids or gases. They will observe that some materials change state when heated or cooled, and they will identify the part played by evaporation and condensation in the water cycle. The knowledge acquired during this unit will help pupils understand the water cycle in geography: the part played by evaporation and associate the rate of evaporation with temperature. This unit is the precursor to the Year 5 unit of materials where 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. <u>Knowledge Content</u> Know that the word **Chemist** come from the Latin word **'alchimista'** meaning **alchemist.** Know that an alchemist is someone who **transforms** things for the better. Know that the study of materials is part of the discipline of chemistry – the study of substances that make up **matter**. Know that matter means everything that takes up space in the universe. Know that a material is any **substance** that has a name. Know that people who work in chemistry are called chemists. Know that chemists study the changes that take place when substances are combined and that these changes are called chemical **reactions**. Know that chemists create new substances for example plastics, building materials, medicines, and many other substances that are useful in everyday life. <u>Solid, Liquids and Gases</u>

descriptions of the states of matter (solids hold their shape; liquids form a pool not a pile; gases escape from an unsealed container).

Observe water as a solid, a liquid and a gas and note the changes to water when it is heated or cooled.

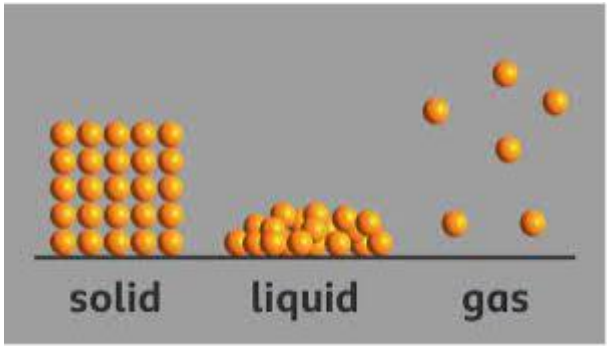
Group and classify a variety of different materials; exploring the effect of temperature on substances such as chocolate, butter, cream.

Research the temperature at which materials change state, for example, when iron melts or when oxygen condenses into a liquid.

Observe and record evaporation over a period of time, for example, a puddle in the playground

Know that a material may exist in three states: **solid, liquid, and gas.**
Know that the state that a material is in depends on the temperature.
Know that everything is made up of tiny **particles**.
Know that the **properties** of a substance depend on what its particles are like, how they move, and how they are arranged.
Know that the particles of a substance are the same in each state, but their arrangement and movement change.

Know the diagram:



Know the information in the table:

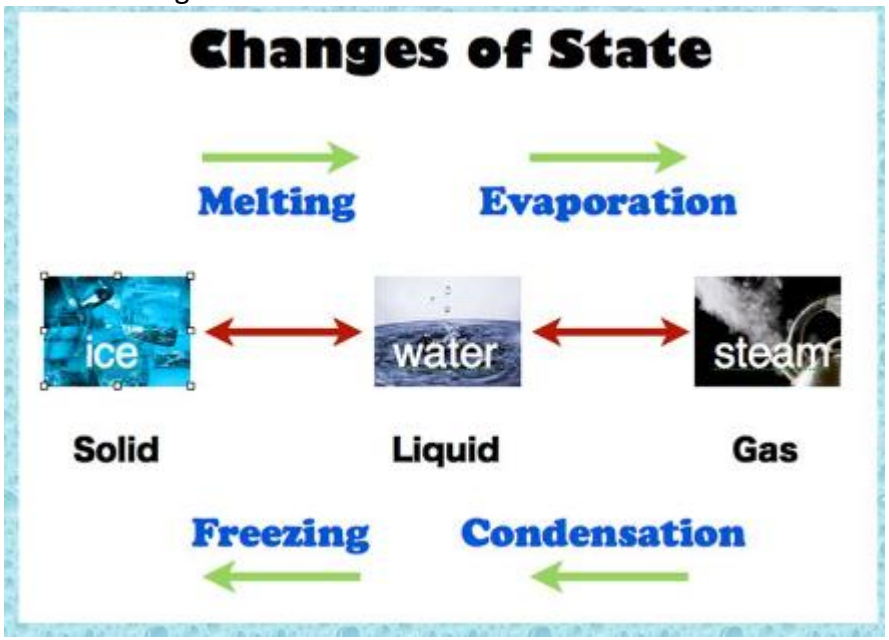
Solid	**Liquid**	**Gas**
Rigid	Not rigid	Not rigid
Fixed shape	No fixed shape	No fixed shape
Fixed volume	Fixed volume	No fixed volume
Cannot be squashed	Cannot be squashed	Can be squashed

