Science

Theme: Earth Structure and Universe

Name: ....

Class: ....

Contents

Introduction

This workbook is focused on the topics Earth Structure and Universe. It is designed to help you develop your knowledge, improve your understanding and to then stretch and challenge you.

You will be expected to use your existing knowledge, the information in the booklet and the recommended websites to produce answers to the questions.

You should not find every task to be easy, you will have to apply your knowledge and think hard. This is important because…

memory is the residue of thought.

Useful websites:

Search 'Bitesize KS3' and then the topic title e.g. 'seasons' or search from the link below

https://www.bbc.co.uk/bitesize/subjects/zng4d2p

https://www.kerboodle.com/ - Go to Lessons or AQA digital book AQA Activate 1 topic 7)

Username and **password** = first initial followed by your surname (unless you changed your password) e.g. jbloggs (if you have to change your password because your name is too short, I suggest using the start of your school email address e.g. slee becomes 19slee)

Institution code = **mnx1**

Can't login?

Email me with your class and name at ajones@southchurchschool.com

Recommended booklets that can be purchased:

✓ Activate 1 Intervention Workbook (Higher)

This can be purchased online:

https://global.oup.com/education/product/9780198423799/?region=uk

✓ Collins KS3 Revision - KS3 Science All-in-One Revision and Practice

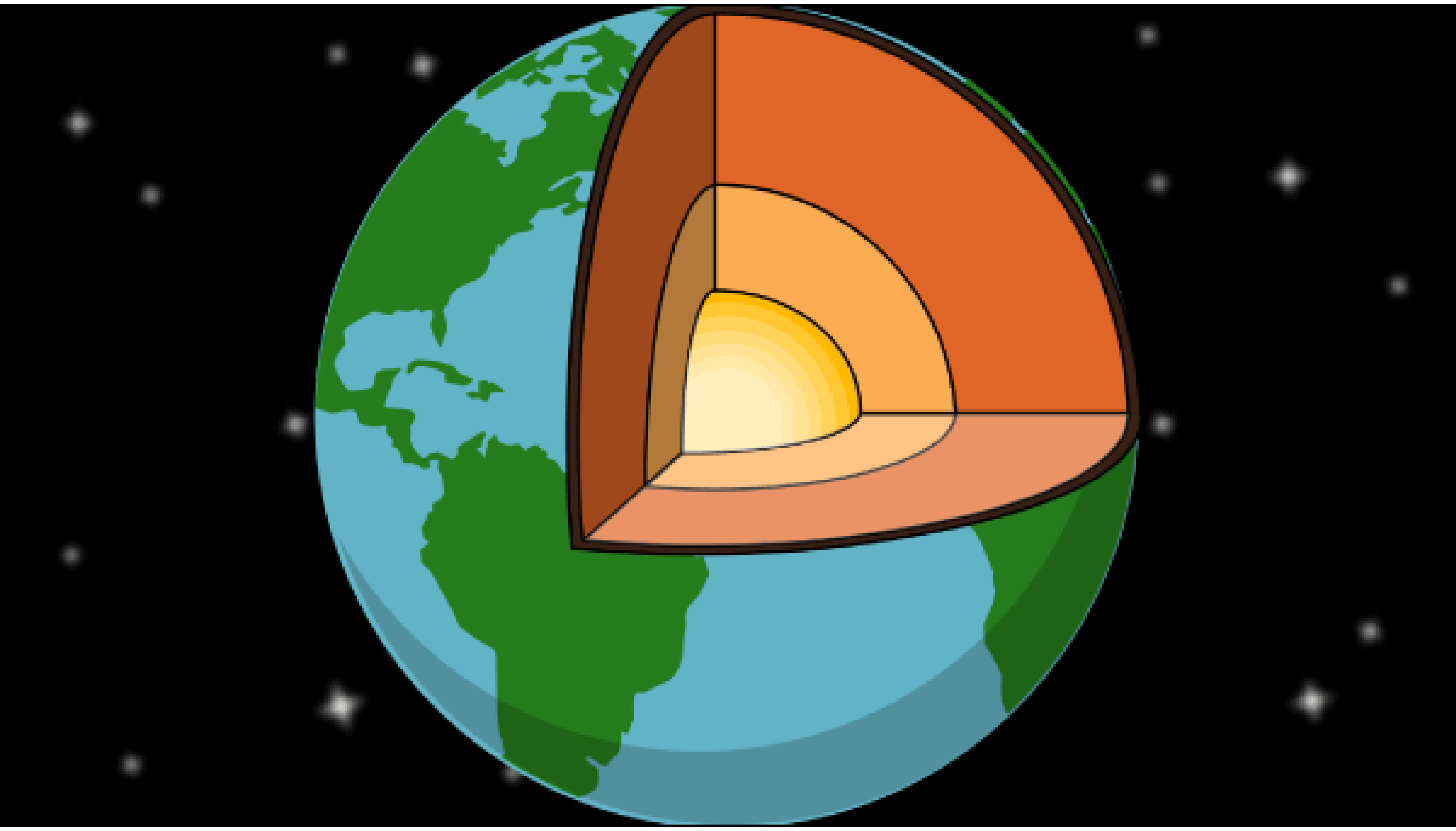
This can be purchased online:

https://collins.co.uk/products/9780007562831

If you require assistance, you should contact me (Miss Jones) by email:

ajones@southchurchschool.com

Earth Structure

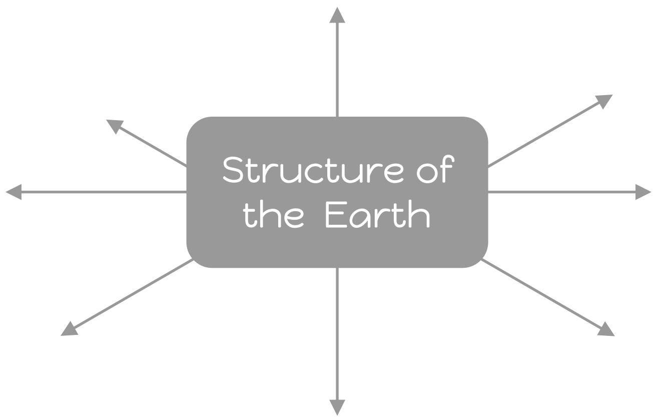


Lesson 1 The Structure of the Earth

Learning Intention:
To be able to describe the structure of the Earth

Learning outcomes:
- I will be able to name the three rock layers of Earth
- I will be able to describe the three rock layers of Earth
- I will be able to compare the layers of the Earth

Starter: Take 5 minutes to form a spider diagram of everything that you know about the structure of the Earth, this can be keywords, knowledge from primary school or anything that you know from everyday life:



Watch the video below – Click on the link if you are using an electronic copy of this booklet or find it on YouTube by searching for the title and or owner. ***Whilst watching the video make notes.***

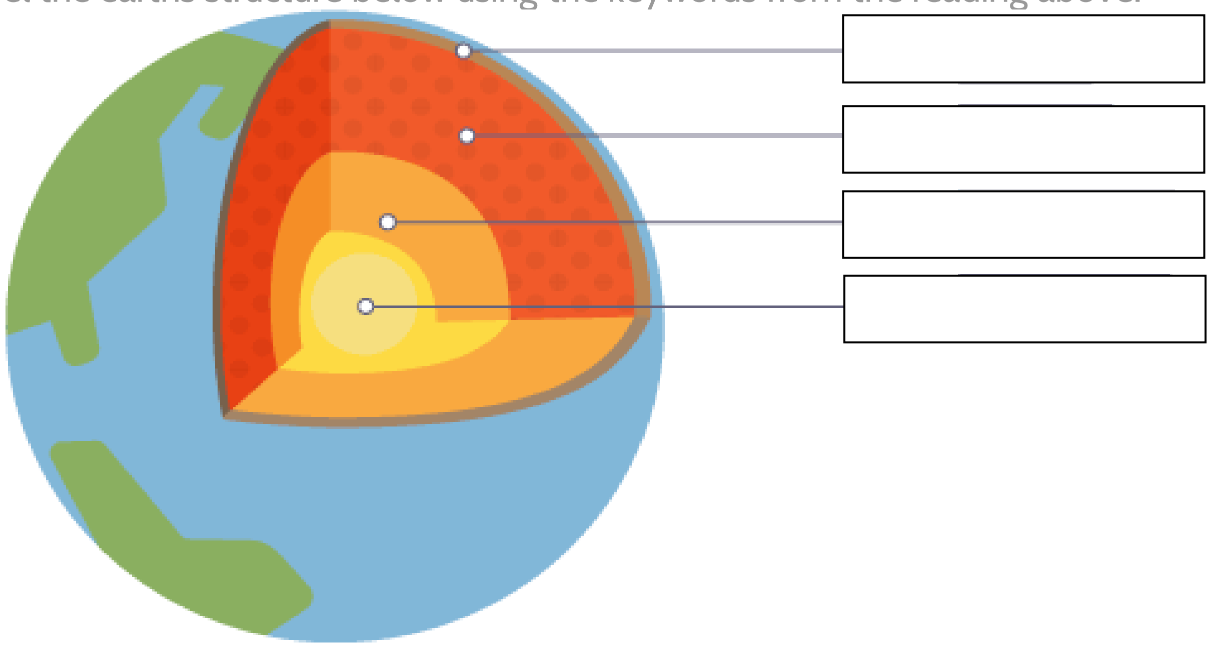
Everything you need to know about planet Earth
httpshttps://www.youtube.com/watch?v=JGXi_9A__Vc

Reading Comprehension Task:

The Earth has three main layers. We live on the outer layer, the crust, and are surrounded by a mixture of gases, the atmosphere. The Earth is almost a sphere. These are its main layers, starting with the outermost: crust (relatively thin and rocky), mantle (has the properties of a solid, but can flow very slowly), core (made from nickel and iron). The radius of the core is just over half the radius of the Earth. The Earth's atmosphere surrounds the Earth. The Earth's crust, its atmosphere and oceans are the only sources of the resources that humans need. Earthquakes and volcanoes tend to happen in the same places. This is because the Earth's surface is split into pieces called "tectonic plates". Where these plates meet are known as tectonic plate boundaries. The plates are always moving. They are moving very slowly, but they are moving, and every now and again, a build-up of pressure is released in the form of a sudden slip of the plates (earthquake) or an explosion of lava (volcano).

The Earth's crust contains a lot of silicon, aluminium and magnesium. The crust is solid, rigid and ranges in temperature form 20-500°C. Continental crust is about 50 km thick, ocean crust is about 5-10 km thick. The average density of the crust is 2.9 g/ml. The Earth's mantle contains a lot of iron and magnesium silicates. The mantle is soft and consists of semi-molten rock called magma. The temperature of the upper mantle is about 1000°C and the temperature of the lower mantle is about 2500°C. The mantle is about 2900 km thick. The average density of the mantle is about 3.6 g/ml. The Earth's core contains a lot of nickel and iron. The inner core is solid. It has a density of about 9.5 g/ml and a temperature of about 4700°C. The outer core is liquid and the temperature is about 4000°C. The radius of inner core is 1230 km and the thickness of the outer core is 2250 km.

1. Label the earths structure below using the keywords from the reading above:



2. Which is the thinnest layer?

....

3. Which is the thickest layer?

....

4. Which part is the solid bit that we stand on?

....

5. What state is the mantle?

....

6. Why is the core liquid even though it is made of iron?

....

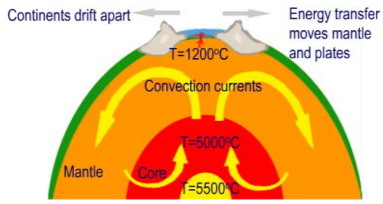
Pangea

Pangaea is a hypothetical supercontinent that included all current land masses, believed to have been in existence before the continents broke apart during the Triassic and Jurassic Periods.

There is some evidence to support this theory:

- *Rocks that are very similar were found on coasts now separated by oceans*
- *Fossils of similar plants and animals were found on these coasts*
- *Some continents looked like they fit together like a jigsaw puzzle*

This force is the one that is responsible for the way the Earth looks today and for the fact that we have earthquakes and volcanoes.



Why do plates move?

The hot mantle nearest the core rises. As it rises it cools. This process is called convection. The convection currents move the tectonic plates.

7. What does the fact that earthquakes and volcanoes occur at the boundaries tell us about the plates? ....

8. What force could possibly be big enough to move whole continents?

....

9. Which is the hottest part of the earth?

....

10. What happens to the density of liquids when they are heated?

....

11. Explain how the continents move.

....

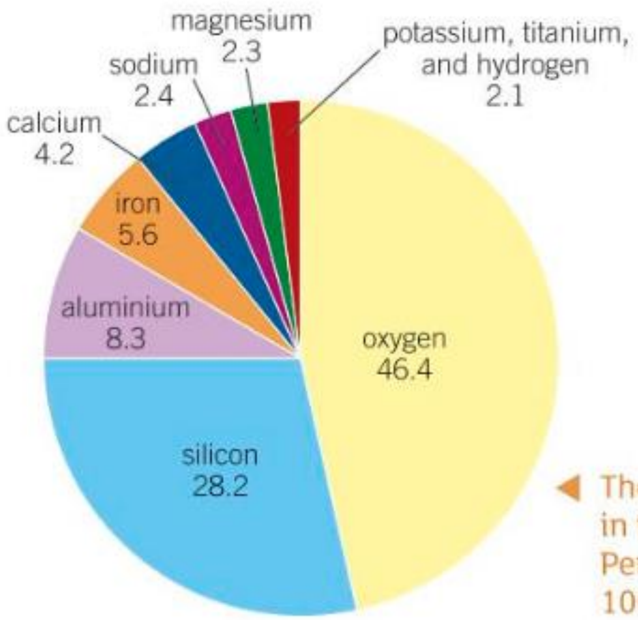
12. Describe the evidence of the theory that the earth's continent once fit together as Pangea.

....

13. Explain how we have the earthquakes and volcanoes?

....

The pie chart shows the elements that make up the minerals of the Earth's crust.



The most common elements in the Earth's crust, by mass. Percentages do not add up to 100% owing to rounding.

List the most common elements in the Earth's crust.

....

Think of some questions that you have about some of the elements in the Earth's crust. Write them down and research the answers.

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Checkpoint:
Explain why scientists study the mantle not by directly studying it, but by studying shock waves from earthquakes and examining materials brought to the surface by volcanoes

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Challenge:
Write a paragraph to compare the properties and composition of the Earth's crust, mantle and core.

