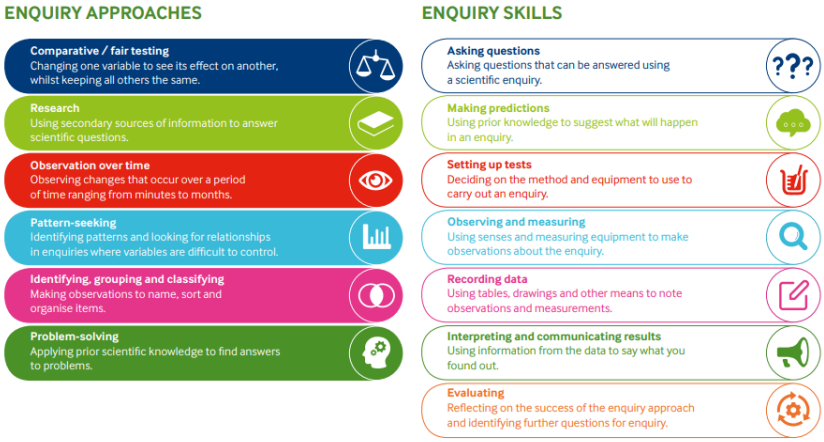
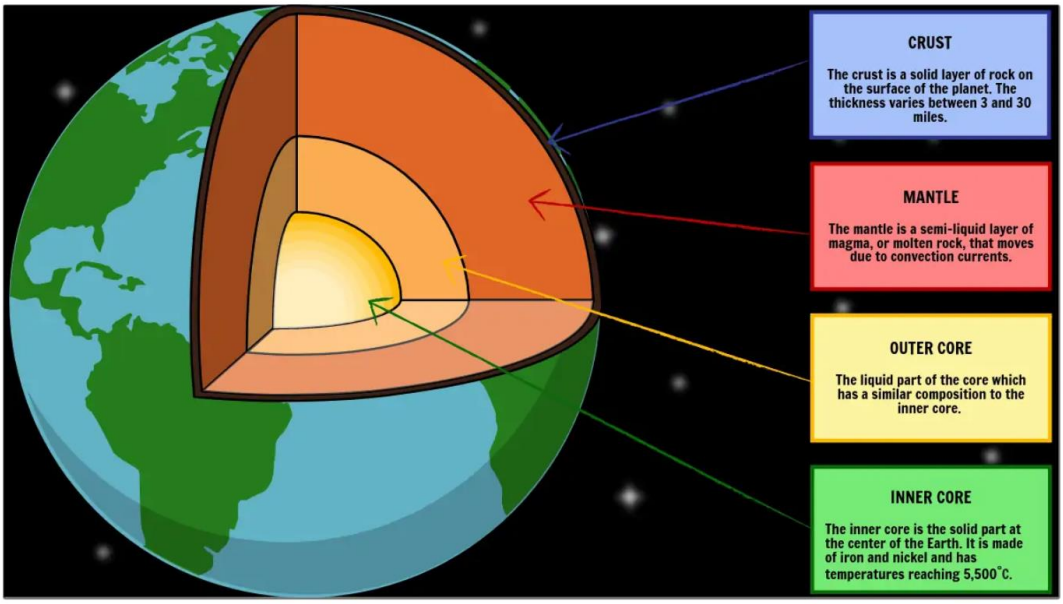
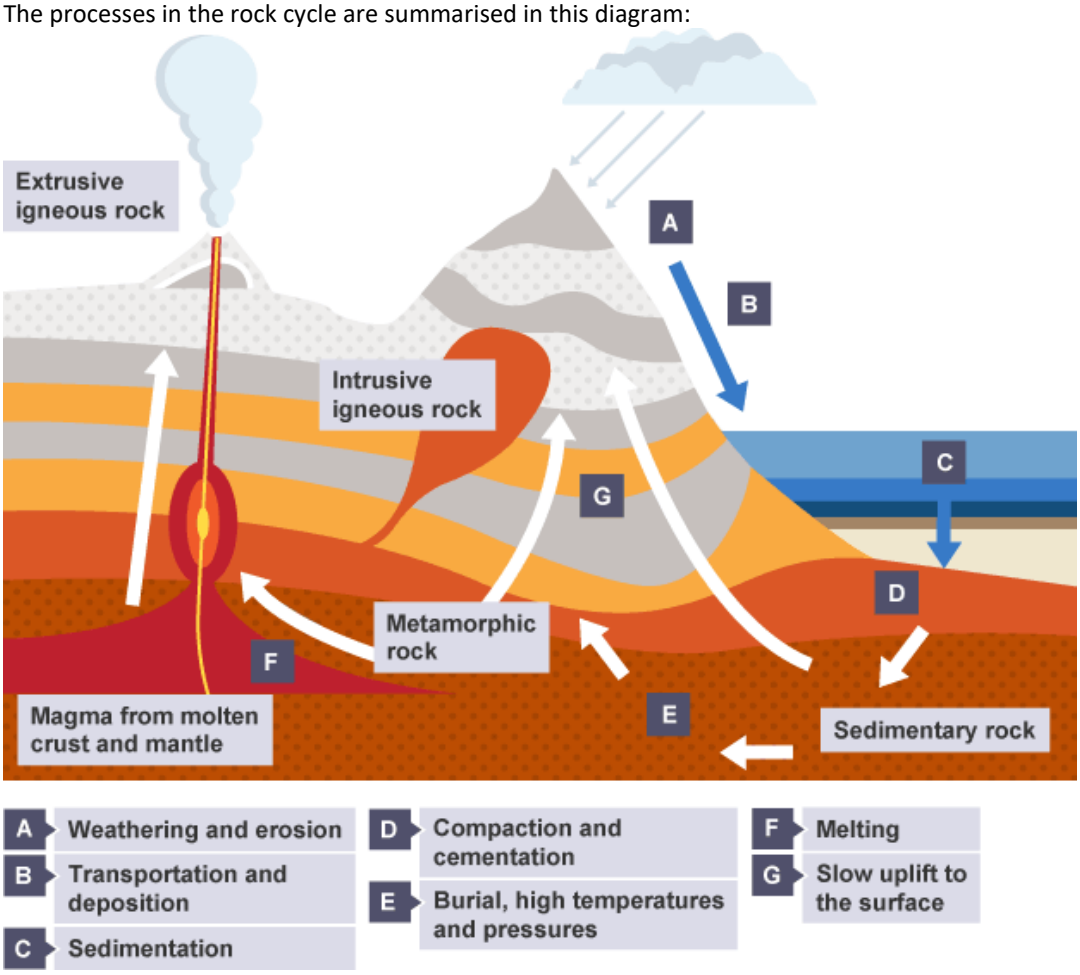
Year Group:	5	Strand: 9	What is the rock cycle?
Geology			
Key NC Reference and Objectives	• the know the basic composition and structure of the Earth • to describe the rock cycle and the formation of igneous, sedimentary and metamorphic rocks		
Enquiry Approaches and Skills in Science			
Key Investigation and other suggestions for investigations and activities	1. To investigate the absorbency of chalk: **Enquiry Approach: Observation over time** **Enquiry Skills: Observing and measuring, recording data** **Guidance:** 1. Weigh the chalk with the spring scale to determine how heavy it is when dry. To do this, hang a small plastic bag from the hook and place the chalk in the bag. Record how much it weighs. 2. Place the chalk in a cup of water. In five minutes take the chalk out of the water, shake it off and weigh it again. Record the weight. Repeat at five-minute intervals until the chalk no longer increases in weight. The chalk got heavier because it was absorbing water. After about 10-15 minutes, it absorbed all that it could hold. You can figure out how much water it absorbed, because 1 gram of water = 1 ml of water = 1 cubic centimetre (cc). If the chalk gained 2 grams in water, that means it soaked up 2 ml or 2 cc. 2. To investigate which rocks are impacted by freeze-thaw **Enquiry Approach: Identifying, grouping and classifying** **Enquiry Skills: making predictions, interpreting and communicating results** **Guidance:** 1. Look at each rock carefully. Which do you think will break down the most when you freeze and thaw them several times? Why? 2. Write down your prediction, then place the rocks in the plastic bottle and cover them with water. 3. Put the bottle in the freezer. When the water is frozen take it out and let it thaw. After the water melts, put the bottle back in the freezer. Repeat the process 3-5 times. 4. Take out the rock samples and look at them carefully again. Which one has changed the most? Do you see where small particles have been split off the rock by the freezing water? Was your prediction correct? Over time whole mountains can be worn down by this freezing/thawing process!		
Key scientists to learn about	N/A for this unit		