Know that when a material is in the solid state, you can hold it in your hands and can form it into a pile.
Know that is not easy to change the shape of a material in the solid state.
Know that sand is a solid. It runs through your fingers, but each grain is a tiny solid.

or washing on a line, and investigate the effect of temperature on washing drying or snowmen melting.	Know that in a solid state the vibrating particles form a regular pattern. This explains the fixed shape of a solid and why it can't be **compressed** or poured. Know that when a material is in the liquid state, you cannot hold it in your hands and it forms a pool, not a pile. Know that liquids take the shape of the bottom of the container they are in. Know that in a liquid the particles still touch their neighbours but they move around, sliding over each other. This is why you can pour, but not compress (squash), a liquid. Know that a material in the gas state escapes from an unsealed container. Know that a gas spreads out to fill all the space available, and takes the shape of the entire container. Know that in the gas state, widely-spaced particles move around randomly. This explains why you can compress gases and why they flow. Know that air is a collection of gases and it contains - 78% nitrogen, 21% oxygen and a small amount of other gases including carbon dioxide. Know that steam and smoke are not the same thing. Know that steam is water in gas form and that smoke comes from burning solid material. Know that room temperature means neither heated nor cooled. http://www.bbc.co.uk/guides/zqpv7p3#zh4fy4j Identify the following solids, liquids and gases at room temperature:

Solid (at room temperature)	**Liquid (at room temperature)**	**Gas (at room temperature)**
wood	water	carbon dioxide
iron	milk	nitrogen
copper	blood	steam
plastic	oil	oxygen

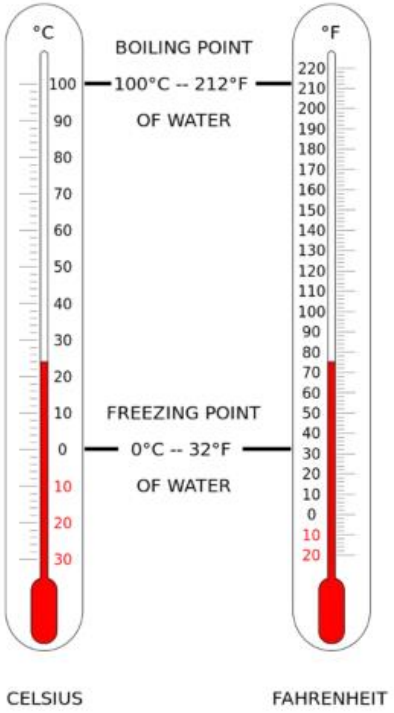
Know that water can exist in all three states.
Know the diagram:



Know that water is in its solid state of ice at 0°C or below.
Know that water is in its liquid state between 0 and 100°C.
Know that water is in its gas state of steam at temperatures of 100 ºC and above.

Know that a material can change from the gas state to the liquid state by **condensing.**
Know that when a material turns from a liquid to a solid, it is called **freezing.**
Know that when a solid melts, it turns into a liquid, because heat has been applied. This is called **melting.**
Know that when a liquid is heated it turns in to a gas and this is called **evaporation.**

Know that we measure temperature using **degrees Celsius (°C)**
Know that in many countries they use a **Fahrenheit** scale.