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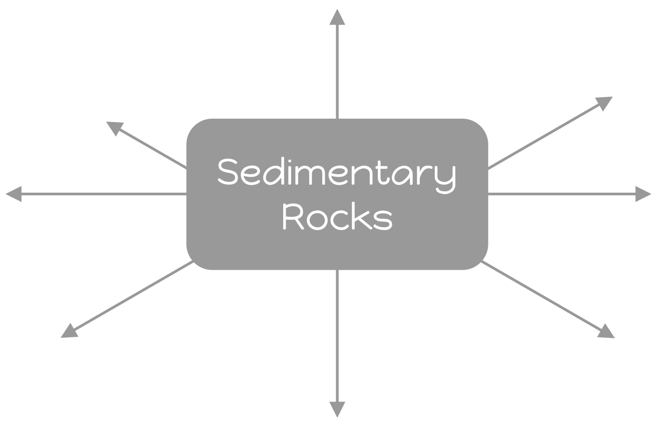
Plenary: Return to your original spider diagram and add new knowledge to this in a different coloured pen.

Lesson 2 Sedimentary Rocks

Learning Intention:
To be able to describe the stages of formation of sedimentary rocks.

Learning outcomes:
I will be able to identify the properties of sedimentary rocks
I will be able to describe how sedimentary rocks are formed
I will be able to explain the properties of sedimentary rocks based on how they are formed.

Starter: Take 5 minutes to form a spider diagram of everything that you know about sedimentary rocks, this can be keywords, knowledge from primary school or anything that you know from everyday life:



Watch the video below – Click on the link if you are using an electronic copy of this booklet or find it on YouTube by searching for the title and /or owner. ***Whilst watching the video make notes.***

Forming Sedimentary Rocks
https://www.youtube.com/watch?v=SuNfbEDMOQs

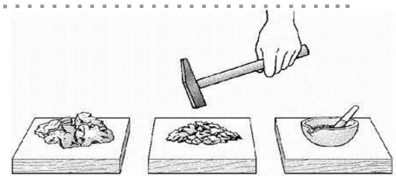
Sedimentary rocks are formed when the broken remains of other rocks become joined together. Rock fragments are carried by strong winds, by rivers or by glaciers (**transport**). When the river reaches a lake or the sea, its load of transported rocks settles to the bottom (**deposited)**. These rocks build up in layers, called sediments (**sedimentation)**. The weight of the sediments on top squashes the sediments at the bottom (**compaction)**. The water is squeezed out from between the pieces of rock and crystals of different salts form. The crystals stick the pieces of rock together (**cementation)**. Dead animals and plants can get trapped in sediment and form **fossils**.
Transport → Deposition → Sedimentation → Compaction → Cementation

Sedimentary Rocks Characteristics
These rocks contain rounded grains in layers. The oldest layers are at the bottom and youngest are at the top. The gaps between the grains make the rocks **porous**. They are soft and can be scratched easily. Examples: chalk, limestone, shale and sandstone.

1. Explain why sedimentary rocks are layered.
……..
……..

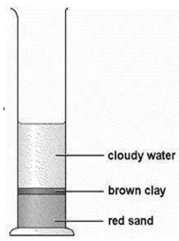
2. What are the properties of sedimentary rocks? Hint: What do they look like under a lens? What property do the gaps between the grains lead to? Are they hard or soft?
……..
……..

Exam style questions



1. Linda had a piece of red sandstone. She hammered it into pieces and then ground them into a powder using a pestle and mortar.

She put the powder into a measuring cylinder with water and shook the mixture. The contents settled. Linda said her results showed that sandstone is a mixture of two substances.



a. How could she tell, from the results, that sandstone is a mixture of substances?
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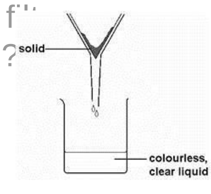
Linda then poured the cloudy water from the measuring cylinder through filter paper in a filter funnel. She said there might be salts dissolved in the colourless, clear liquid that came through the f



b. What could Linda do to find out if there were salts dissolved in the colourless, clear liquid?
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………………………………………………………………………………………………………
c. What would she see if there had been salts dissolved in the colourless, clear liquid?
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2. Sandstone is a sedimentary rock. Four stages in the formation of sedimentary rock are listed below. They are not in the correct order. compacted deposited weathered transported
Put these stages in the correct order and explain what happens at each stage.

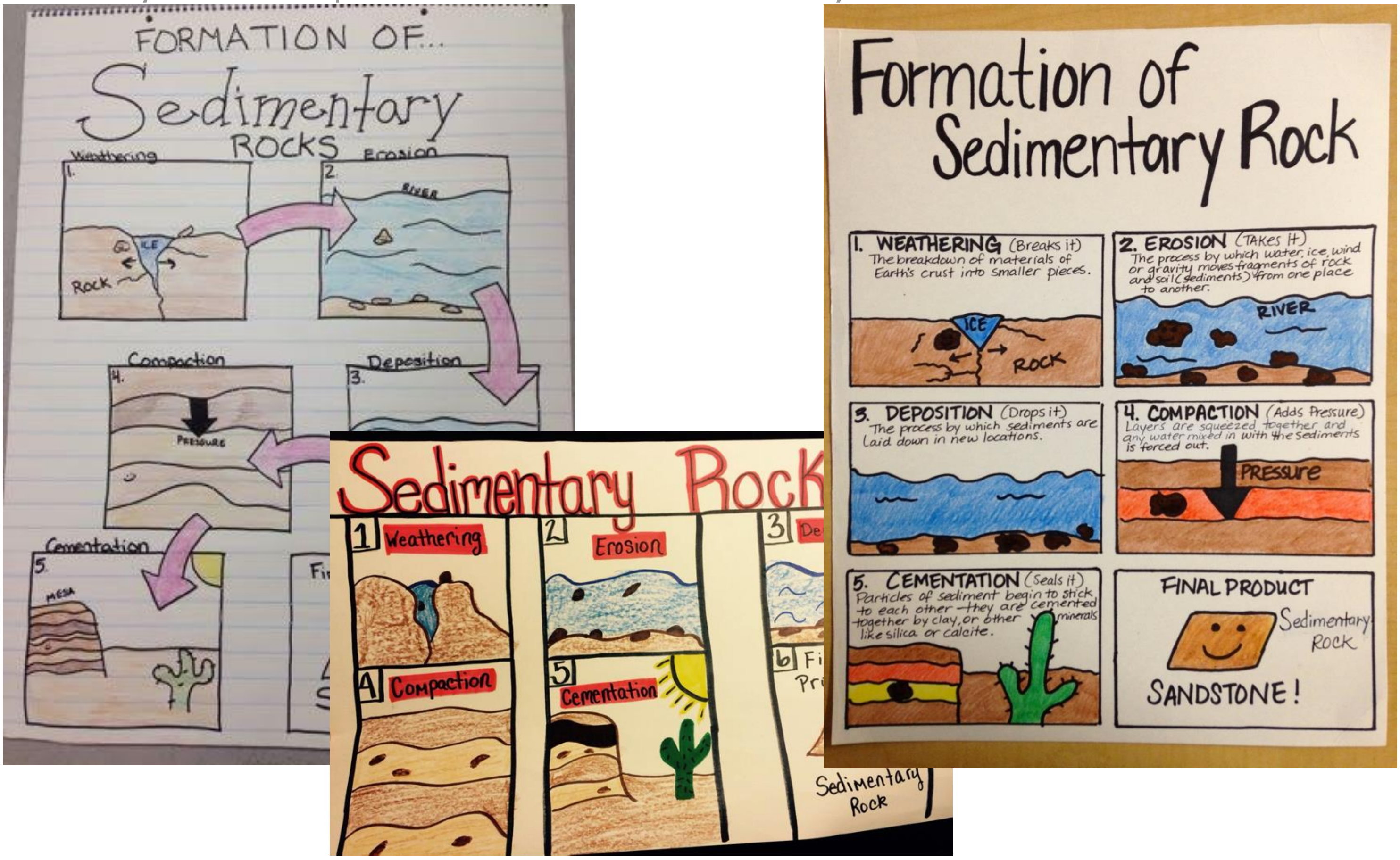
stage 1 ....

stage 2 ....

stage 3 ....

stage 4 ....

4. Use your newly acquired knowledge and the examples below as inspiration to create your own story board to explain the formation of sedimentary rocks.



Checkpoint:
Look at the photo of Mars.
Describe the evidence from the photo that shows that the rock is sedimentary. Suggest what the condition on Mars might have been like when the rock was formed. Give reasons for your suggestions (PEE: Point-Evidence-Explain)

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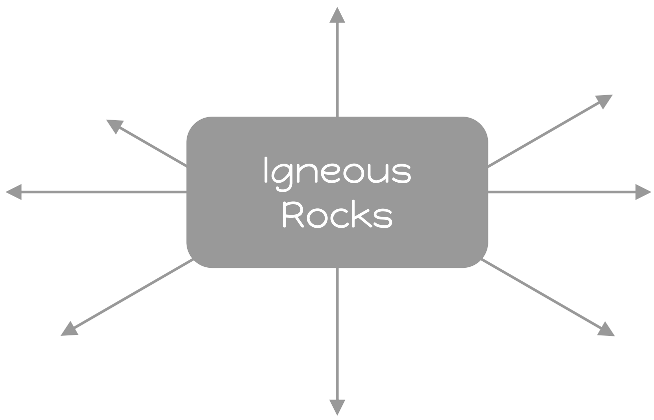
Plenary: Return to your original spider diagram and add new knowledge to this in a different coloured pen.

Lesson 3 Igneous Rocks

Learning Intention:
To be able to describe the formation of igneous rocks

Learning outcomes:
I will be able to describe how igneous rocks are formed
I will be able to identify the properties of igneous rocks
I will be able to explain the properties and uses of igneous rocks based on how they are formed.

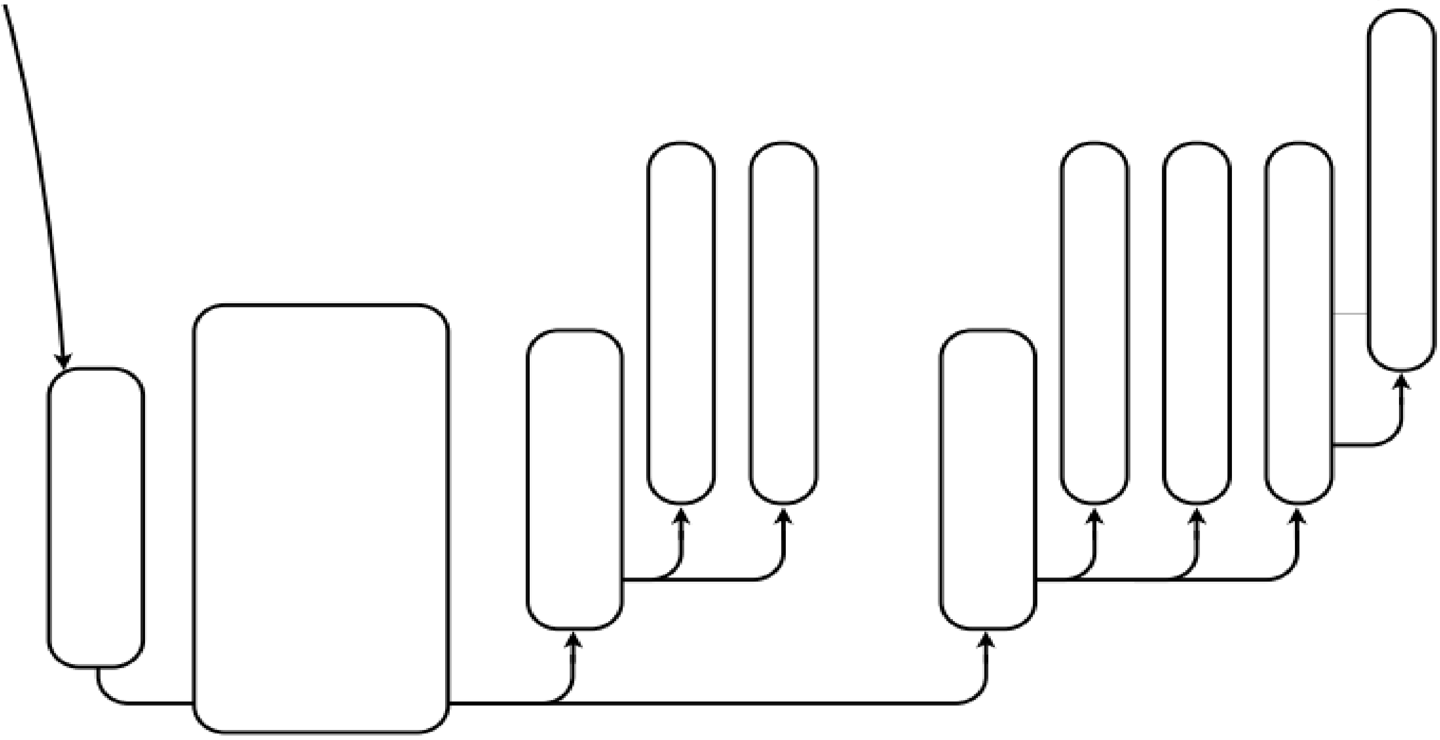
Starter: Take 5 minutes to form a spider diagram of everything that you know about igneous, this can be keywords, knowledge from primary school or anything that you know from everyday life:



Watch the video below – Click on the link if you are using an electronic copy of this booklet or find it on YouTube by searching for the title and /or owner. ***Whilst watching the video make notes.***

What is an Igneous Rock-Mike Sammartano
https://www.youtube.com/watch?v=aCnAF1Opt8M

Turn your book sideways and use the information in the video to complete this flow diagram



1. Recap - What are sediments and what are the properties of sedimentary rocks?

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2. What is the difference between intrusive (plutonic) and extrusive (volcanic)?

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3. What is vesicular?

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4. Why does obsidian have a glassy appearance? (Answer this using PEE, Point-Evidence-Explain)

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Draw a diagram to describe the difference between magma, lava and intrusive and extrusive igneous rocks.

Checkpoint:
What properties would a rock have if it was formed from lava? (Answer this using PEE, Point-Evidence-Explain)

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Challenge:
Explain why granite is not porous based on how it was formed.