Previously Taught Vocabulary	Earth's crust, humus, metamorphic rock, sedimentary rock, igneous rock, lava, mineral, soil, topsoil, organism, sediment, palaeontologist, extinct, fossil, fossil fuel, fossilisation, marine terrestrial, amber, cast, minerals	
New Key Vocabulary	**crust**- Earth's rocky outer layer **erosion**- movement of rocks **freeze-thaw** – action of ice or water on rocks **inner core**- the inner most part of the Earth **lithosphere** – crust and upper mantle **magma-** molten rock **mantle**- the semi-liquid layer below the earth's crust **outer core**-part of the centre of the Earth **rock cycle**- cycle of processes undergone by rocks in the earth's crust **strata**- layers of rock, or sometimes soil **weathering** – breakdown of rocks at the earth's surface, usually by rainwater or temperature	
Core Substantive Knowledge and Background Teacher Knowledge	**The structure of the earth:**  **Types of rocks:** When molten rock is below the Earth's surface it is called magma. Once it comes to the surface it is called lava. Magma and lava describe the same substance; the only difference is where you find it. Rocks are classified according to how they were formed. When magma or lava cools, it forms igneous rock. Examples of igneous rock include granite and pumice. Igneous rocks often have tightly interlocking crystals, making them very hard. When rocks erode or break down through weathering, they are carried by rivers to the sea, and form sediments on the seabed. Over time, these are compressed to form sedimentary rock, such as limestone. Sedimentary rocks may contain fossils, for example plants, dinosaurs, ammonites and trilobites. Underground rock may experience pressure and heat that change its properties and cause it to turn into metamorphic rock, such as marble and slate. **Common misconception:** *Hopefully this misconception will have been addressed in the Y3.9 unit.* Some children might think that bricks and concrete are examples of rocks, or that rocks can be man-made. Rock is a natural material; man-made building materials such as brick and concrete are therefore not rocks. Children often think that all rocks are very hard, when in fact some are soft enough to break apart with their hands - showing pupils chalk and clay can help to ensure they understand this.	