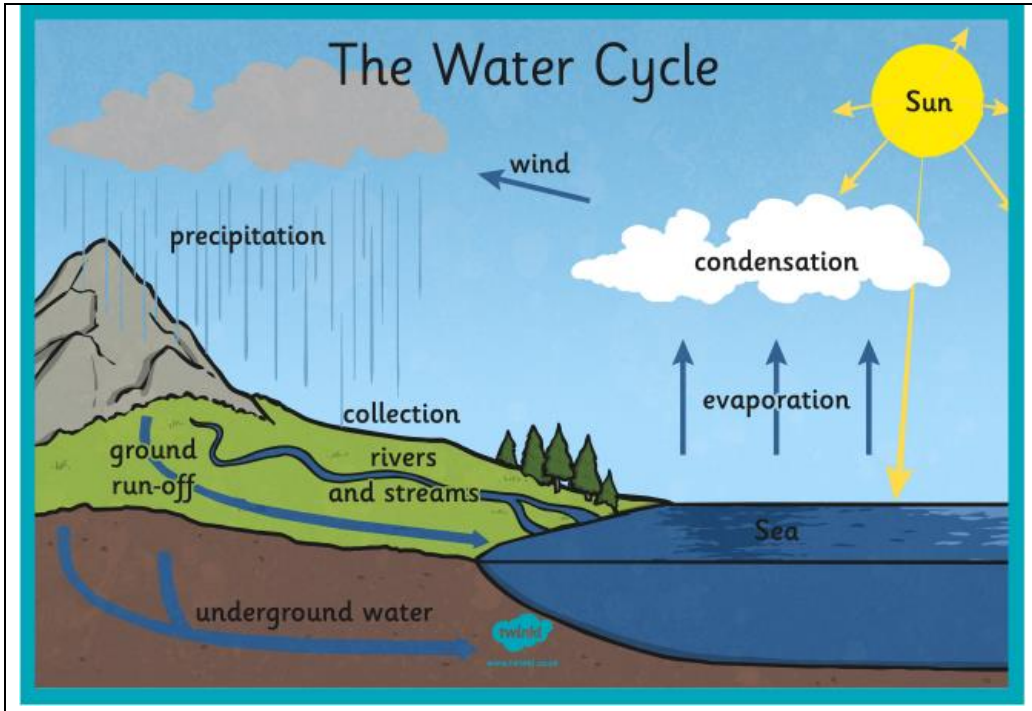


The Met Office website www.metoffice.gov. uk/learning has some weather-related explanations and video clips.

Water Cycle (link to the geography curriculum)

Know that the study of the water cycle is part of the discipline of physics, (**the hydrologic cycle**) – the study of the processes that shape our world and how we use it.

Know the term for each part of the water cycle: **evaporation, condensation, precipitation, runoff**



Know that evaporation is when water changes from a liquid to **vapour** (gas) as a result of becoming hotter.
Know that condensation is the name of the process when water vapour changes into liquid through cooling.
Know that condensation also refers to the liquid as it appears on windows on a cold day.
Know that as water condenses clouds form in the sky. When it is cool enough, and a vast amount of water has formed, it falls in the form of rain and is called **precipitation.**
Understand that water will change from a liquid to a solid when cooled to 0°C and that this is the freezing process. When ice melts, it becomes liquid which becomes part of the water cycle again.

Know that about 70% of the earth's surface is water.
Know that about 96% of earth's water is stored in the oceans.
Know that the remaining 4% is stored in rivers, lakes, ice caps, glaciers, water vapour in the air, in the soil and even in animals.

	WORKING SCIENTIFICALLY Melting Test- Observe and record how long different foods take to melt. For example chocolate and butter. Measure the temperatures with a thermometer and record results in a graph.
	STEAM Opportunities - Create a bar graph, e.g. of melting and boiling points of different substances. - Children to make a video on the water cycle using iPads. - Writer to develop creative writing linked to solids, liquids and gases. - Visit a local water treatment works. -Create a painting using watercolours.
	Outcome Topic Test 2 Water Cycle model
	Reading Link Charlie and the chocolate factory
	Scientist/Inventor Lord Kelvin
Approved Resources	BBC Bitesize Switched on Science CGP