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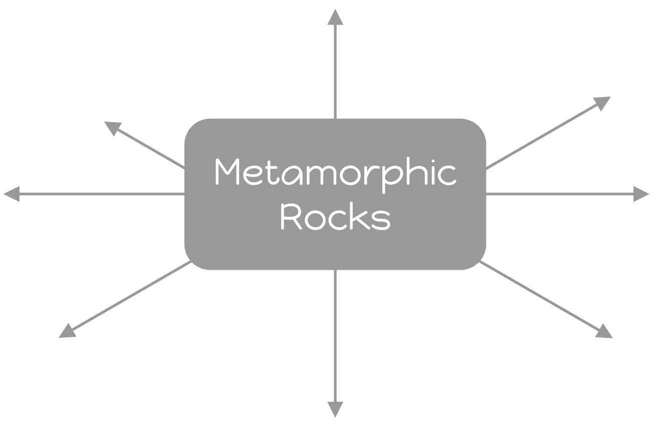
Plenary: Return to your original spider diagram and add new knowledge to this in a different coloured pen.

Lesson 4 Metamorphic Rocks

Learning Intention:
To be able to describe the formation of metamorphic rocks

Learning outcomes:
🥉 I will be able to describe how metamorphic rocks are formed
🥈 I will be able to identify the properties of metamorphic rocks
🥇 I will be able to explain the properties and uses of metamorphic rocks based on how they are formed.

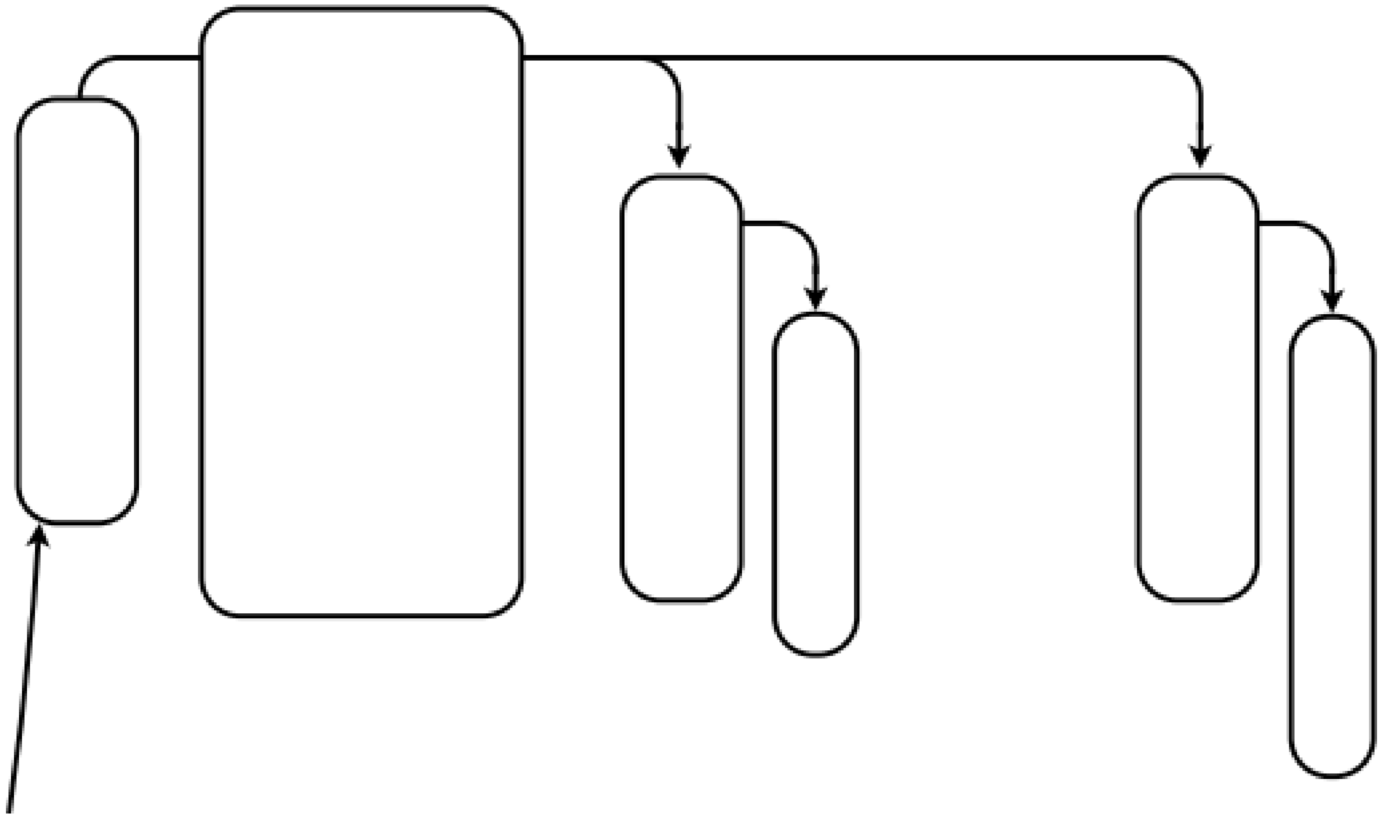
Starter: Take 5 minutes to form a spider diagram of everything that you know about metamorphic rocks, this can be keywords, knowledge from primary school or anything that you know from everyday life:



Watch the video below – Click on the link if you are using an electronic copy of this booklet or find it on YouTube by searching for the title and /or owner. ***Whilst watching the video fill in the flow chart over the page.***

What is a Metamorphic Rock-Mike Sammartano
https://www.youtube.com/watch?v=1oQ1J0w3x0o

Turn your book sideways and use the information in the video to complete this flow diagram



Metamorphic rocks have been subjected to tremendous heat and/or pressure over millions of years, causing them to change into another type of rock. They are usually resistant to weathering and erosion and are therefore very hard-wearing.
Examples: Marble, which originates from limestone below the Earth's surface heating up, causing its particles to rearrange; Slate, which originates from a sedimentary rock called mudstone, and is formed when high pressure squeezes all the water out of mudstone and makes new layers of crystals.
Characteristics of Metamorphic rock:

- These are formed when either igneous or sedimentary rocks are changed.
- Heat and/or pressure will cause the elements in the original rock to react and re-form.
- They are made up of densely packed crystals and are consequently not porous.
- Metamorphic rocks are highly resistant to erosion and are often used in building materials.

1. Recap - Which is the thinnest section of the Earth?

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2. Recap – How are igneous rocks formed?

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3. Recap – How are sedimentary rocks formed?

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4. What type of rock is formed inside a volcano from magma?

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5. Explain what happens to the temperature of the earth as you get further underground?

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6. What does ‘density’ mean?

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7. Describe how metamorphic rocks are made from sedimentary rocks.

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8. Explain the physical properties of the metamorphic rock. (Answer this using PEE, Point-Evidence-Explain)

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9. The list below gives some processes which occur in the rock cycle.

1. Grains of sediment collect in layers on the sea bed.
2. Large crystals form as molten magma cools deep below the Earth’s surface.
3. A glassy rock forms as molten magma erupts into sea water.
4. Grains of sediment are cemented together as they are buried deep under thick layers of other sediments.
5. New crystals form in layers as rocks are affected by high temperature and increased pressure deep in the Earth’s crust.
6. New minerals form with flat crystals when layers of mudstone are squeezed.

a. Give the number of one metamorphic process. ………………………………………………

b. Give the number of one igneous process. ………………………………………………………

c. Give the numbers of the two steps which could lead to the formation of sandstone

………………………. and then ……………………….

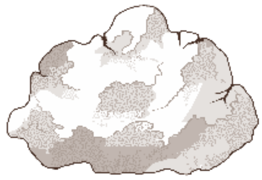
10. Limestone and sandstone are two different rocks. Limestone is mainly calcium carbonate. It reacts with dilute hydrochloric acid to produce bubbles of gas. Complete the word equation for the reaction. Hint: You may need to think back to the metals/acids and alkalis topic.

hydrochloric acid + calcium carbonate → water + ☐ + ☐

Exam style questions

1. Helen weighed three pieces of rock and soaked them in water. The next day, she weighed them again. Her results are shown below.

rock	mass before soaking in water (g)	mass after soaking in water (g)
granite	26.3	26.3
marble	20.4	20.4
sandstone	25.5	27.6



Rocks that have lots of small spaces are described as porous.
a. What evidence is there in the table that sandstone is porous, but granite and marble are not porous?

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………………………………………………………………………………………………………..

Helen put the soaked sandstone into a freezer for 24 hours. Water in the spaces in the sandstone froze and expanded.
b. What would happen to the sandstone as the water froze and expanded?

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………………………………………………………………………………………………………..

c. In the winter this process happens in rock in the countryside. What is the name of this process?

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………………………………………………………………………………………………………..

Helen placed fresh pieces of granite, marble and sandstone in beakers of dilute sulfuric acid. Only the marble reacted with the acid.
d. Use Helen's results to explain why granite is more suitable than marble for a statue in a city centre.

2. Look at the diagram below.
a. Draw a line from the name of each rock below to the group of rocks it belongs to and then to the way the group of rocks was formed.

name of rock	**group of rocks**	**way the group of rocks was formed**
Granite	sedimentary	the effect of high temperature and pressure on limestone
Marble	igneous	formed when magma cools
Sandstone	metamorphic	particles are deposited in layers

Checkpoint:
Describe the properties of the metamorphic rock, slate, that make it suitable for roofing tiles.

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Challenge:
Describe how marble is formed, linking it to its properties that make it suitable for kitchen worktops.

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Plenary: Return to your original spider diagram and add new knowledge to this in a different coloured pen.

Lesson 4 The Rock Cycle

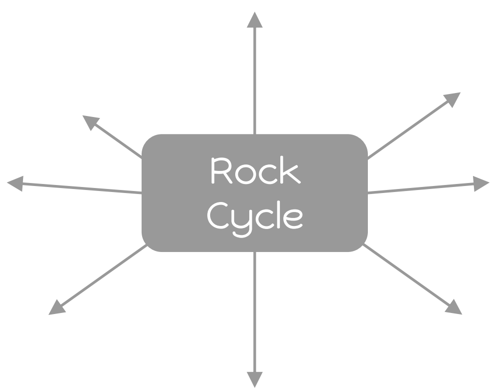
Learning Intention:
To be able to describe the rock cycle

Learning outcomes:
I will be able to list the processes that interconvert sedimentary, igneous and metamorphic rocks
I will be able to construct a labelled diagram to explain the processes of rock formation
I will be able to compare different physical processes with the processes of rock formation

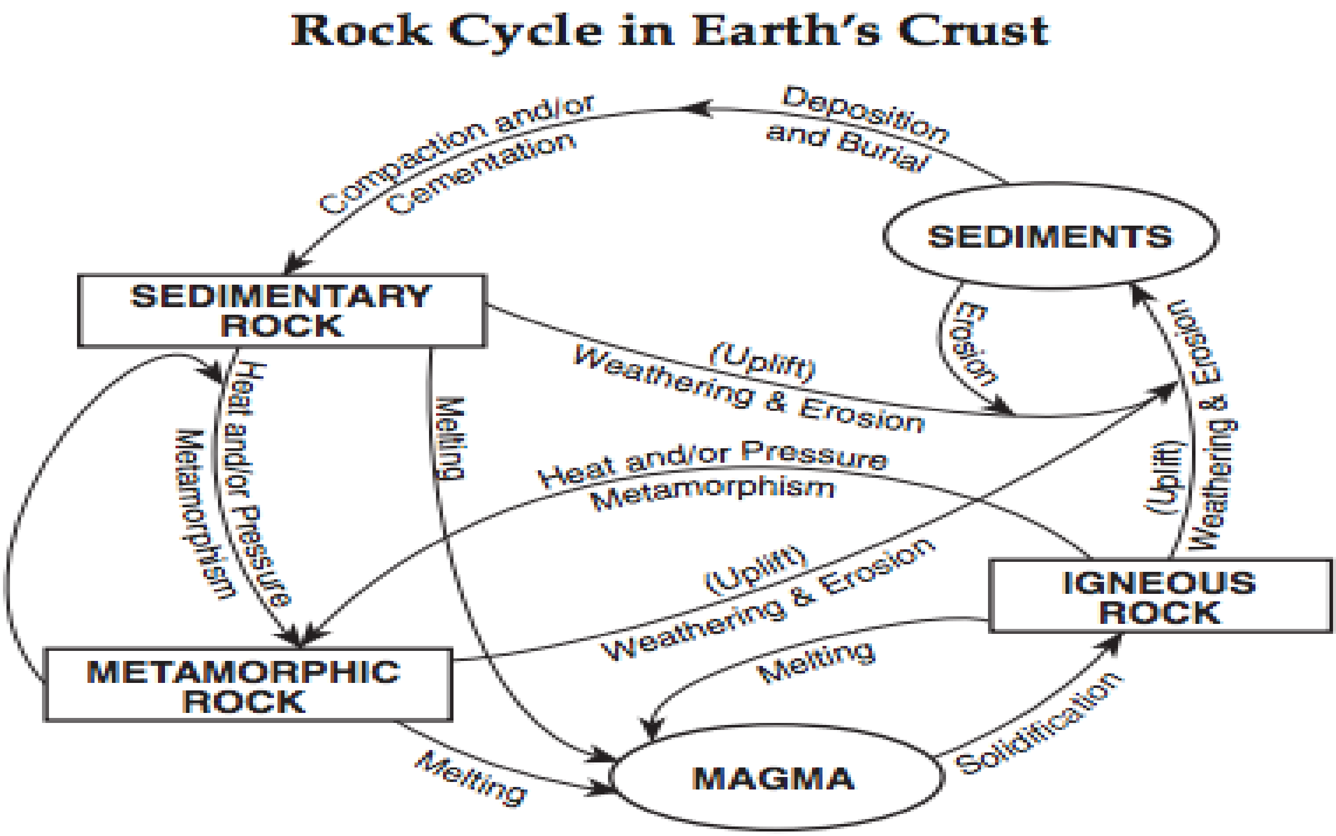
Starter: 1. Recap - Complete the table by describing how each type of rock is formed

