

# YEAR 3: SPRING 1 – TIMECOP #1

## SCIENCE: PROPERTIES OF ROCKS

### UNDERSTAND, DESCRIBE AND EXPLAIN:

To understand the formation and properties of rocks

|                                 |                               |                                      |                        |                      |                  |                    |
|---------------------------------|-------------------------------|--------------------------------------|------------------------|----------------------|------------------|--------------------|
| <i>Igneous:</i>                 | <i>Metamorphic:</i>           | <i>Sedimentary:</i>                  | <i>Tectonic plates</i> | <i>Earth's crust</i> | <i>Erosion</i>   | <i>Weathering</i>  |
| <i>Granite</i><br><i>Basalt</i> | <i>Marble</i><br><i>Slate</i> | <i>Limestone</i><br><i>Sandstone</i> | <i>Volcano</i>         | <i>Sediment</i>      | <i>Crystals</i>  | <i>Ore</i>         |
| <i>Molten rock/ Magma</i>       | <i>Metamorphosed</i>          | <i>Compacting</i>                    | <i>Rock cycle</i>      | <i>Rock hardness</i> | <i>Permeable</i> | <i>Impermeable</i> |

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| <b>Learning links:</b>  |
| <b>Geography:</b>   |
| Y3: Coastal Erosion<br>Erosion/Abrasion/<br>Weathering/Sediment               |
| Y4: Mountains &<br>Volcanoes<br>Igneous rocks/Earth's<br>crust/Minerals/Magma |
| Y5: Rivers<br>Erosion/Abrasion/<br>Attrition/Sediment                         |
| Y6: Earthquakes<br>Earth's crust/Tectonic<br>plates                           |

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| <b>Learning Links:</b>   |
| <b>Science:</b>  |
| Y5: Properties of<br>materials<br>Hardness and Porosity/<br>Melting/Molten |

#### ROCKS:

A **rock** is a **solid** made up of lots of **different minerals**. Rocks are generally **not exactly the same**. Scientists generally **classify (group) rocks** by **how they were made or formed**.

There are **3 major types** of rocks:

- 1. Metamorphic**
- 2. Igneous**
- 3. Sedimentary**

#### THINKING POINT:



What are rocks made from? What are the three types?



**Metamorphic Rocks** are formed by great **heat and pressure**. They are generally found **inside the Earth's crust**, where there is enough heat and pressure to form the rocks.

**Metamorphic rocks** are often made from other types of rock when they are pushed downwards under the Earth's mass and pressure on top of each other to create a layered rock.

For example, **shale**, a sedimentary rock, can be changed into a metamorphic rock, such as slate.

Other examples of metamorphic rocks include **marble**, anthracite, soapstone, and schist.

#### THINKING POINT:



Look at these rocks, can you see the layers of the rock?

**Igneous Rocks** are formed by **volcanoes**.

When a **volcano** erupts, it spews out **hot molten rock** called **magma** or lava.

Eventually, the **magma** will cool down and **harden**, either when it reaches the Earth's surface or somewhere within the crust.

This **hardened magma** or lava is called igneous rock. Examples of igneous rocks include pumice and granite.

#### THINKING POINT:



What differences do you notice between these rocks and the metamorphic rocks?

**Sedimentary rocks** are formed by years and years of **sediment compacting together** and becoming hard.

Generally, something like a stream or river will carry lots of small **pieces of rocks and minerals** to a larger body of water. These pieces will **settle** at the bottom and, over a really long time (perhaps **millions of years**), they will **form into solid rock from the weight and pressure pushing down on top of them**.

Some examples of sedimentary rocks are shale, limestone and sandstone.

#### THINKING POINT:



What is the difference between sedimentary rock and metamorphic rock?

#### The properties of rocks:

Depending on the type of rock and how it was formed, rocks will have different properties. **Rocks can be:**

**Permeable:** They allow water to pass through.

**Impermeable:** They do not allow water to pass through.

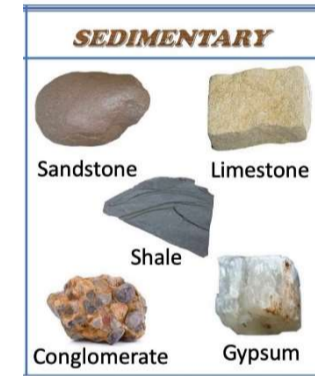
**Hardness:** This varies between rocks. **Some rocks** are much, much **harder than others**.