Year 5 Term Autumn 2	Unit Title: Properties and Changes in Materials
NC Objectives	**Key Knowledge Content**
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. Know that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution. Use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating. Give reasons for the particular uses of everyday materials, including metals, wood and plastic.	<u>Context of Study</u> This unit is the final of the five science units where pupils study materials as part of the discipline of chemistry – the study of substances that make up matter. In this unit, pupils learn about materials and how they change. First, they test properties of materials before looking at how materials dissolve, what a solution is and evaporation. Finally, children compare reversible and irreversible changes. The knowledge from the Year 4 unit of states of matter will be revisited in this Year 5 unit. Pupils will also be secure from KS1 on identifying and naming everyday materials as well as describing their properties. A scientist has also been studied in each year group to develop a greater understanding of materials and their uses. Then in year 6 children will revisit fossils as part of the evolution and inheritance unit making links to the Year 3 unit of rocks, where rocks, soils and fossils were studied. <u>Knowledge Content</u> Know that the study of materials is part of the discipline of **Chemistry** – the study of substances that make up matter. Know that the study of rocks, fossils and soils is also part of the discipline of **Physics** - the study of the processes that shape our world and how we use it. Children already know: *How to identify everyday materials including rock (Year 1)* *How to identify and compare everyday materials including rock (Year 2)* *How to identify rocks, soils and fossils (Year 3)* *How to identify solids, liquids and gases (Year 4)* Know that materials are grouped on their properties. Know that different materials will have different purposes, based on their properties. Know how to compare materials based on the properties of hardness, solubility (how easily

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. **Non statutory:** Explore and compare the properties of a broad range of materials; linking it to magnetism (year 3) and electricity (year 4). Explore reversible changes, including evaporating, filtering, sieving, melting and dissolving, recognising that melting and dissolving are different processes. Explore changes that are difficult to reverse, for	dissolvable it is), transparency, magnetism, conductivity of thermal (heat) and electricity. Know that 'material' doesn't just mean 'fabric'. A 'science material' means any kind of matter in the world around us. Know that the choice of a material for a particular job is often a **compromise.** Know that silver is a better electrical conductor than copper, but it would be too expensive to use in electrical wires. Know that a material chosen for a job depends on the **appearance, comfort, cost** or all of these. Know that wood, steel and plastic are all strong enough to make chairs and can all be **manufactured** into suitable shapes. <u>Hardness</u> 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. Know how to conduct a scratch test: 1. If Specimen A can scratch Specimen B, then Specimen A is harder than Specimen B. 2. If Specimen A does not scratch Specimen B, then Specimen B is harder than Specimen A. 3. If the two specimens are equal in hardness then they will be relatively ineffective at scratching one another. Small scratches might be produced, or it might be difficult to determine if a scratch was produced. 4. If Specimen A can be scratched by Specimen B but it cannot be scratched by Specimen C, then the hardness of Specimen A is between the hardness of Specimen B and Specimen C. Know that Diamond scores the highest, 10, on the Moh's scale (therefore is the hardest mineral). Know that talc scores the lowest, 1, on the Moh's scale (therefore is the softest mineral). Know the following sequence of materials ordered by hardness: Fingernail > glass> knife blade <u>Solutions and Mixtures</u> Know that a mixture contains more than one **substance**. Know that these are not **chemically** joined, which means they are easy to separate using their properties, e.g. size, magnetism and solubility. Know that a substance may dissolve in one liquid but not in another.

example, burning and rusting. Find out about how chemists create new materials, for example, Spencer Silver, who invented the glue for sticky notes or Ruth Benerito, who invented wrinkle-free cotton. Observe that some conductors will produce a brighter bulb in a circuit than others and that some materials will feel hotter than others when a heat source is placed against them. Carry out tests to answer questions, for example, 'Which materials would be the most effective for making a warm jacket, for wrapping ice cream to stop it melting, or for making blackout curtains?'	<u>Solubility</u> 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. Know that there is a limit to how much material can be dissolved in a given liquid. Know that this is called the **saturation point.** Know that after this no more material will be dissolved and 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. <u>Transparency</u> Revise vocab - **transparent, translucent, opaque.** Know that a solution is usually transparent, even if it's coloured. <u>Magnetism</u> (Revision from Y3 unit) Revise vocab- **north and south pole, magnetic field, attract, repel.** Know how to use a magnet to test for magnetism. <u>Thermal Conductivity</u> 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. 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. <u>Electrical Conductivity</u>