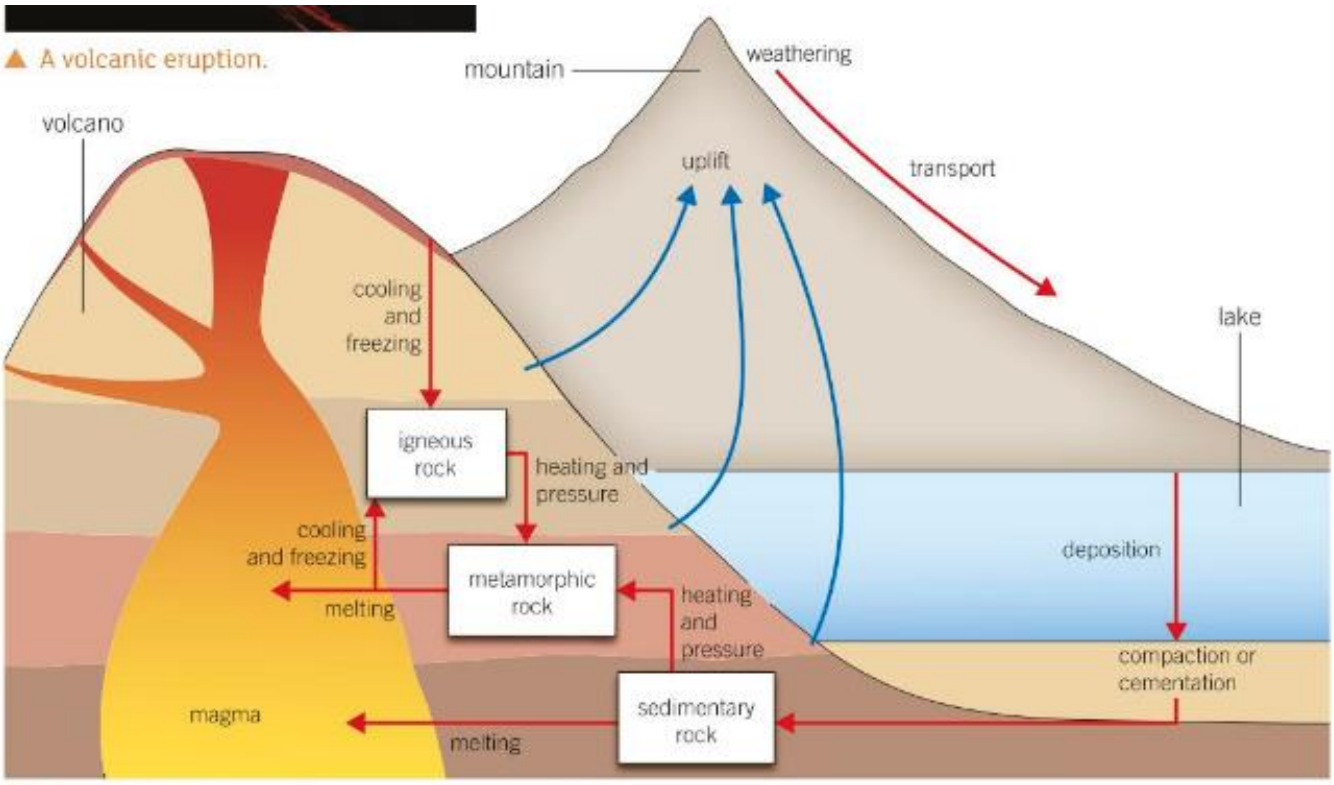
Type of rock	How its formed
Sedimentary	
Metamorphic	
Igneous	

2. Add to the spider diagram everything that you know about the Rock Cycle, this can be keywords, knowledge from primary school or anything that you know from everyday life:



1. Study the two images showing the rock cycle below.
Shade the different processes different colours e.g. Heat and/or Pressure then Deposition and Burial then Compaction and/or Cementation etc...





The rock cycle.

Watch the video below – Click on the link if you are using an electronic copy of this booklet or find it on YouTube by searching for the title and /or owner. ***Whilst watching the video make notes.***

Rock Cycle-Mike Sammartano
https://www.youtube.com/watch?v=BgJ74KKZyD4&feature=youtu.be

The different rock types, and the process that change one rock type into another are linked in the rock cycle, which is how materials are recycled.

Uplift

The Earth's crust moves constantly. When the continents collide, huge forces from inside the Earth push rocks upwards, and mountains can form, alongside earthquakes occurring. This is called **uplift**. This uplift provides evidence for the rock cycle as it brings up rocks that were once buried.

1. Use the information from the video and rock cycles to name processes causing each change, giving a reason for each.

Change	Name of Process	Reason it is this process
Metamorphic rock into magma		
Magma into igneous rock		
Layers of sediment into sedimentary rock		

2. Describe all the ways that rocks can change over time.

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3. What is uplift?

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4. Go back to your starter and add any extra detail, in a different coloured pen on how rocks are formed

Challenge Checkpoint: Complete the table below to compare different physical process with processes in the rock cycle.

Physical Process	Rock Cycle Process it is similar to	Ways it is different to the rock cycle process
Water cooling and freezing		
Heating and melting ice		
Mud falling to the bottom of bucket of muddy water		

Plenary: Return to your original spider diagram and add new knowledge to this in a different coloured pen.

Lesson 5 Ceramics

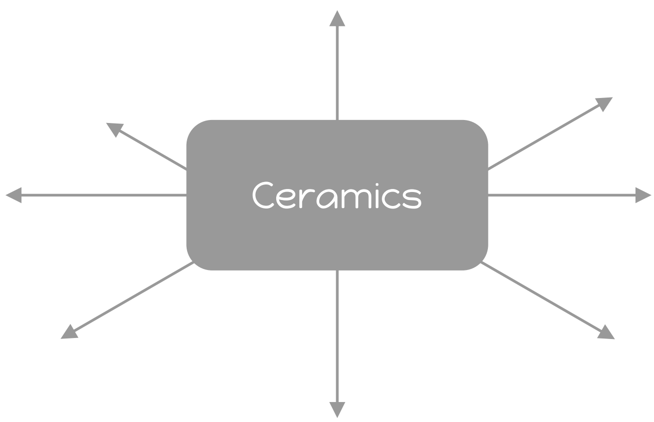
Learning Intention:
To be able to explain the properties of ceramics

Learning outcomes:
I will be able to describe the properties of ceramics
I will be able to explain why ceramics are useful
I will be able to link the properties of substances with how they are formed

Starter: 1. List all the words that you have learnt in this topic so far, then try to define them from memory.

Keywords	Definition from Memory	Looked up Definition

2. Add to the spider diagram everything that you already know about Ceramics



Ceramics

Ceramic materials are compounds that contain metals. The include metal silicates, metal oxides, metal carbides and metal nitrides.

They form solids made by baking a starting material in a very hot oven or kiln are hard and tough have very many different uses. For example, bricks are ceramic materials made by baking moulded clay. You will have seen ceramic materials coated in a tough glaze in bathrooms. They are hard and tough, and waterproof.

Ceramic materials are used to make wall tiles, baths, sinks and toilets.

Pottery

People have been making and using pottery for thousands of years. Pottery is made by moulding clay into the desired shape and baking it in a kiln. The high temperature drives out all the water, and causes chemical reactions that make the clay stronger and harder. Pottery is usually decorated with a tough, coloured glaze.

Properties of ceramics

- Brittle – they break easily
- Hard – difficult to scratch
- Stiff – difficult to bend
- Solid at room temperature, with very high melting points
- Electrical insulators
- Easy to break when stretched
- Do not react with water, acids or alkalis

1. State what a ceramic material is.

....

2. List four physical properties and one chemical property of ceramics.

....

3. List the properties that make bricks useful for building walls and then give a reason why that property is useful.

Properties making bricks useful	Why this property is useful

4. Imagine that you work for a ceramics company like this one https://www.youtube.com/watch?v=pYw5zUyiS7M (search you YouTube for "How are Ceramic Mugs Mass Produced?"). Your boss wants you to write a newspaper article for a newspaper, explaining why ceramics are useful.

Add to your spider diagram and use this to make notes on what to include, then organise your ideas into paragraphs. Write your article over the page.

....

Daily Planet

Linking the properties of ceramics to their structure

In ceramic materials, a huge number of particles join together in one big structure. There are strong forces between the particles. This structure explains the properties of ceramic materials.

- A huge amount of energy is needed to break forces between particles, which explains why ceramics have a high melting point.
- The particles are held together by strong forces, making ceramics very hard.

5. Why are ceramics suitable for use in jet-engine turbines? Try to relate this to both their properties and their structure. (Answer this using PEE, Point-Evidence-Explain)

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Checkpoint:

Look at the data in the table. Decide which materials could be ceramics. Explain your choices.

Material	Relative Hardness	Melting Point (°C)
A	2.3	324
B	9.0	3544
C	3.1	903
D	9.0	2940
E	5.8	2800

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Challenge:

Suggest how the properties of a ceramic material, brick are similar to and different from, the properties of granite rock.

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Plenary: 1. Return to your starter, look up the keyword definitions and write them in.
2. Add new knowledge to your spider diagram in a different coloured pen.

Lesson 6 Fossils

Learning Intention:
To be able to describe how fossils form

Learning outcomes:
- I will be able to state what a fossil is
- I will be able to describe how fossils form
- I will be able to explain how fossils form, linking to the rock cycle

Starter: What is the highest scoring word related to the topic of 'Earth Structure', that you can find?

Watch the video below – Click on the link if you are using an electronic copy of this booklet or find it on YouTube by searching for the title and /or owner. ***Whilst watching the video make notes.***

How Do Fossils Form | Evolution | Biology | FuseSchool
https://www.youtube.com/watch?v=ID7qhn1ipmw

A fossil is the preserved remains or traces of a dead organism. The process by which a fossil is formed is called **fossilisation**. It is very rare for living things to become fossilised. Usually after most animals die their bodies just rot away and nothing is left behind. However, under certain special conditions, a fossil can form. After an animal dies, the soft parts of its body decompose leaving the hard parts, like the skeleton, behind. This becomes buried by small particles of rock called sediment. As more layers of sediment build up on top, the sediment around the skeleton begins to compact and minerals move into and eventually turn to rock. The bones then start to be dissolved by water seeping through the rock. Minerals in the water replace the bone, leaving a rock replica of the original bone called a fossil. Fossils display evidence of evolution. Fossils of the simplest organisms are found in the oldest rocks, and fossils of more complex organisms in the newest rocks. This supports the theory of evolution which states, that simple life forms gradually evolved into more complex ones.

Comprehension Questions:

1. What is a fossil?

……………………………………………………………………………………………………

……………………………………………………………………………………………………

2. Which type of rock would fossils be most likely to be found in?

……………………………………………………………………………………………………

3. Recap - What are the two conditions needed for sedimentary rock to become metamorphic rock?

……………………………………………………………………………………………………

4. Recap - What are the two types of igneous rock?

……………………………………………………………………………………………………

5. Recap - How can mountains grow or islands appear overnight?

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6. Research the theory of evolution and state what it is.

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7. How do fossils provide evidence to the theory of evolution?

……………………………………………………………………………………………………

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8. The diagram shows a fossil of a creature called 'archaeopteryx'.

Which type of rock would this have been found in?

....

9. What do fossils tell us about life on Earth?

....

....

10. Explain why the fossil record is incomplete and is unlikely to ever give a complete record of living things on Earth.

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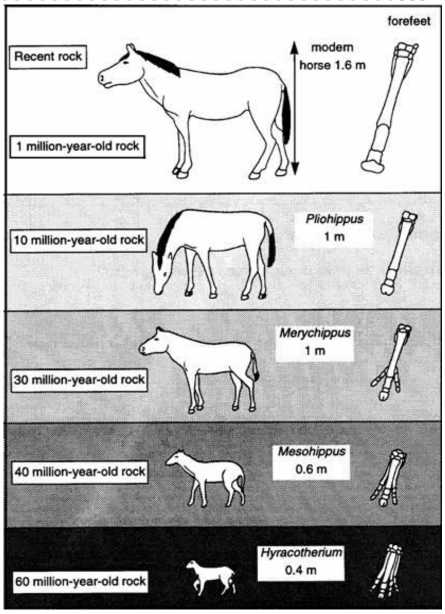
Exam style questions

1. The diagrams show fossil animals found in rocks of different ages. Scientists have used this information to work out how the modern horse evolved.



(a) Mesohippus became extinct over thirty million years ago.
Use information from the diagrams to suggest two reasons why this happened.

1 ....

....

2

....

....(2)

(b) (i) How do scientists know how big these early horses were?

....

....(1)

(ii) How do scientists know when they lived?

....(1)

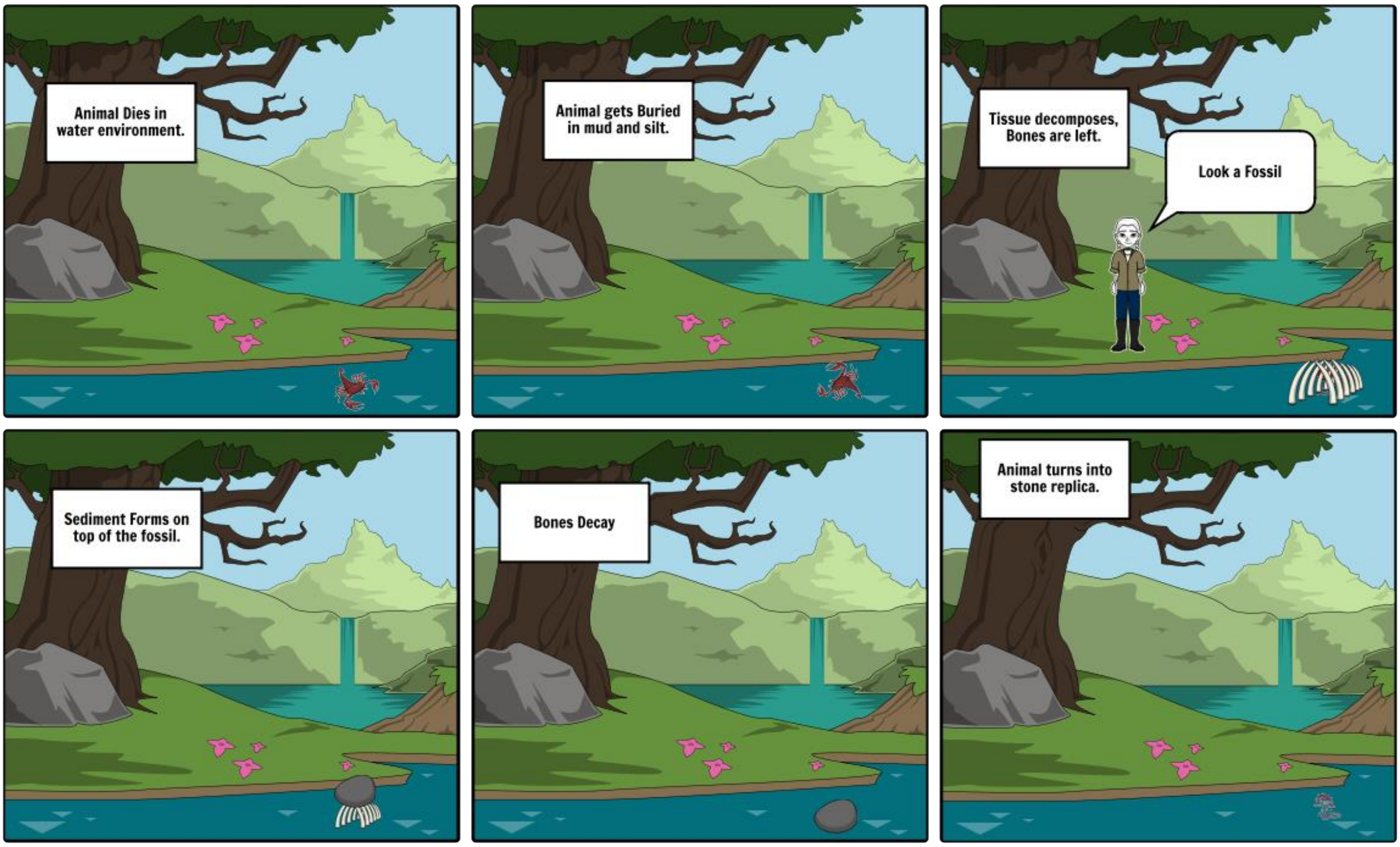
(c) Explain how the information in the diagrams supports the theory of evolution.