If a rock can scratch glass, it's harder than glass. If it can **scratch another rock**, it's harder than that rock.

#### THINKING POINT:



Try the scratch test investigation below to observe a difference in rock hardness.



### ENQUIRE, TEST, RECORD, REPORT AND CONCLUDE:

**The Mohs Test:**  
To compare the hardness of minerals and rocks

[https://gb.education.com/science-fair/article/mohs-hardness-test-minerals/?source=related\\_materials&order=1](https://gb.education.com/science-fair/article/mohs-hardness-test-minerals/?source=related_materials&order=1)  
Some minerals are harder than others because of how strongly their atoms are bound together at the molecular level. You can test the hardness of a mineral by scratching it with specific objects. If a scratch is left, the mineral is softer than the scratch test object. For example, if the mineral is unaffected by a copper penny but scratched by a steel nail it has a hardness of >3 but <5.5.

| Mineral   | Scratch test object        |                            |                            |                               |
|-----------|----------------------------|----------------------------|----------------------------|-------------------------------|
|           | Fingernail (Hardness: 2.5) | Copper Penny (Hardness: 3) | Steel Nail (Hardness: 5.5) | Piece of Quartz (Hardness: 7) |
| Amethyst  |                            |                            |                            |                               |
| Azurite   |                            |                            |                            |                               |
| Calcite   |                            |                            |                            |                               |
| Lodestone |                            |                            |                            |                               |
| Mica      |                            |                            |                            |                               |
| Rose      |                            |                            |                            |                               |
| Talc      |                            |                            |                            |                               |
| Pyrite    |                            |                            |                            |                               |

HYPOTHESISE  
ENQUIRE  
TEST  
RECORD  
REPORT  
CONCLUDE

### KEY ASSESSMENT QUESTIONS AND SCENARIOS:

#### EXS:

- Are all rocks the same?
- Describe the difference between sedimentary, metamorphic and igneous rock.

#### GDS:

- As a cartoonist, draw cartoons of the different types of rocks with speech bubbles to explain their strengths, weaknesses, hardness and characteristics.

# YEAR 3: SPRING 1 – TIMECOP #1

## SCIENCE: PROPERTIES OF SOIL

### UNDERSTAND, DESCRIBE AND EXPLAIN: THE PROPERTIES AND DORMATION OF SOIL

|  |                            |                          |                          |                                  |                         |                        |                    |                 |
|--|----------------------------|--------------------------|--------------------------|----------------------------------|-------------------------|------------------------|--------------------|-----------------|
| To understand the formation and properties of soil | <i>Soil</i>                | <i>Mud</i>               | <i>Silt</i>              | <i>Mineral</i>                   | <i>Organic Material</i> | <i>Living organism</i> | <i>Topography</i>  | <i>Climate</i>  |
|  | <i>Disintegrate</i>        | <i>Texture</i>           | <i>Structure</i>         | <i>Density</i>                   | <i>Temperature</i>      | <i>Colour</i>          | <i>Consistency</i> | <i>Porosity</i> |
|  | <i>Organic/Humus layer</i> | <i>Topsoil 'A' layer</i> | <i>Subsoil 'B' layer</i> | <i>Parent material 'C' layer</i> |                         |                        | <i>Illuviation</i> |                 |

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| <b>Learning links:</b>                                 |
| <b>Geography:</b>                                      |
| Y4: Mountains & Volcanoes<br>Agriculture/Fertile soil  |
| Y5: Rainforest<br>Fertile soil/Climate/<br>Agriculture |

#### What is soil and how is it formed?

**Soil** is the loose upper layer of the Earth's surface where plants grow. Soil consists of a mix of **organic material** (decayed plants and animals) and broken bits of rocks and minerals. **Soil is formed** over a long period of time. It can take up to 1,000 years for just an inch of soil to form.