	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. <u>Separating Solids and Liquids</u> Know that solids, liquids and gases can be separated using filtering, sieving and evaporation. Know the following terms: **Filtering**: separates an insoluble solid from a liquid. **Sieving**: separates solids of different sizes. **Evaporation**: separating dissolved substances from liquids. <u>Reversible and Irreversible Changes</u> Know that reversible changes are changes that are not permanent. Dissolving, mixing and altering states are reversible changes. Know that water can be **altered** from a solid to liquid, to gas and back. Know that 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. Know that wood or paper that is burnt cannot be returned to its original state. Know that cooking an egg is an example of an irreversible change. Know that adding acid to bicarbonate of soda results in the bicarbonate breaking down into salt, water and gas. Know that the resulting product cannot be **transformed** back into its **original** form. *Know what this looks like through teacher demonstration.* <u>WORKING SCIENTIFICALLY</u> Hardness: Know how to conduct a simple scratch test on familiar items

	Solubility: 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.
	<u>STEAM Opportunities</u> - Invite in to school a crafts person, e.g. to make stained glass, carpenter or a food technician/chef. - Invite in to school someone from a local university to talk about smart materials. - Design clothes using for example ring pulls, newspaper, plastic bags. - Research discoveries and inventions, fir example: Playdoh, Post-It notes, microwave ovens. - Read Michael Rosen's Centrally Heated Knickers – design and evaluate a pair using materials and technology.
	<u>Outcome</u> Topic Test 2 Keeping warm/cool investigation
	<u>Reading Link</u> Kensuke's Kingdom
	<u>Scientist/Inventor</u> Stephanie Kwolek
Approved Resources	BBC Bitesize Switched on Science CGP

<table>
<tr><th>Year 6 Term Autumn 2</th><th>Unit Title: Evolution and Inheritance</th></tr>
<tr><th>NC Objectives</th><th>Key Knowledge Content</th></tr>
<tr><td rowspan="2">Recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago.

Recognise that living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents.

Identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution.

Non-statutory notes</td><td>Context of Study
This unit is part of the discipline of biology- the study of living organisms. It comes after pupils have studied a variety of living things in their local and wider environment. Building on what they learned about fossils in Year 3, pupils find out more about how living things have changed over time. They are introduced to the idea that characteristics are passed from parent to their offspring, but that they are not exactly the same. They should also appreciate that variation over time can make animals more or less likely to survive in particular environments (adaptation). Pupils look at evolution and Charles' Darwin's theory of natural selection, as well as palaeontologist Mary Anning's work with fossils. In KS3 pupils will continue to learn about genetics and evolution as part of the biology curriculum.</td></tr>
<tr><td>Knowledge Content

Know that biology is the study of living organisms.
Know that Biology derives from the Greek root bios meaning 'life' and logy meaning 'the study of'. (Recap the word biology from Autumn 1- Animals including Humans)

Children should already:
Know that we all have different characteristics like eye colour, nose shape and hair colour.
Know that offspring look similar to their parents.