....

....(3)

(Total 7 marks)

Below is a simple storyboard outlining how fossils form. Use this and your newly acquired knowledge to produce your own story board, but incorporate parts of the rock cycle too e.g. weathering, transportation, sedimentary rock, metamorphic rock.



Create your own at Storyboard That

Checkpoint:
Explain how fossil formation is linked to the rock cycle.

....

....

....

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Challenge:
Explain why the fossils of a dinosaur are more likely to be found than those of a jellyfish.

....

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....

Plenary: Make a list of questions that you still have about this topic. Research their answers. Contact me for further help.

Universe

Lesson 1 The Sky at Night

Learning Intention:
To be able to describe the contents of the universe

Learning outcomes:
- ③ I will be able to describe the objects in the Universe
- ② I will be able to order objects in the Universe in terms of size
- ① I will be able to describe examples of artificial satellites

Starter: Crack the puzzle by finding out the missing letters and substituting these in for the key!

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
1		19		18				24									17			5	16				

U _ I V E R _ E   I _   _ _ E   _ A _ E   _ _ A _
5 22 24 16 18 17 3 18   24 3   8 7 18   22 1 11 18   8 7 1 8

_ E   U _ E   _ _   _ E _ C R I _ E   _ _ E   C _ _ _ E C _ I
13 18   5 3 18   8 20   21 18 3 19 17 24 23 18   8 7 18   19 20 12 12 18 19 8 24

_ _   _ _   A _ _   _ _ E   _ _ I _ _ _   _ _ A _
20 22   20 4   1 12 12   8 7 18   8 7 24 22 14 3   8 7 1 8

E _ I _ _   I _   _ _ A C E .   I _   I _   _ A _ E
18 25 24 3 8   24 22   3 10 1 19 18   24 8   24 3   11 1 21 18

_ _   _ I _ _ I _ _ _   _ _   _ _ A R _   A _ _   _ _ A _ E _
20 4   23 24 12 12 24 20 22 3   20 4   3 8 1 17 3   1 22 21   10 12 1 22 18 8

_   A _ _   E _ _ R _ _ U _   C _ _ U _ _   _ _   _ A _
3   1 22 21   18 22 20 17 11 20 5 3   19 12 20 5 21 3   20 4   14 1 3

_ E _ A R A _ E _   _ _   A   _ I _ A _ _ I C   E _ _ _ _
3 18 10 1 17 1 8 18 21   23 15   1   14 24 14 1 22 8 24 19   18 11 10 8 15

_ _ A C E   _ _ I C _   I _   C A _ _ E _   _ _ E
3 10 1 19 18   13 7 24 19 7   24 3   19 1 12 12 18 21   8 7 18

U _ I V E R _ E .
5 22 24 16 18 17 3 18

Read through the passage below. Highlight anything that you feel is important, give each paragraph a title on the right hand side and summarise each paragraph in five words or less on the left. Then write the three most important points at the bottom.

Add a title to each paragraph	Highlight any key points - be brief!	Summarise paragraph in five words or less
	When we send a letter abroad we include the house name or number, street, town, and country. The Universe includes everything that exists. If we could send a message to another place in the Universe we would need more information in the address. We live on a planet called Earth. Planets are smaller than stars and travel around them. Earth is our planet and it orbits the Sun. Moons are smaller than planets and travel around them. Earth has one moon. A solar system includes a star, its planets, and their moons. All stars give out heat and light. We can see the planets that orbit the Sun because they reflect the Sun's light. The star closest to the Sun is called Proxima Centauri. Billions of stars grouped together form a galaxy. Our galaxy is called the Milky Way galaxy, and is shaped like a spiral. The Sun is in one of the galaxy arms. The closest galaxy to the Milky Way is the Andromeda galaxy. There are billions of other galaxies in the Universe.	

Summarise the three most important points of the text:

- ……………………………………………………………………………………………………

……………………………………………………………………………………………………

- ……………………………………………………………………………………………………

……………………………………………………………………………………………………

- ……………………………………………………………………………………………………

……………………………………………………………………………………………………

Checkpoint:

State the objects in the Universe which give out their own light.

....

State the objects in the Universe that reflect light from stars.

....

Describe the different types of objects found in the Universe.

....

....

....

....

Write down the address of Earth in as much detail as possible.

....

....

Explain which parts of the Universe are in the Solar System and in a galaxy.

....

....

Challenge:

What keeps planets orbiting stars? Are these orbits circular or are they another shape?

....

....

Complete the summary below about our galaxy, you can use the information in the previous activity or you can use the internet to help you research this.

Define the following words:

Solar system:

Galaxy:

Universe:

Star:

Put the following in order of size from smallest to largest:
Planet, Star, Universe, Solar System, Galaxy

What is the name of our galaxy? How many stars does it contain?

What is an orbit? What does the Earth orbit? What orbits the Earth?

Why should we not worry about being hit by falling space debris?

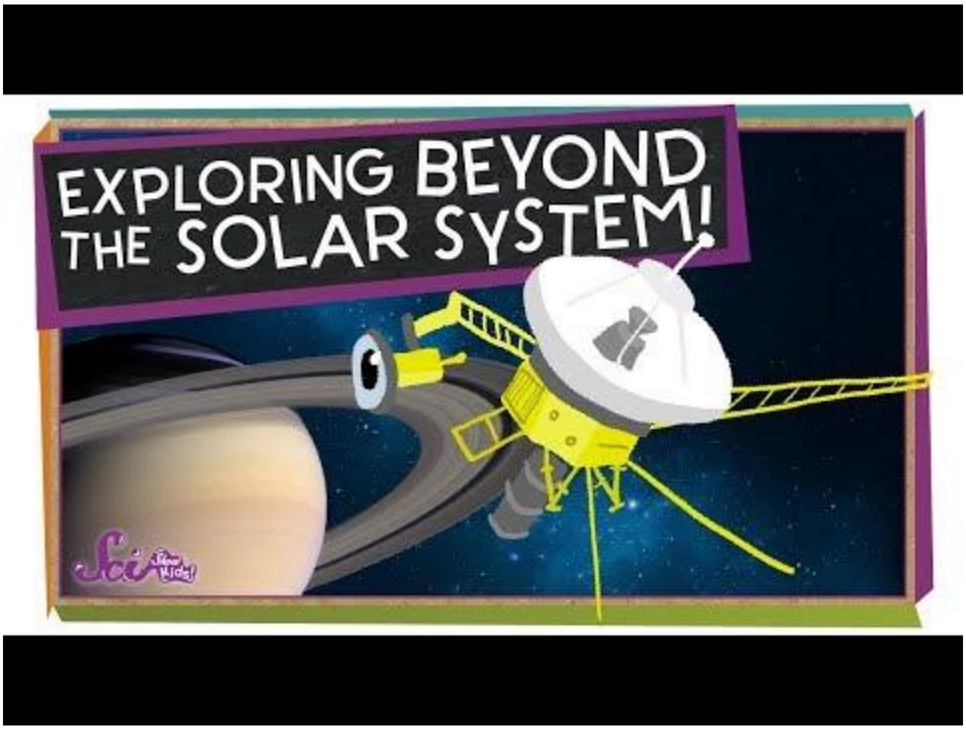
How is a natural satellite different to an artificial satellite? Give an example of each:

How is a meteor different to a meteorite?

Checkpoint:
Decide which object is bigger and give a reason to why it is bigger and how you know this!

Which is bigger?	Why is it bigger?
Universe or Galaxy	
Planet or Moon	
Universe or Solar System	
Meteor or Meteorite	

Watch the video below – Click on the link if you are using an electronic copy of this booklet or find it on YouTube by searching for the title and /or owner. ***Whilst watching the video make notes.***



The Farthest We've Ever Gone in Space – SciShow Kids
https://www.youtube.com/watch?v=L1UiaMNK614

Use the Frayer models below in order to state characteristics (you can use describing words) of these different types of objects as well as to give examples (what they are) and non examples (what they are not) for each type of these objects:

Definition:	Characteristics:
A moon in orbit around a planet	
Natural Satellites	
Examples:	Non-Examples:

Definition:	Characteristics:
A man made spacecraft	
Artificial Satellites	
Examples:	Non-Examples:

Checkpoint:

Your task is to make a fact file about the Voyager space missions, you could include:

- When it was launched
- What it has discovered
- The purpose of the missions
- Significant breakthroughs
- Differences between Voyager 1 and 2

Use the structure on the next page to help you, you can use information from the video or from other sources to help you.

Voyager Space Missions

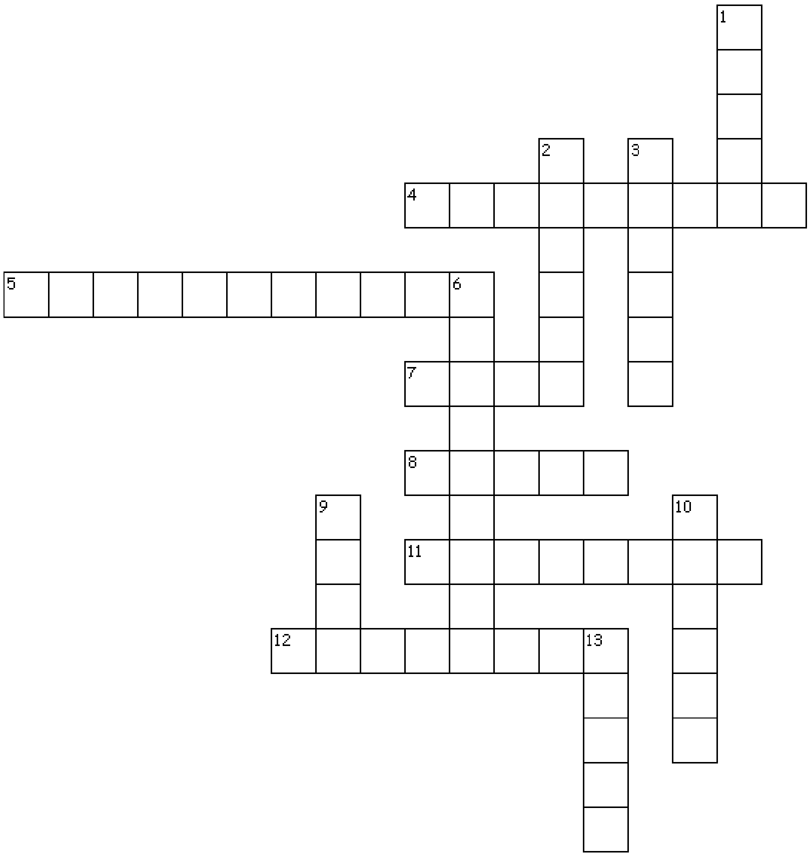
History of the Voyager missions - when were they launched and what have they discovered?

Purpose of the Voyager missions - What was the goal of the Voyager missions?

Major breakthroughs made through the Voyager missions:

How was Voyager 1 different to Voyager 2?

Plenary:
Complete the crossword by identifying the key terms that you have used throughout this lesson:



Across
4. An object which will orbit another
5. The sun and other planets in orbit around it
7. A body in space that gives out its own light
8. Dust particles frozen in ice that orbit the Sun
11. The galaxy containing our Sun and Solar system
12. Everything that exists

Down
1. The path taken in space by one body around another
2. A piece of rock or dust that makes a streak of light in the night sky
3. A large body that orbits a star in a solar system
6. A stony or metallic object that has fallen to Earth from outer space
9. A rocky body that orbits Earth
10. A number of stars and the solar systems around them grouped together
13. A rocky inner planet, third from the Sun in our Solar system

Extra Challenge (Optional):
Create a fact file about the other missions into space which have had colleges names after them, you should look at the same criteria as that of Voyager to see if you can find out any interesting facts!

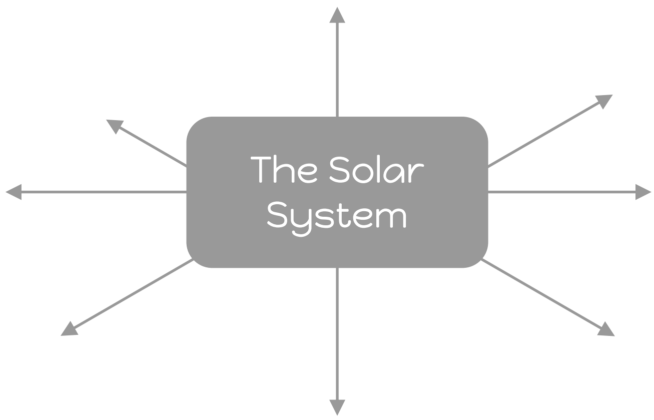
- Challenger
- Discovery
- Endeavour
- Apollo

Lesson 2 The Solar System

Learning Intention:
To be able to describe the planets within our Solar system

Learning outcomes:
- I will be able to research the planets within the Solar system
- I will be able to summarise the properties of the planets within our Solar system
- I will be able to apply knowledge of our Solar system

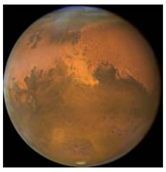
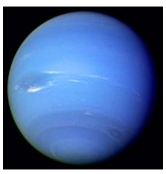
Starter: Take 5 minutes to form a spider diagram of everything that you know about the Solar system, this can be keywords, knowledge from primary school or anything that you know from everyday life:



Watch the video below – Click on the link if you are using an electronic copy of this booklet or find it on YouTube by searching for the title and /or owner. ***Whilst watching the video make notes.***

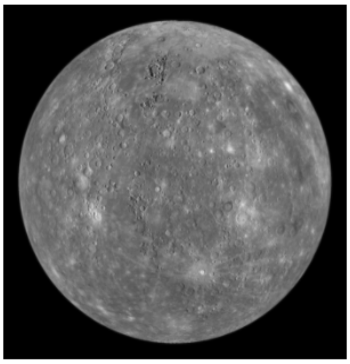
Solar System 101 | National Geographic
https://www.youtube.com/watch?v=libKVRa01L8

Read through the information on the next two pages in order to fully complete the summary table of the properties of planets within the Solar system.