The rock cycle:
The Earth's rocks do not stay the same forever. They are continually changing because of processes such as weathering, erosion and large earth movements. The rocks are gradually recycled over millions of years. This is called the rock cycle.

For example, sedimentary rocks can be changed into metamorphic rocks. These can be weathered, eroded, and the pieces transported away. The pieces of rock could be deposited in a lake or sea, eventually forming new sedimentary rock. Many routes through the rock cycle are possible.

The processes in the rock cycle are summarised in this diagram:



Letter Description
A Weathering breaks down rocks on the surface of the Earth. There are three types of weathering (biological physical and chemical). Wind and water move the broken rock particles away. This is called erosion.
B Rivers and streams transport rock particles to other places. Rock particles are deposited in lakes and seas.
C Rock particles form layers.
D Compaction and cementation presses the layers and sticks the particles together. This creates sedimentary rock.
E Rocks underground get heated and put under pressure, and are changed into metamorphic rock.
F Rocks underground that get heated so much they melt turn into magma. Magma also comes from deeper inside the Earth, from a region called the mantle. Pressure can force magma out of the ground, creating a volcano. When the magma (lava) cools quickly, it turns into solid extrusive igneous rock. Magma that cools slowly underground forms solid intrusive igneous rock.
G Areas of rock can move slowly upwards, pushed up by pressure of the rocks forming underneath. This is called uplift.

How rocks change:
Chemical weathering
The weathering of rocks by chemicals is called chemical weathering.