Evolution
Know that evolution is the way that living things change over time.
Know that the first person who explained how evolution happens was Charles Darwin.</td></tr>
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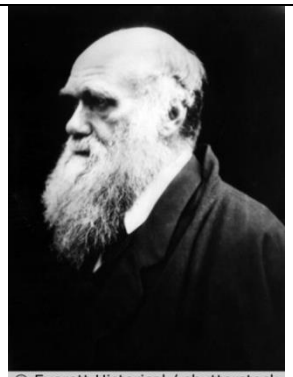
Find out more about how living things on earth have changed over time. Introduce the idea that characteristics are passed from parents to their offspring. Appreciate that variation in offspring over time can make animals more or less able to survive in particular environments. Find out about the work of palaeontologists. Observe and raise questions about local animals and how they are adapted to their environment.	 © Everett Historical / shutterstock Know that his scientific theory of natural selection was proposed in 1858. Know that **natural selection** is a process in which living things adapt themselves in order to survive and that they don't have any control over it. Know that animals do not 'choose' to change. Know that animals breed and pass on their **characteristics**. Know that Darwin spent time studying evolution on the Galapagos Islands. Know that Darwin collected **specimens** of the different species of finch living on the islands. Know that finches on the different islands had beaks that were adapted to their environment. Know that finches whose beaks weren't adapted wouldn't survive. Know what is meant by **'survival of the fittest'.** Know that different birds eat different things and we can tell this from their beaks. Know what these birds eat:

Compare how some living things are adapted to survive in extreme conditions. Analyse the advantages and disadvantages of specific adaptations.	 © YK / shutterstock  © dhogan172 / Adobe stock  © Imagestate Media (John Foxx) / Vol 12 Nature & Animals 2  © mark penny / Adobe stock  © David McMillan / shutterstock Know that ducks, eagles, flamingos and hummingbirds have beaks which are adapted to suit the foods they eat. Know that evolution is not 'just a **theory**'. https://www.bbc.co.uk/bitesize/topics/zvhhvcw/articles/z9qs4qt Know that scientists believe it explains how the wide **variety** of life on Earth came about. Know that evolution is a process which takes place over very long timescales. Know that the evolution of the polar bear from the brown bear took between 100,000 and 250,000 years. Know that brown bears gradually moved north in search of food. Know that the bears best suited to life in the cold survived, and passed on those characteristics to their offspring. <u>Inheritance</u> Know that **inherited** is the way that a trait or characteristic is passed to offspring from parents Know that the way we look is controlled by our genes, which are a mixture of those from our parents – half from the mother and half from the father. Know that some characteristics are carried by a single pair of genes, others by lots of genes working together. Know that some characteristics, such as brown eyes, are **dominant.**

	Know that if your mother has a blue-eyed gene and your father a brown version and these come together in the fertilised egg cell, the brown will 'win' and you will have brown eyes. Know that only if you have two blue-eyed genes will you have blue eyes. Know that with identical twins, a fertilised egg splits in two. Know that the genes in each half will be exactly the same, and so twins formed in this way will look identical in many ways. Know that even identical twins can look slightly different: they might decide to change their hair style, or hair colour, eat different diets, etc. Know that these are environmental changes, rather than genetic ones. Know that external features can also change how we look, as well as our genes. <u>Adaptation</u> Know that **adaptation** is a small change that a living thing goes through Know that Meerkats have dark circles around their eyes which act like sunglasses. This helps them to see even when the sun is shining very brightly!  © Duncan Noakes / Adobe stock Know that the blue whale can produce the loudest sound of any animal. At 188 decibels, the noise can be detected over 800 kilometres away. Know that even when a snake has its eyes closed, It can still see through its eyelids.

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Know that living things have adapted to use **camouflage** colours to help them blend in with the background and stop predators seeing them.

Know how toads, seahorses and owls camouflage themselves:

Animal	**Camouflage**
 © vladdon / shutterstock	Toads camouflage with their backgrounds and the surroundings of their natural habitat.
 © Laura Dinraths / shutterstock	Some seahorses can change their colour and even their textures to camouflage and blend in with their environment.

	 © Agnieszka Bacal / shutterstock	The owl is well camouflaged against the backdrop of the bark on the tree.

Know the habitats for these animals and how they have adapted:

- Arctic Fox
- Cactus
- Penguins
- Camels
- Crabs
- Antarctic Seals
- Flamingos

<u>Fossils</u>
Know that a **fossil** is a living thing that has been turned to stone by one of several methods
Know that Planet Earth is 4.6 billion years old.
Know that the first life began in the seas around 3.6 billion years ago.
Know that the earliest life were single-celled creatures like bacteria and algae.
Know that homo sapiens have only been around for a small part of the Earth's history.
Know that homo sapiens are the species to which all modern human beings belong.
Know that **homo sapiens** are a Latin word meaning "wise man".