Planet	Diameter (km)	Distance from Sun (AU)	Distance from Sun (km)	Time to orbit the Sun (Earth days)	Solid or Gas	Type of planet
Mercury 						
Venus 						
Earth 						
Mars 						
Jupiter 						
Saturn 						
Uranus 						
Neptune 						

Information sheet

Mercury



Mercury is the closest planet to the Sun with a distance of **58 million kilometres**. This is equal to **0.39 astronomical units (AU).** It is also the smallest inner planet with a diameter of **4,879km**. It has an **elliptical** orbit meaning part of its year takes it closer to the sun.

It takes Mercury **58 days** to rotate once, compared to Earth's 24 hour days. A year on Mercury is just **88 days**. This is because Mercury is so close to the sun and therefore has a smaller **orbit**.

Mercury is much hotter than the Earth because it is so close to the sun, with **temperatures of 430°C** in the day. However, at night time it becomes very cold because there is no atmosphere to trap the Sun's heat. Mercury's atmosphere was blasted away by solar winds due to its proximity to the Sun.

Mercury is a **rocky planet** like Earth. It resembles the Moon with many craters. Some of these craters were made from volcanic activity, however mostly they are from asteroid and comet impacts.

Mercury has **no moons** because it is not big enough to generate enough gravity to lock a moon into orbit.

Venus

Venus is the second planet orbiting the Sun at a distance of **108 million kilometers**. This is equal to **0.72 astronomical units (AU).** It is known as Earth's sister planet due to its similar size with a diameter of **12,100km.**

Venus spins very slowly on its axis taking **117 Earth days** to rotate once. A year on Venus is **225 Earth days**.

Although Venus is further from the Sun than Mercury it is hotter, with a surface **temperature of 465°C**. This is due to the thick, sulphuric acid atmosphere that traps heat in a process known as the greenhouse effect.

Venus is a **rocky planet** and has volcanos, valleys and mountains much like Earth.

Like Mercury, Venus has **no moons** orbiting around it.

Earth

Earth is the third planet from the Sun at **150 million kilometres** away. This is equal to **1.0 astronomical units (AU).** This puts Earth in the **Goldilocks zone**, which is a habitable area around a star that has the right conditions for life.
Our planet has a diameter of **12,756km**.

A day on Earth is **24 hours**, which is how long it takes to spin on its axis once. It takes the Earth **365 ¼ days** to orbit the Sun, which is one Earth year.

Earth has a comfortable average **temperature of 15°C**, which is perfect for life to thrive. Our planet has a protective atmosphere of oxygen, nitrogen, carbon dioxide and argon. It allows us to breath and protects us from harmful UV rays from the Sun. It keeps the planet warm at night and prevents severe temperature extremes.

Earth is a **rocky planet** with water covering 71% of the surface and the remaining 29% land.

The Earth has **one moon**, which has no atmosphere and has lots of craters like Mercury.

Mars

Mars is the fourth planet and the last of the **inner planets** (inside the asteroid belt). It is **228 million kilometres** from the Sun, where it is much colder. This is equal to **1.52 astronomical units (AU).** Mars is half the size of Earth with a diameter of **6,756km**.

Mars rotates at a similar rate to the Earth with days that last **25 hours**. However it takes twice as long for Mars to orbit the Sun with years that last **687 Earth days**.

It is much colder on Mars with an average **temperature of -60°C**, due to its distance from the sun and thin atmosphere.

Mars is known as 'the red planet'. It has high levels of iron oxide (rust), which gives it the red appearance. It is a **rocky planet** and has volcanos, gorges and mountains. It is thought that there was once running water on Mars.

Mars has **two small moons** called Phobos and Deimos.

Information sheet

Jupiter

Jupiter is the first **outer planet** (after the asteroid belt) and orbits **778 million kilometres** from the Sun. This is equal to **5.20 astronomical units (AU).** Jupiter is the largest planet in our solar system with a diameter of **143,000km.**

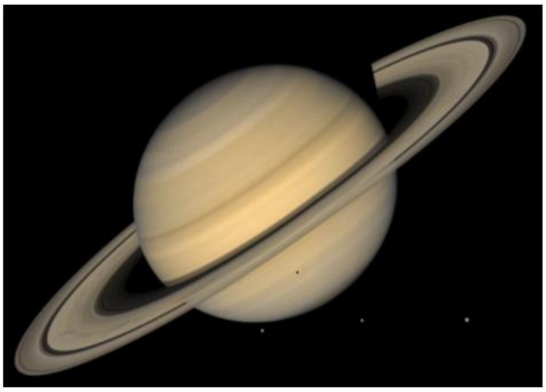
Jupiter spins the fastest with short **10 hour days**. Due to its distance from the Sun it takes **11.9 Earth years** to orbit the Sun once.

It is very cold on Jupiter with an average **temperature of -150°C**.

Jupiter is a **gas giant** and has no solid surface. The Great Red Spot is a violent hurricane 25,000km across, that's about twice the size of the Earth!

Jupiter has many moons with **63 discovered** so far, however only 4 are major. These moons are called Io, Callisto, Europa and Ganymede.

Saturn



Saturn is the second **gas giant** in the solar system and orbits **1,434 million kilometres** from the Sun. This is equal to **9.54 astronomical units (AU).** Saturn is the second largest planet in the solar system with a diameter of **120,536km.**

Saturn spins almost as fast as Jupiter with **11 hour days**. It takes **29.4 Earth years** to orbit the Sun.

Saturn is colder than Jupiter with an average **temperature of -180°C**.

Saturn has the lowest density of all the planets and would float on water! Saturn is well known for its rings, which are made up of ice particles. It is made of gas.

Saturn has **61 moons**, of which Enceladus and Titan have been the focus of a lot of research in space exploration.

Uranus

Uranus is a whopping **2,870 million kilometres** from the Sun! This is equal to **19.2 astronomical units (AU).** It's smaller than Saturn with a diameter of **51,118km.**

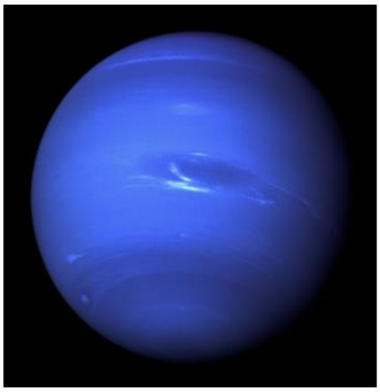
Uranus has days that last **17 hours** and orbits the Sun in **84 Earth years.**

It is extremely cold this far from the Sun and Uranus suffers an average **temperature of -193°C**. It is made of gas.

Uranus spins on its side and so has extreme seasons. Each pole has 42 years in constant dark, in Winter and 42 years in constant light, in Summer. Uranus also has 13 faint rings.

There are **27 known moons** orbiting Uranus.

Neptune



Neptune is the last planet of our solar system and the furthest away from the Sun at **4,500 million kilometres**. This is equal to **30.1 astronomical units (AU).** It is a similar size to Uranus with a diameter of **49,528km** and thus known as Uranus' twin.

The days on Neptune last **16 hours**, however it takes **165 Earth years** to orbit the Sun due to its distance from the Sun.

It is even colder than Uranus on Neptune with average **temperatures of -200°C**.

Neptune was the first planet discovered by mathematics rather than telescopes. Astronomers noticed Uranus was being pulled off course by another object. This led to the discovery of Neptune, which was later confirmed.

Neptune has **13 known moons** of which Triton is found. Triton is even colder than Neptune (-235°C) and orbits Neptune in the opposite direction to the other moons. It is made of gas.

Checkpoint:
State the planets below in terms of smallest to largest.

....

....

Challenge:
What is meant by an astronomical unit?

....

....

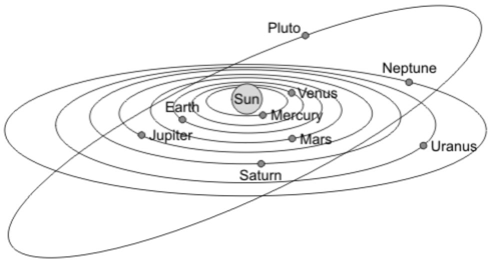
Use the prompts below to help you answer the question below,, you must write in full sentences as if the prompts were not there to help you.
Describe and explain the link between distance from the Sun and temperature of the planets. Explain why Venus is the odd planet out. (6)

State how the distance from the Sun affects the temperature of planets	
Link your above points to energy, would more or less energy be present when a planet is colder?	
Link this to Venus and Mercury, include information about the atmosphere of each	

Exam style questions:

1 Pluto was discovered in 1930. It was classified as a planet.
In 2006, scientists agreed that Pluto is **not** a planet.

(a) The diagram below shows our solar system.



not to scale

(i) **From the diagram**, what supports the idea that Pluto is a planet?

....

1 mark

(ii) **From the diagram**, what supports the idea that Pluto is **not** a planet?

....

(b) The table below shows information about planets in our solar system.

planet	diameter (km)
Mercury	4800
Venus	12200
Earth	12800
Mars	6800
Jupiter	142600
Saturn	120200
Uranus	49000
Neptune	50000

Pluto has a diameter of 2 300 km.
How does this information suggest to scientists that Pluto is **not** a planet?

....

1 mark

(c) An object called Charon orbits Pluto.

How does the presence of Charon support the idea that Pluto is a planet?

....

(d) The table below shows the composition of the atmosphere of some of the objects in our solar system.

object	atmosphere
Mercury	none
Venus	mainly carbon dioxide
Earth	mainly nitrogen and oxygen
Neptune	hydrogen, helium and methane
Earth's moon	none
Titan (a moon)	nitrogen and methane
Pluto	nitrogen and methane

Atmosphere is **not** used to classify objects as moons or planets.
Use the information above to suggest a reason for this.

....

....

1 mark

(e) Why do you think scientists found it difficult to decide how Pluto should be classified?

....

....

1 mark
maximum 6 marks

2 The table shows information about three planets in our solar system.

planet	time taken to orbit the Sun (Earth-years)
Mars	2.0
Venus	0.6
Earth	1.0

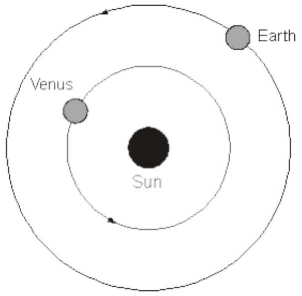
(a) Give **one** reason why Venus takes less time than Earth to orbit the Sun.

....

....

1 mark

(b) The diagram below shows the orbits of Venus and Earth.
The Sun is a source of light. Venus does **not** produce its own light.



not to scale

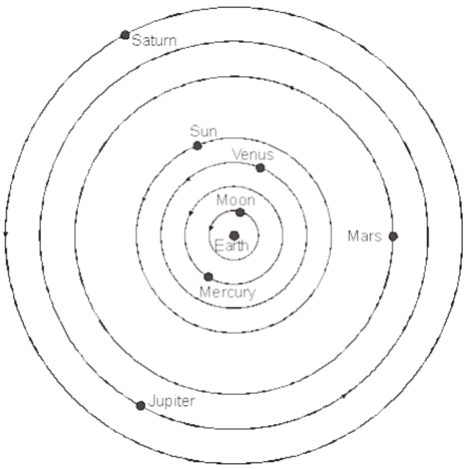
On the diagram above, draw rays of light to show how Venus can be seen from Earth. Use a ruler.

1 mark

Draw an arrow **on each** ray to show the direction of light.

1 mark

(c) The diagram below shows how the astronomer Ptolemy drew the solar system 2000 years ago.



not to scale

(i) The planets Uranus and Neptune are missing from his diagram.

Suggest why Ptolemy did **not** include these planets in his diagram.

....

....

1 mark

(ii) Today we know the correct arrangement of the planets in our solar system.

Give **one** way the diagram above is incorrect.
Complete the sentence below.

In the correct arrangement ....

....

1 mark
maximum 5 marks

Exam style questions:

3 In 1610, the Italian scientist, Galileo, observed four bright moons near Jupiter.
Each night the moons moved.

(a) (i) The Sun and stars are light sources, and the planets are seen by reflected light.
Explain how we can see the moons of Jupiter.

....

....

....

....

2 marks

(ii) The four moons are approximately the same distance from the Earth.
However, they do **not** have the same brightness.
Suggest **one** reason for this.

....

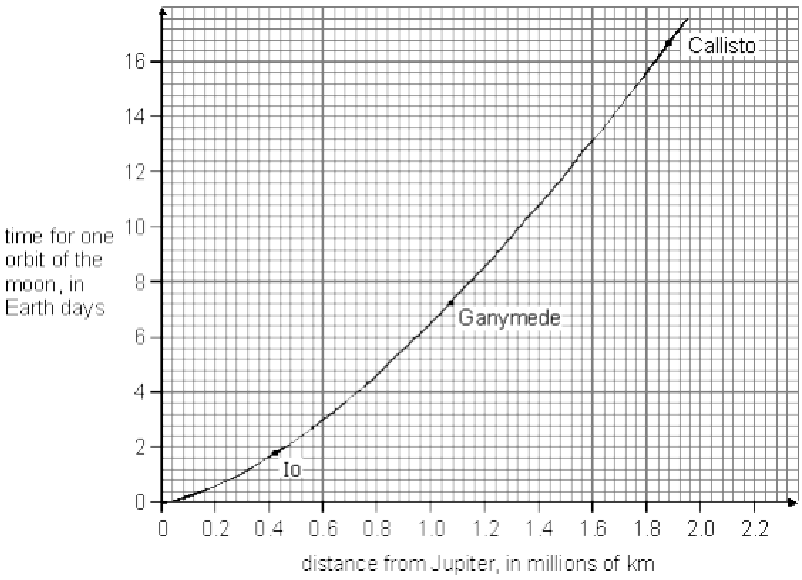
....