	• Rainwater is naturally slightly acidic because carbon dioxide from the air dissolves in it. Minerals in rocks may react with the rainwater, causing the rock to be weathered. • Some types of rock are easily weathered by chemicals. For example, limestone and chalk are mostly calcium carbonate. When acidic rainwater falls on limestone or chalk, a chemical reaction happens. New, soluble, substances are formed in the reaction. These dissolve in the water, and then are washed away, weathering the rock. • Some types of rock are not easily weathered by chemicals. For example, granite and gabbro are hard rocks that are weathered only slowly. However, some of their minerals do react with the acids in rainwater to form new, weaker substances that crumble and fall away. **Physical weathering** Physical weathering is caused by physical processes such as changes in temperature, freezing and thawing, and the effects of wind, rain and waves. • Temperature changes When a rock gets hot it expands a little, and when it gets cold the rock contracts a little. If a rock is heated and cooled many times, cracks form and pieces of rock fall away. This type of physical weathering happens a lot in deserts, because it is very hot during the day but very cold at night. • Wind, rain and waves Wind, rain and waves can all cause weathering. The wind can blow tiny grains of sand against a rock. These wear the rock away and weather it. Rain and waves lashing against a rock can also wear it away over long periods of time. • Freeze-thaw Water expands slightly when it freezes to form ice. This is why water pipes sometimes burst in the winter. You might have seen a demonstration of this sort of thing - a jar filled to the brim with water eventually shatters after it is put into a freezer. The formation of ice can also break rocks. If water gets into a crack in a rock and then freezes, it expands and pushes the crack further apart. When the ice melts later, water can get further into the crack. When the water freezes, it expands and makes the crack even bigger. This process of freezing and thawing can continue until the crack becomes so big that a piece of rock falls off.
Prior Knowledge	**3.9: Are all rocks the same?** Compare and group together different kinds of rocks on the basis of their appearance and simple physical properties, recognise that soils are made from rocks and organic matter. **4.9 What do fossils tell us about our world?** Describe in simple terms how fossils are formed when things that have lived are trapped within rock, describe in simple terms the period on Earth when dinosaurs lived
Assessment	Thorough assessment of outcomes in books and folders, quizzes and written scientific investigations, also supported by observations and questioning in lessons, assessing the following: Substantive Knowledge: - Pupils can explain the composition and structure of the earth. - Children can explain the different parts of the rock cycle. - Pupils know some features and uses for sedimentary, igneous and metamorphic rocks. Disciplinary Knowledge: - Pupils can use secondary sources of information to research. - Pupils can present their own data in different ways.

Useful Planning Resources **Useful Links**	Starburst Rock Cycle Science Project: https://learning-center.homesciencetools.com/article/rock-cycle-science-lesson/ **Frozen Rock Experiment:** Rocks are formed at every stage of the rock cycle. Formation of a new rock often requires the destruction of an "old" rock. Agents that break down rocks include wind, rain, rivers, and rock slides. But they are also broken apart by freezing and thawing. When water freezes, it expands. Water that has seeped into a rock will expand when frozen, causing cracks in the rock. After it freezes and thaws several times, bits of rock will begin to split off entirely. Do these rock experiments to see how it works and find out what kinds of rocks break down the most when frozen. What You Need: Several different kinds of rocks, such as granite, sandstone, or limestone Plastic bottle or container Water What You Do: 1. Look at each rock carefully. Which do you think will break down the most when you freeze and thaw them several times? Why? 2. Write down your prediction, then place the rocks in the plastic bottle and cover them with water. 3. Put the bottle in the freezer. When the water is frozen take it out and let it thaw. After the water melts, put the bottle back in the freezer. Repeat the process 3-5 times. 4. Take out the rock samples and look at them carefully again. Which one has changed the most? Do you see where small particles have been split off the rock by the freezing water? Was your prediction correct? Over time whole mountains can be worn down by this freezing/thawing process! **Absorbency of chalk investigation:** You may be wondering how water gets in rocks in the first place. Aren't rocks solid? Actually, they have tiny pores or pockets that can be filled with water or air (or sometimes oil and natural gas) like a sponge. No rock can soak up as much water as a sponge, but some rocks absorb more water than others – these are called porous rocks. This experiment will show you how a piece of chalk can absorb a great deal of water in a short time. Chalk is composed of the mineral calcium carbonate. Different types of rocks are made of different pure minerals; rocks such as limestone have lots of calcium carbonate. Have older students try this with various types of porous rock, such as pumice – they may need to wait up to a day for the rock to absorb the total amount of water it can hold. What You Need: A piece of chalk Cup of water Spring scale What You Do:

	1. Weigh the chalk with the spring scale to determine how heavy it is when dry. To do this, hang a small plastic bag from the hook and place the chalk in the bag. Record how much it weighs. 2. Place the chalk in a cup of water. In five minutes take the chalk out of the water, shake it off and weigh it again. Record the weight. Repeat at five-minute intervals until the chalk no longer increases in weight. The chalk got heavier because it was absorbing water. After about 10-15 minutes, it absorbed all that it could hold. You can figure out how much water it absorbed, because 1 gram of water = 1 ml of water = 1 cubic centimeter (cc). If the chalk gained 2 grams in water, that means it soaked up 2 ml or 2 cc.