Share the table with pupils:

	Million years ago
Present Day	0
Modern Humans Appear (Homo Sapiens)	0.2
Last Ice Age	2.4
First Human-like animals appear	2.5
Dinosaurs wiped out by asteroid	66.4
First Flowering Plants	141
Birds appear	195
First dinosaurs and mammals	230
First Reptiles	340
First insects	360
First Amphibians	370
Plants appear on land	420
Cambrian Explosion - First Fish	530
Simple multicelled creatures appeared	700
Algae, fungi, single celled animals appear	2100
Life first begins with single celled creatures like bacteria	3,600

Know that fossils tell us a lot about living things that died millions of years ago.


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Know that the parts that become fossilised can tell us about how they looked, how big they were and even what they ate.
Know that skin does not fossilise.

Know who Mary Anning was.


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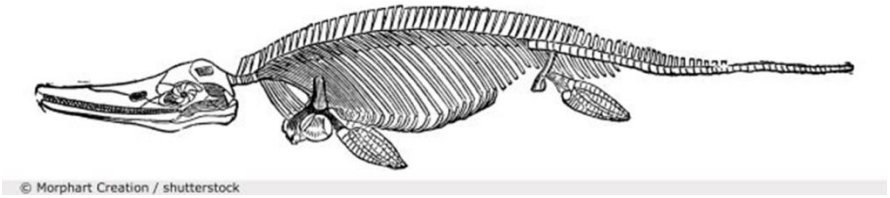
Know that she collected and sold fossils.
Know that in 1811, Mary Anning uncovered an almost complete skeleton of a new dinosaur called an **Icthyosaur**. This meant fish-lizard



Know that areas such as Lyme Regis on the south coast of England are excellent places to find fossils.
Know that the cliffs are made of **sedimentary** rock, such as limestone and sandstone that would have been at the bottom of the sea millions of years ago.
Know that the chalk cliffs are made from the skeletons of billions of **microscopic** sea creatures.
Know that fossil seashells have sometimes been found at the top of high mountains.
Know that a very famous site for fossils is called the Burgess Shale in Yoho National Park in the Canadian Rockies; 500 million years ago it used to be sea floor, but now is 2000 m above sea level!

Know that **prehistoric** means 'before written history'.
Know the names of these dinosaurs and identify them from pictures:

- Diplodocus
- Stegosaurus
- Triceratops
- Velociraptor
- Tyrannosaurus Rex

<u>WORKING SCIENTIFICALLY</u>

Know the case study of **The Peppered Moth**

The story of the peppered moth is a famous one because it shows how quickly an animal can evolve through natural selection. Before the Industrial Revolution, most peppered moths were light in colour and this camouflaged them against light-coloured trees. There were some peppered moths that were darker in colour. During the Industrial Revolution, industry created a lot of pollution and many trees became black with soot. The

	effect on the peppered moth was that the light-coloured moths were easily seen against black sooty trees by predators such as birds. This caused these moths to become fewer in number. The dark peppered moths increased in number because their colour camouflaged them against the sooty trees. Know how to design a test to show what happened to the peppered moths. a) What is your question? b) What will you do? c) What will you need? d) What will you keep the same? e) What will you change? f) What will you measure?
	<u>STEAM Opportunities</u> - Invite in to class a biologist from a local secondary school or university to work with children. - Invite in to school a vet or dog breeder. - Produce graphs and charts from data collected. - Use software (Comic Life) to create a comic strip story about Mary Anning.
	<u>Outcome</u> Topic Test 2 Design an enclosure for an animal at a zoo
	<u>Reading Link</u> One Smart Fish
	<u>Scientist/Inventor</u> Charles Darwin
Approved Resources	BBC Bitesize Switched on Science CGP