1 mark

(b) The table shows the distances of the four moons from the centre of Jupiter, and the times of their orbits. Europa's distance has been left out.

name of moon	distance from Jupiter, in millions of km	time for one orbit, in Earth days
Io	0.42	1.8
Europa		3.6
Ganymede	1.07	7.2
Callisto	1.88	16.7

The graph was plotted using the information in the table.



Use the graph to estimate Europa's distance from Jupiter.

.... millions of km

1 mark

(c) Galileo realised that Jupiter and its moons formed a model of our Solar System. In this model:

what did Jupiter represent? ....

what did the moons represent? ....

1 mark

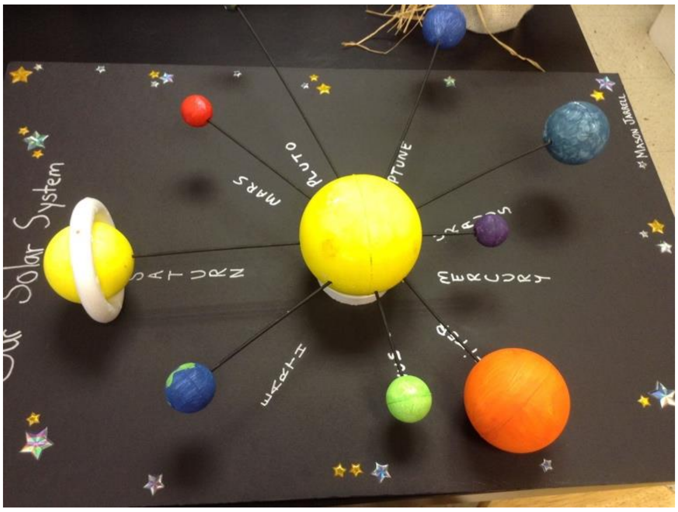
Maximum 5 marks

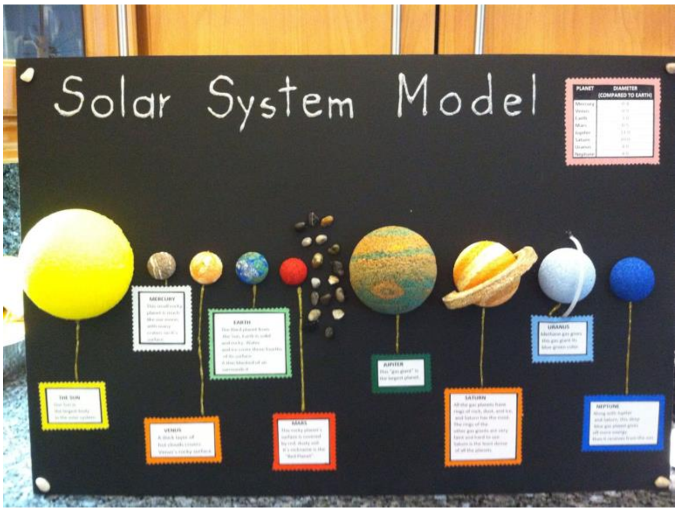
Plenary: Return to your original spider diagram and add new knowledge to this in a different coloured pen.

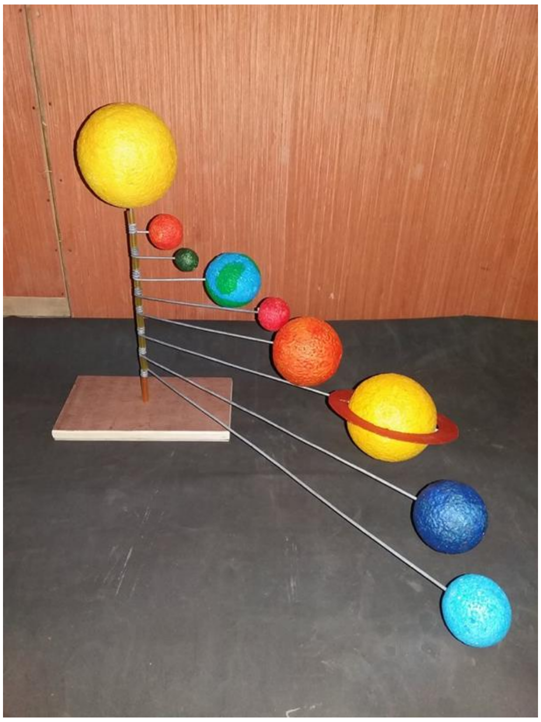
Extra Challenge

You can create a model of the solar system. This can be in any form - model, drawing, baking or even something else!

If you are to do this make sure that the planets are in the correct order and you include some information about these. Below are some examples for inspiration!





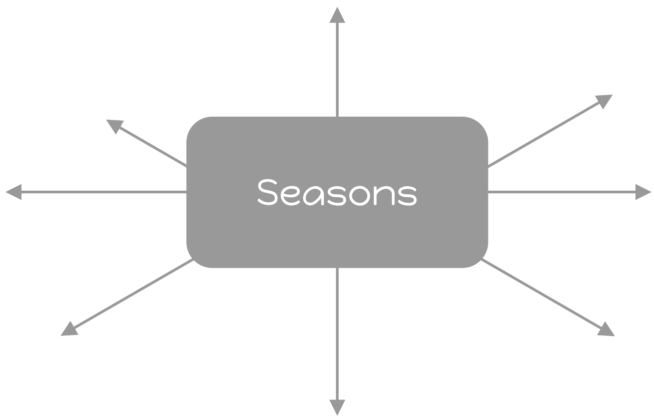


Lesson 3 The Earth

Learning Intention:
To be able to describe what causes seasons

Learning outcomes:
I will be able to describe what causes seasons on Earth
I will be able to represent data about the Earth's seasons
I will be able to analyse information about the Earth's seasons

Starter: Take 5 minutes to form a spider diagram of everything that you know about seasons, this can be keywords, knowledge from primary school or anything that you know from everyday life:



Watch the video below – Click on the link if you are using an electronic copy of this booklet or find it on YouTube by searching for the title and or owner. ***Whilst watching the video make notes.***

Bill Nye the Science Guy - S01E15 Seasons
https://www.youtube.com/watch?v=a9z-aGB3atg

1. Why do we have seasons on Earth?

....

2. What does the Earth orbit? How quickly?

....

3. When is it day time? When is it night time?

....

4. How does the tilt of the Earth affect seasons?

....

5. What is the angle of the Earth's tilt?

....

6. How does the tilt affect temperature?

....

7. Why does the sun rise and set?

....

8. What affects the length of the day?

....

9. What is an equinox?

....

Checkpoint:
Explain why Australia will have their seasons at different times to us in the UK.

....

....

Challenge:
If the Earth's tilt suddenly changed to 0°, what effect would this have on the seasons? Why?

....

....

....

....

Different places on Earth experience different day lengths and temperatures. This is because the Earth is tilted on its axis. Places tilted towards the Sun have more daylight than places tilted away from the Sun.

Month	Daylight hours in different regions (h)			
	South Pole	North Pole	Equator	UK
January	24	0	12	8
February	24	0	12	9
March	0	24	12	11
April	0	24	12	13
May	0	24	12	15
June	0	24	12	16
July	0	24	12	16.5
August	0	24	12	16
September	24	0	12	14
October	24	0	12	11
November	24	0	12	10
December	24	0	12	8

Use the data on the previous page in order to plot a line graph for the daylight in different regions in different months of the year. To be successful you must:

- *Use a line graph*
- *Plot the month on the X axis and the hours of daylight on the Y axis*
- *Plot all three sets of data on the same graph, but use different colours and a key to tell the difference between data*
- *Draw a smooth line of best fit for each set of data in the same colour as the key*

Checkpoint:
How do the daylight hours compare in the North and South poles?

Challenge:
How do you predict daylight hours would compare in the Uk to Australia? Why?

Below is a table which represents the average temperatures in the same regions throughout the year:

Month	Average temperature in different regions (°C)			
	South Pole	North Pole	Equator	UK
January	–26	–30	20	3
March	–50	–33	20	7
May	–54	–12	19	12
July	–56	0	16	17
September	–55	–10	18	14
November	–37	–28	19	8

Use this information in order to answer the questions below:

Use the graph that you drew to describe how daylight hours change throughout the year at the different regions.

North Pole: ....

....

South Pole: ....

....

Equator: ....

....

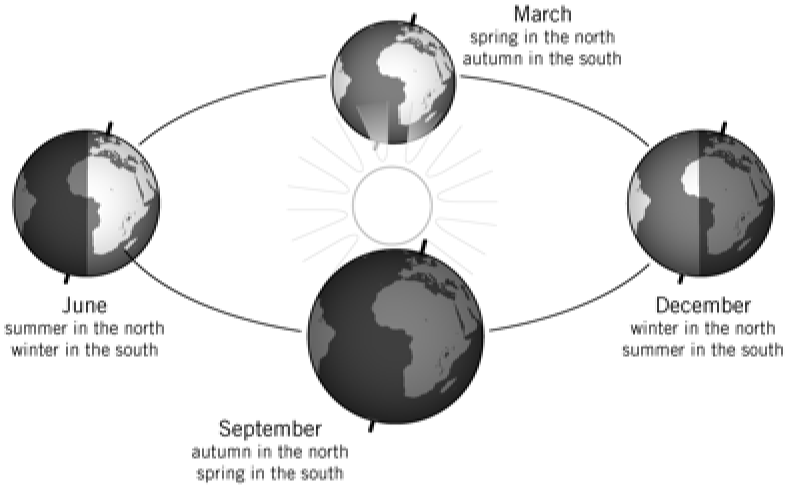
Use the data to state where the Uk is situated geographically compared to the regions above. Gibe a reason for your answer.

....

....

....

Add labels to the diagrams below to show where the UK is positioned.



Use the data in the second table in order to compare the temperature at the North pole, the South pole and the equator throughout the year.

....

....

....

Checkpoint:
Use the data in the two tables to describe how daylight hours and temperature are linked, use examples from your tables to support this.

....

....

....

Challenge:
Apply your knowledge of the tilting Earth to suggest how the daylight hours will vary for a country between the UK and the North Pole.

....

....

....

Plenary: Return to your original spider diagram and add new knowledge to this in a different coloured pen.

Lesson 4 The Moon

Learning Intention:
To be able to describe how the moon's movement leads to phases and eclipses

Learning outcomes:
🥉 I will be able to describe phases of the moon
🥈 I will be able to investigate eclipses
🥇 I will be able to apply knowledge of the moon

Starter: Answer the questions relating to your previous learning - rate your confidence in each question as either red - not confident, amber - somewhat confident or green - full of confidence!

The Night Sky	Answer	RAG	What is the actual answer?
What is our Galaxy called?			
What is an artificial satellite?			
How is a meteor different to a meteorite?			
The Solar System	**Answer**	**RAG**	**What is the actual answer?**
WHich is the planet closest to the Sun?			
Which planets are rocky dwarfs?			
What is an astronomical unit?			
The Earth	**Answer**	**RAG**	**What is the actual answer?**
What causes the different seasons?			
What is the angle at which the Earth tilts?			
How does the tilt of the Earth affect temperature?			

Depending on where the moon is in relation to the Earth, it can undergo different phases. Read through the information below in order to learn more about the phases of the moon. Highlight any names of moon phases in one colour and their features in another:

Phases of the Moon

Have you ever heard anyone talk about a full moon? Superstition says when the moon is full, unpredictable things can happen!! When you look at the moon at different times, it appears to change shape! Sometimes it's a half circle, sometimes it's a full circle, and other times you can only see a sliver of it in the shape of a fingernail! The moon can be seen from Earth as it rotates around and is illuminated (or lit up) by the sun – the moon itself does not give off light! As the moon rotates, we see different portions of the moon from where we are on the Earth based on the position of the moon and sun. No matter what phase the moon is in, the same side of the moon is always facing Earth.

There are 8 key stages as it revolves around Earth once approximately every 29 days. The phase you see depends on how much of the sunlit part of the moon you can see. The lit part you can see depends on the positions of the Earth, moon, and sun. When the sun, moon, and Earth are in line with each other, that is a new moon. During a new moon, you only see the dark side of the moon, which you actually can't see at all. The moon then rotates counterclockwise around the Earth and the position change allows us to see different parts of the moon as it changes. After the new moon, we can see a sliver of the moon reappear in a phase called the waxing crescent. The term waxing means "growing", so this means the light on the moon is growing – the waxing crescent comes after a new moon and lights up less than half of the moon. The term 'crescent' always refers to when less than half of the moon is seen.

After the moon has traveled 90 degrees from new moon position, it has reached the first quarter phase. At this point, half of the moon is lit up. After that, the moon reaches waxing gibbous where over half of the moon is lit up. The word 'gibbous' refers to phases where over half of the moon is seen. The next phase is a full moon and that completes half of the cycle. This is when the moon has traveled to the other side of the earth from new moon and we see the entire side of the moon lit up! After full moon, the moon enters the 'waning' phases. Waning means "shrinking" or decreasing in illumination (light). After full moon comes the waning gibbous phase where you can see over half of the moon, then the third quarter phase where you can see half the moon, and finally the waning crescent where you can see less than half of the moon. At this point, the phases begin all over again with new moon.

It is important to understand that no matter what phase the moon is in, one-half of the moon is ALWAYS lit by the sun. What you see depends on where you are on Earth and where the moon is in regards to the sun. Challenge yourself by looking out at the moon every night for a month and noticing how it changes. Then apply what you see to the phases you've learned about.