**THINKING POINT:** 

What is soil made from? Therefore, will the soil in England be the same as the soil in another country?

#### The properties of soil:

One of the most **important properties** of soil is the **texture**.

**Texture** is a **measure** of whether the soil is more like **sand, silt, or clay**.

The **more like sand** a soil is the **less water** it can hold.

On the other hand, the **more like clay** a soil is, the **more water** it can hold.

#### Soil Horizons:

Soil is made up of many **layers**, called **horizons**.

Depending on the type of soil there may be **several layers**.

There are **3 main horizons** (called **A, B, and C**).

The **layers/horizons** are:

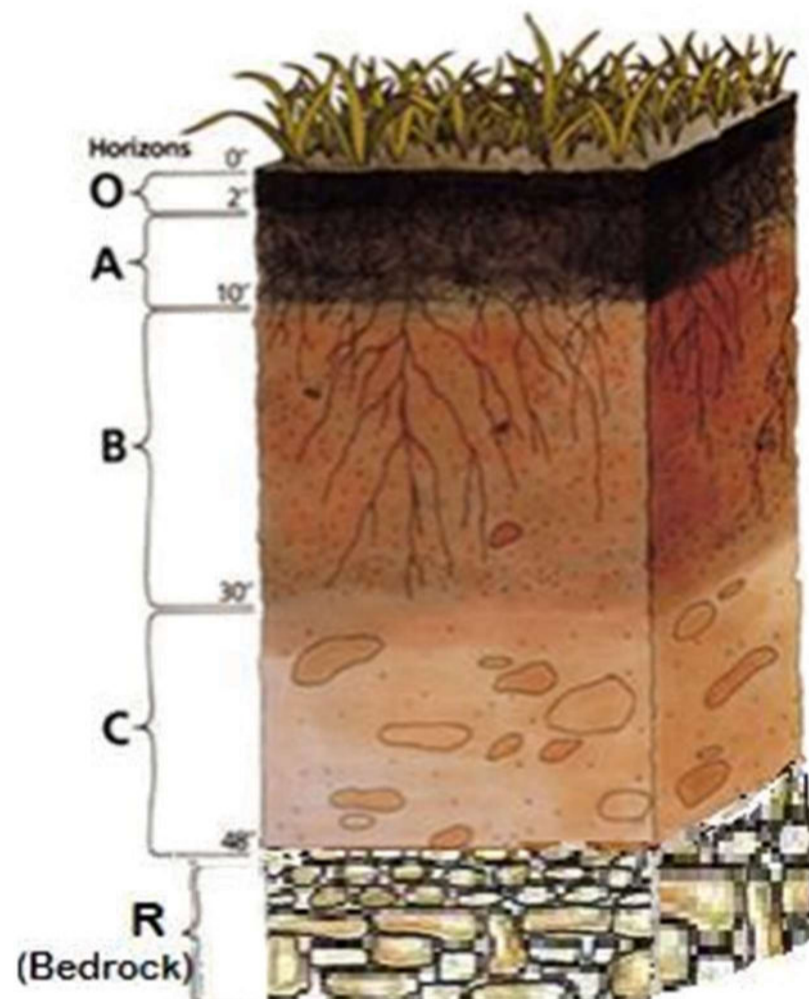
**Organic** - The organic layer is a **thick layer of plant remains**, such as leaves and twigs.

**Topsoil** - The **"A"** horizon is a **fairly thin** layer (5-10 inches) composed of **organic matter and minerals**. This layer is the **primary layer** where **plants and organisms live**.

**Subsoil** - The **"B"** horizon. This layer is made primarily of **clay, iron, and organic matter**.

**Parent material** - The **"C"** horizon is called the parent material because the **upper layers** developed from this layer. It is made up **mostly of large rocks**.

**Bedrock** - The **bottom layer** is **several feet below** the surface. The bedrock is made up of a **large solid rock**.



**THINKING POINT:** 

Can you remember how many layers (horizons) there are? What are they called?

### ENQUIRE, TEST, RECORD, REPORT AND CONCLUDE:

**The Porosity Test:**  
To compare the porosity of soils from various locations

Some soils are more porous than others – these means that they can store more water than others.

To test the porosity of different soils by pouring in water to the soil until it can't hold any more; measuring how much water it can hold. Collect and weigh out 200ml of each sample soil. Using a measuring jug, filled with 100ml of water, pour in the water until the soil is saturated and begins to overflow at the top – subtract the water that is left in the jug from the starting 100ml to work out how much was poured in.

| Soil sample (200ml)           | Amount of water added (ml) | Soil Porosity (1/2 of the water added = %) |
|-------------------------------|----------------------------|--|
| Sample A: Reading/Forest area | ml                         | %  |
| Sample B: Gardening compost   | ml                         | %  |
| Sample C: Field               | ml                         | %  |
| Sample D: Sand                | ml                         | %  |

### KEY ASSESSMENT QUESTIONS AND SCENARIOS:

#### EXS:

- What is soil made up of?
- How is soil made/formed?
- Draw a diagram with labels and descriptions to explain the contents of soil and the different horizons.

#### GDS:

- What makes the best soil for different plants?
- Explain how the quality and richness of the soil will affect plant growth.
- Take a sample of soil from different areas of the grounds, how do they differ and how would this affect plant growth?

# YEAR 3: SPRING 2 – WATER, WATER EVERYWHERE

## SCIENCE: FOSSILS

### UNDERSTAND, DESCRIBE AND EXPLAIN: THE PROPERTIES AND FORMATION OF FOSSILS

|   |                            |                      |                         |                        |                      |                     |                      |
|---|----------------------------|----------------------|-------------------------|------------------------|----------------------|---------------------|----------------------|
| To understand the formation and properties of fossils | <i>Fossils</i>             | <i>Preserve(d)</i>   | <i>Sedimentary Rock</i> | <i>Living Organism</i> | <i>Minerals</i>      | <i>Body fossils</i> | <i>Trace fossils</i> |
|   | <i>Amber fossilisation</i> | <i>Carbonization</i> | <i>Casts and moulds</i> | <i>Freezing</i>        | <i>Mummification</i> |                     |                      |

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| Learning links:                          |
| Geography:                               |
| Y3: Coastal Erosions<br>Sedimentary Rock |
| Learning links:                          |
| Science:                                 |
| Y6: Evolution<br>Fossils/Evidence        |

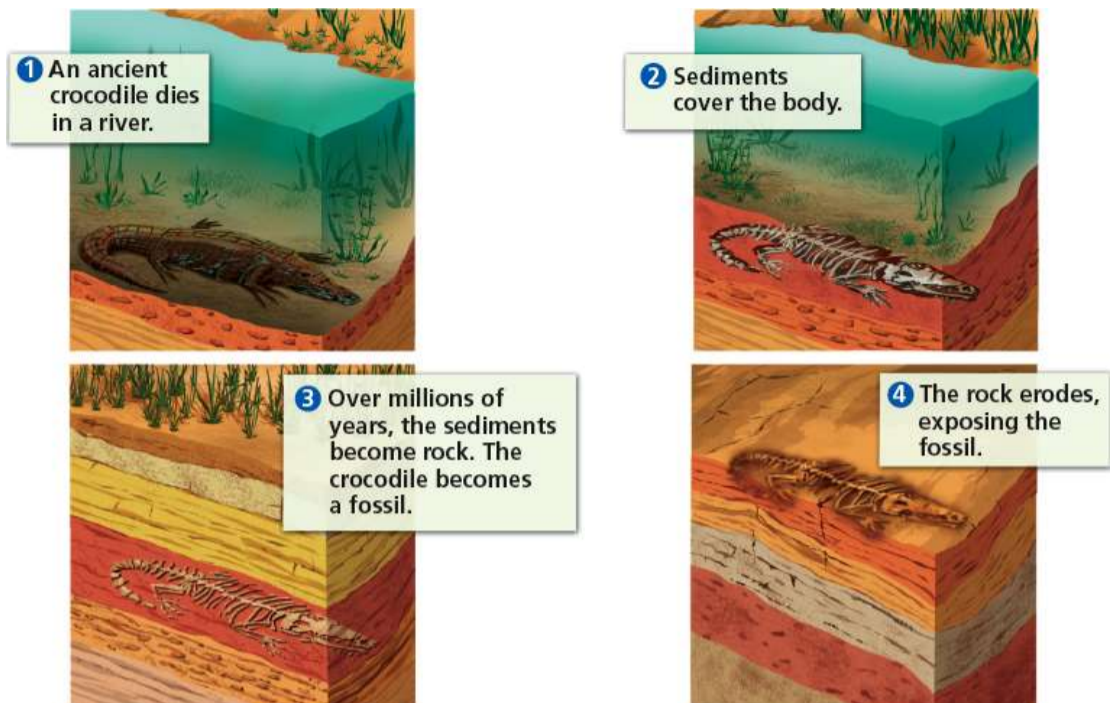
#### What are fossils and how are they formed?