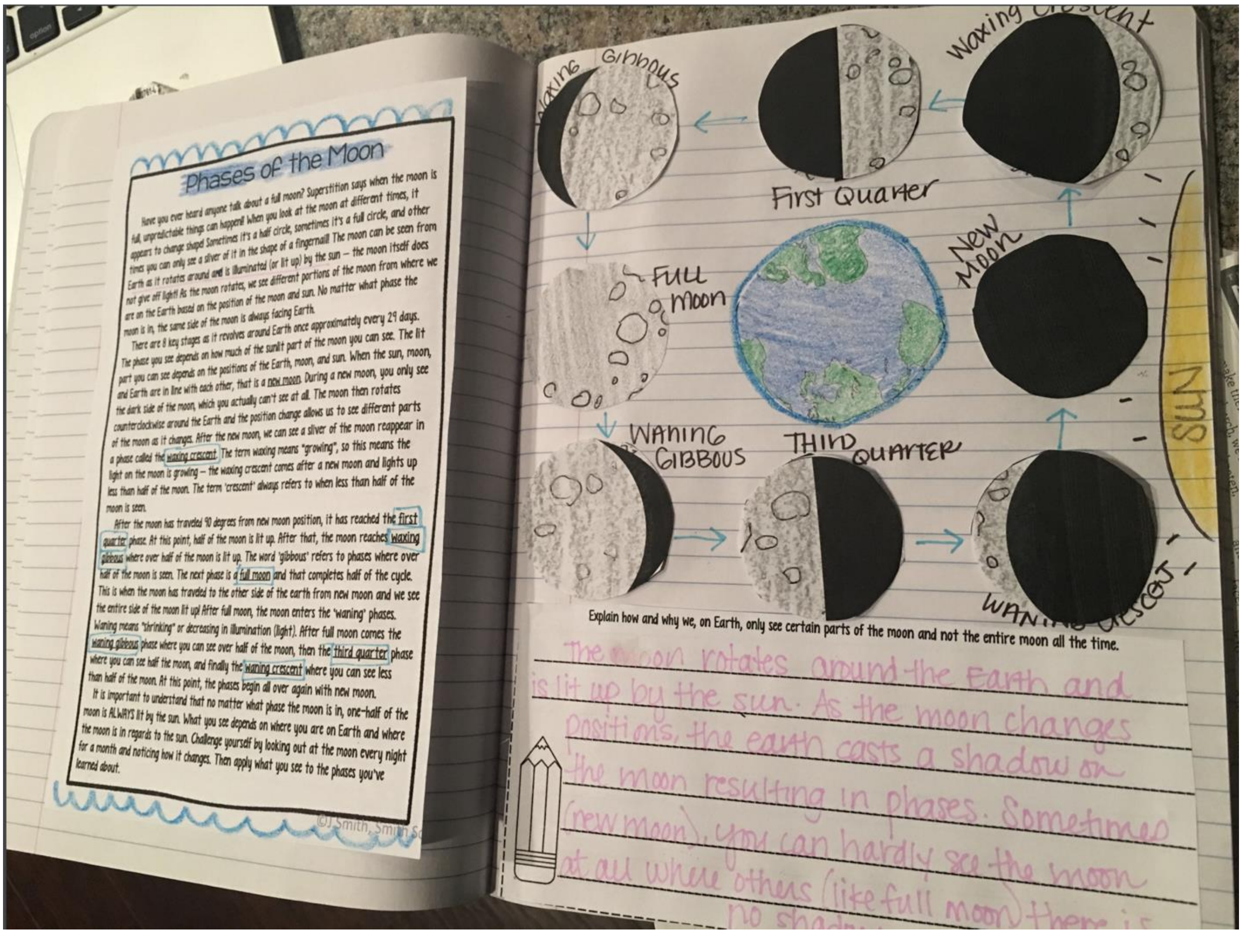
4

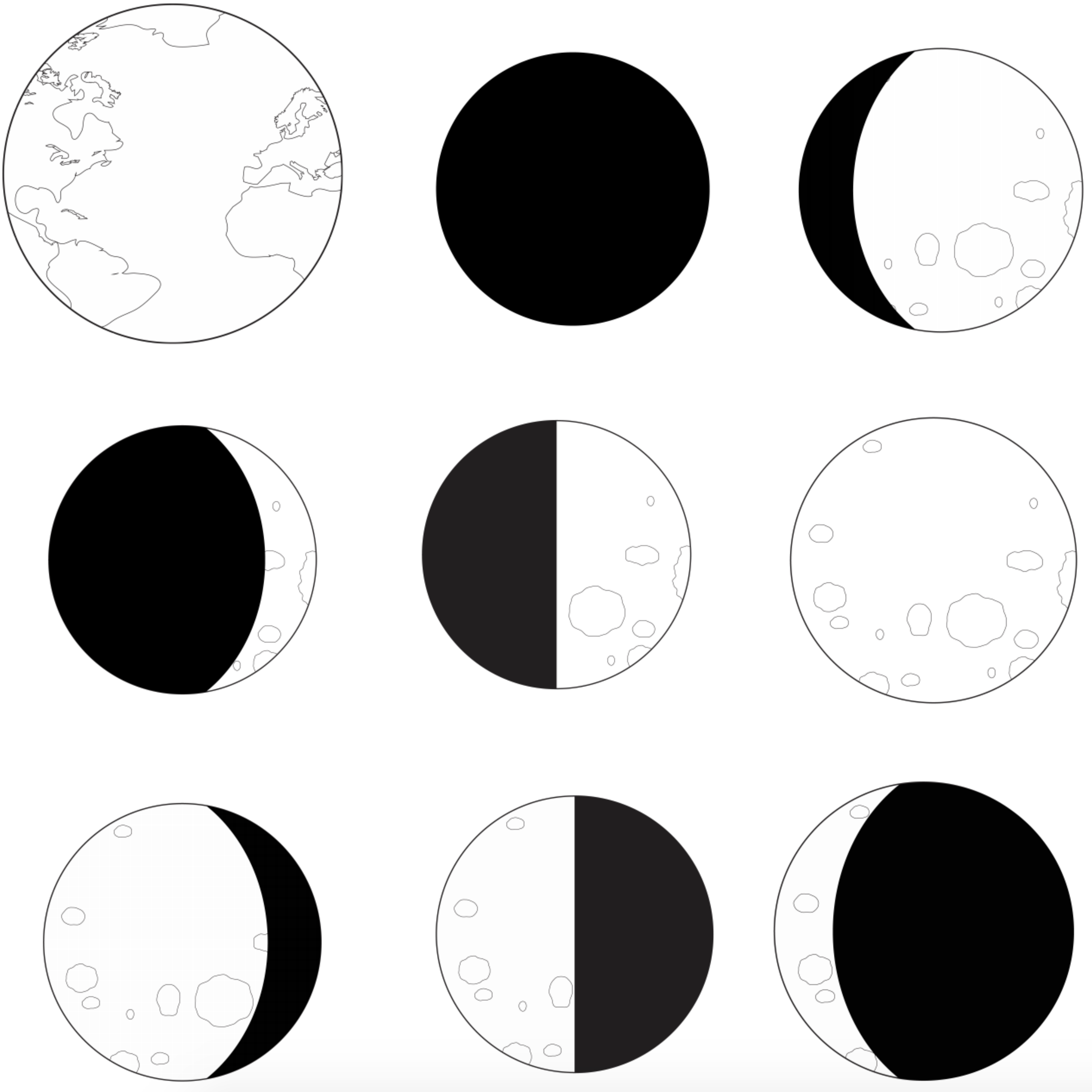
Watch the video below - if you cannot load this on this document the address and name are below so that you can find it on youtube!

The Universe: The Phases of the Moon | History

https://www.youtube.com/watch?v=nXseTWTZlks&feature=emb_title

Use the example below in order to construct a representation of the different phases of the moon using the information on the previous page, you will need to either cut out the diagrams of the moon, or redraw them - it will be beneficial for you to draw a Sun as in the example!





Checkpoint:

Draw the phases of the moon in a labelled diagram below and answer the question underneath:

Explain how and why we, on Earth, only see certain parts of the moon and not the entire moon all the time.

An eclipse is an event in which light is blocked from hitting one object by another. There are two types of eclipse, solar and lunar eclipses.

Task: You will need a tennis ball and a larger ball (footballs are fine) as well as a torch.

- *First of all turn on the torch and place the tennis ball between the torch and the large ball, note down your observations in the space below (this represents a solar eclipse)*
- *Secondly place the larger ball between the torch and the tennis ball, again note down your observations below (this represents a lunar eclipse)*

Observations:

Solar eclipse:

……

……

Lunar eclipse:

……

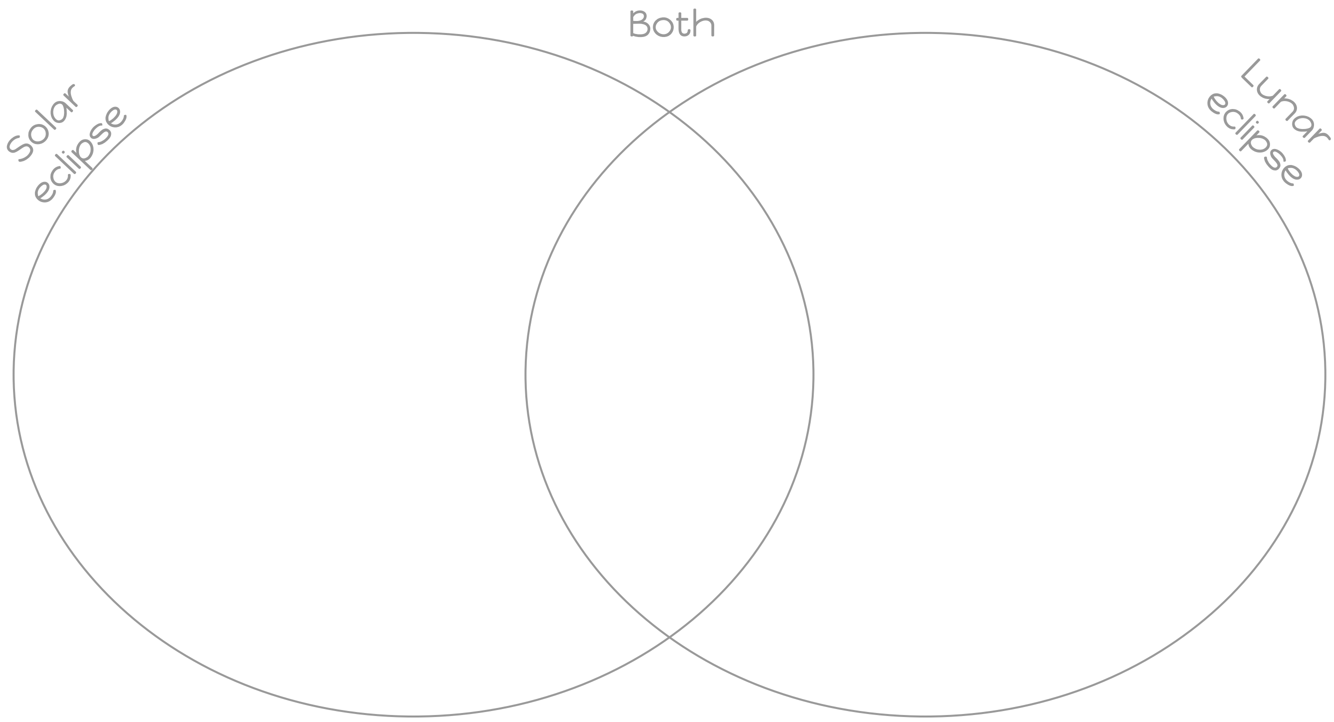
……

Watch the video below – Click on the link if you are using an electronic copy of this booklet or find it on YouTube by searching for the title and or owner. ***Whilst watching the video make notes.***

What's the difference between a solar and lunar eclipse? – Physics Girl

https://www.youtube.com/watch?v=rVE8PFYlwSM

Complete the venn diagram about solar and lunar eclipses, you may wish to include information about the amount of light blocked, how often they happen, what causes them and the effect that they have on the Earth:



Checkpoint:

Complete the sentence in the three different ways:

Solar eclipses are different to lunar eclipses **because** ....

....

Solar eclipses are different to lunar eclipses **but** ....

....

Solar eclipses are different to lunar eclipses **so** ....

....

Exam style questions

Q1.

Some children watched an eclipse of the Sun.

During the eclipse, the Moon passed between the Sun and the Earth.

It blocked out sunlight.

(a) Amrik watched the eclipse. He knew that the Sun is much bigger than the Moon but they looked about the same size.

Why did they look the same size? Tick the correct box.

The Moon is nearer to the Earth than the Sun is. ☐

The Sun is nearer to the Earth than the Moon is. ☐

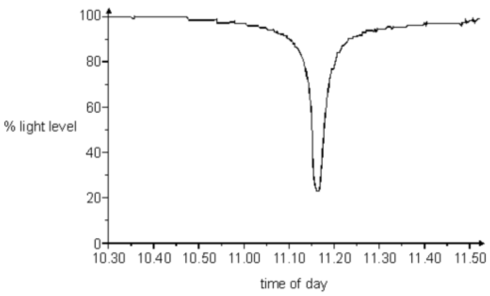
The Sun goes round the Earth faster than the Moon does. ☐

The Moon goes round the Sun faster than the Earth does. ☐

1 mark

(b) Amrik's class measured the light level during the eclipse.

The graph below shows their results.



(i) At what time did the Moon block out most of the Sun's light? Use the graph to help you.

.... am

1 mark

(ii) What happened to the air temperature during the eclipse?

....

Give the reason for your answer.

....

....

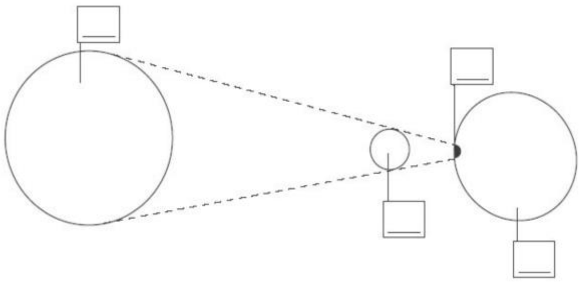
1 mark
Maximum 3 marks

Q2.

(a) The diagram below shows the positions of the Sun, Moon and Earth during a solar eclipse.

Write numbers (1–4) on the diagram below to label the features during an eclipse.

1. the Earth
2. the Moon
3. the Sun
4. a region where the total eclipse of the Sun is taking place



2 marks

(b) Scientists discovered a regular cycle of eclipses. It is called the Saros cycle.
The table below shows the dates of some eclipses in this cycle.

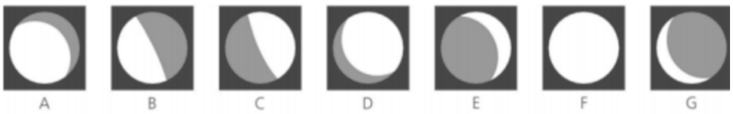
Complete the table by predicting the date of the next eclipse in the Saros cycle.

eclipse	date
eclipse 1	20th July 1963
eclipse 2	31st July 1981
eclipse 3	11th August 1999
eclipse 4	

2 marks
maximum 4 marks

Q3

The following diagrams show the different phases of the Moon. They are **not** in order.



(a) Fill in the table below.

Phase	Letter
full moon	
new moon	
crescent moon	or

4 marks

(b) Explain why we see different phases of the moon.

....

....

....

2 marks
Maximum 6 marks

Plenary: Use the grid below to recall five facts from each of the lessons in the topic, you can use images to help with this if you feel it is beneficial, but these would need to be clearly annotated.

Topic	Fact One	Fact Two	Fact Three	Fact Four	Fact Five
The Night Sky					
The Solar System					
The Earth					
The Moon					