A **fossil** is the **preserved** remains or impressions of a **living organism** such as a plant, animal, or insect.

Studying fossils helps scientists to learn about the history of life on Earth.

Fossils are found **all over the world**.

**Most** fossils are found in **sedimentary rock** such as shale, limestone and sandstone.



#### There are two main types of fossils:

**Body fossils** - Body fossils are fossils where some portion of the **actual organism's body remains** as part of the fossil. This might be a tooth or piece of bone.

**Trace fossils** - Trace fossils are fossils where there **isn't any actual part** of the original organism, but "**traces**" of the organism are **preserved in rocks and minerals**. There are many different types of **trace fossils** including **moulds, animal tracks, casts, and impressions**.

#### THINKING POINT:



What is the difference between a body fossil and a trace fossil?

#### There are a number of ways that fossils may form:



#### Amber:

**Full body insect fossils** can be found preserved in **hardened tree sap** called **amber**. These fossils can **remain preserved** in amber for millions of years.

#### Carbonization:

All the **elements** of the organism are **dissolved** except for the carbon. The **carbon leaves a residue** which shows an **outline of the organism**.



#### Casts and moulds:

A cast or a mould fossil is an **impression of a living organism**.

They are made when an **organism dissolves** in the Earth and **leaves a hollow mould** behind.

The **mould** is then **filled in by minerals** leaving something like a **statue** of the organism behind.



#### Frozen:

Some fossils are **preserved in ice**. As long as the ice doesn't melt, the fossil may be **preserved for thousands of years**. Large fossils such as the **woolly mammoth** have been discovered in the **glaciers of the Arctic**.



#### Mummification:

In really **dry areas**, a fossil may be formed through **mummification**.

This is when the dead organism **quickly dries out**.

Because there is **little moisture**, the remains of the organism can be **preserved for a long time** leaving a fossil.

#### THINKING POINT:



Have you seen any of these types of fossil before? Which type?

## ENQUIRE, TEST, RECORD, REPORT AND CONCLUDE:

**Cast and mould fossils:**  
**To understand how cast and mould fossils are formed**

1. Place some clay into the bottom of a container, and flatten it so that it is at least ½-inch deep.
  2. Spray the surface of the clay, as well as the visible sides of the container, with cooking spray.
  3. Lay a seashell/bone/creature skeleton on top of the clay, with the most textured side facing downwards.
  4. Press onto the seashell and then remove it so that it leaves a deep impression in the clay.
  5. Use the directions on the package of plaster of Paris to make about ½ cup of plaster.
  6. Pour the plaster over the clay so that it completely covers the seashell impression.
  7. Wait at least 30 minutes for the plaster to dry completely.
  8. Squeeze the container so that the piece of clay and plaster pops out of it. Peel the clay off to reveal the plaster “fossil.”
  9. Consider how this fossil resembles cast and mould fossils. What does the clay represent? What does the plaster represent?
- Children to repeat the process in pairs and, when complete, label their example and write a description/explanation to go alongside.

## KEY ASSESSMENT QUESTIONS AND SCENARIOS:

### **EXS:**

1. What is a fossil and how are fossils formed?
2. Are there different types of fossil?

### **GDS:**

1. As a budding palaeontologist, explain to an audience how fossils are formed and the varying types.