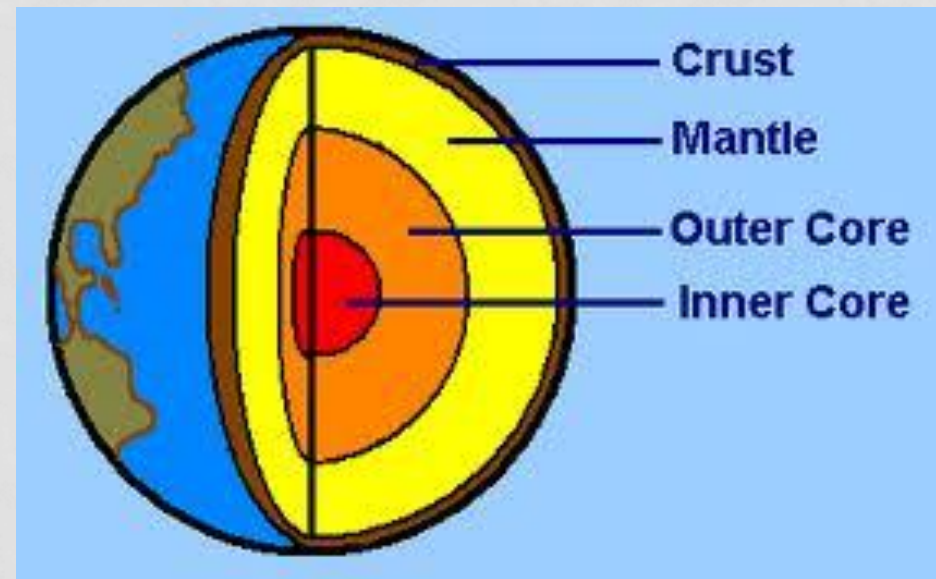


ROCK CYCLE & TIMESCALE



THE ROCK LAYERS OF THE EARTH

- The Earth is a huge ball made of mainly different types of rocks.
- Its total diameter is about 12 500km and it has four layers:
 - Crust
 - Mantle
 - Outer core
 - Inner core



WHAT ARE ROCKS?

- A rock is:
 - A solid
 - Naturally occurring
 - Is made up of minerals or mineral like matter.
- Some rocks are composed of just one mineral. Pyrite and quartz are two common rocks that fit this category.
- Most rocks are a solid mixture of several minerals like granite.
- Rocks are classified by how they are formed. There are three basic groups: igneous, sedimentary & metamorphic.



EXAMPLES OF IGNEOUS ROCKS

granite



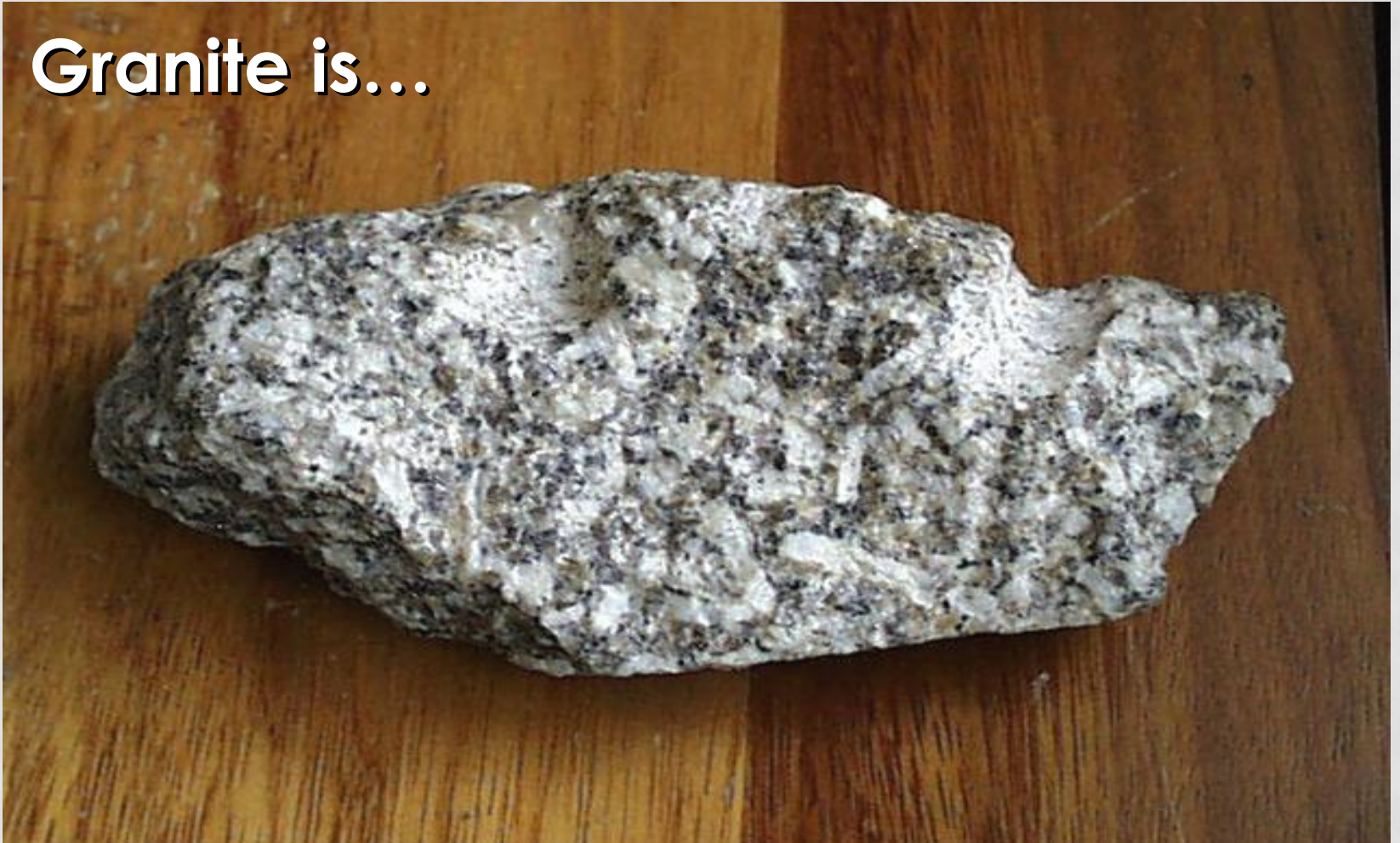
pumice



basalt



Granite is...



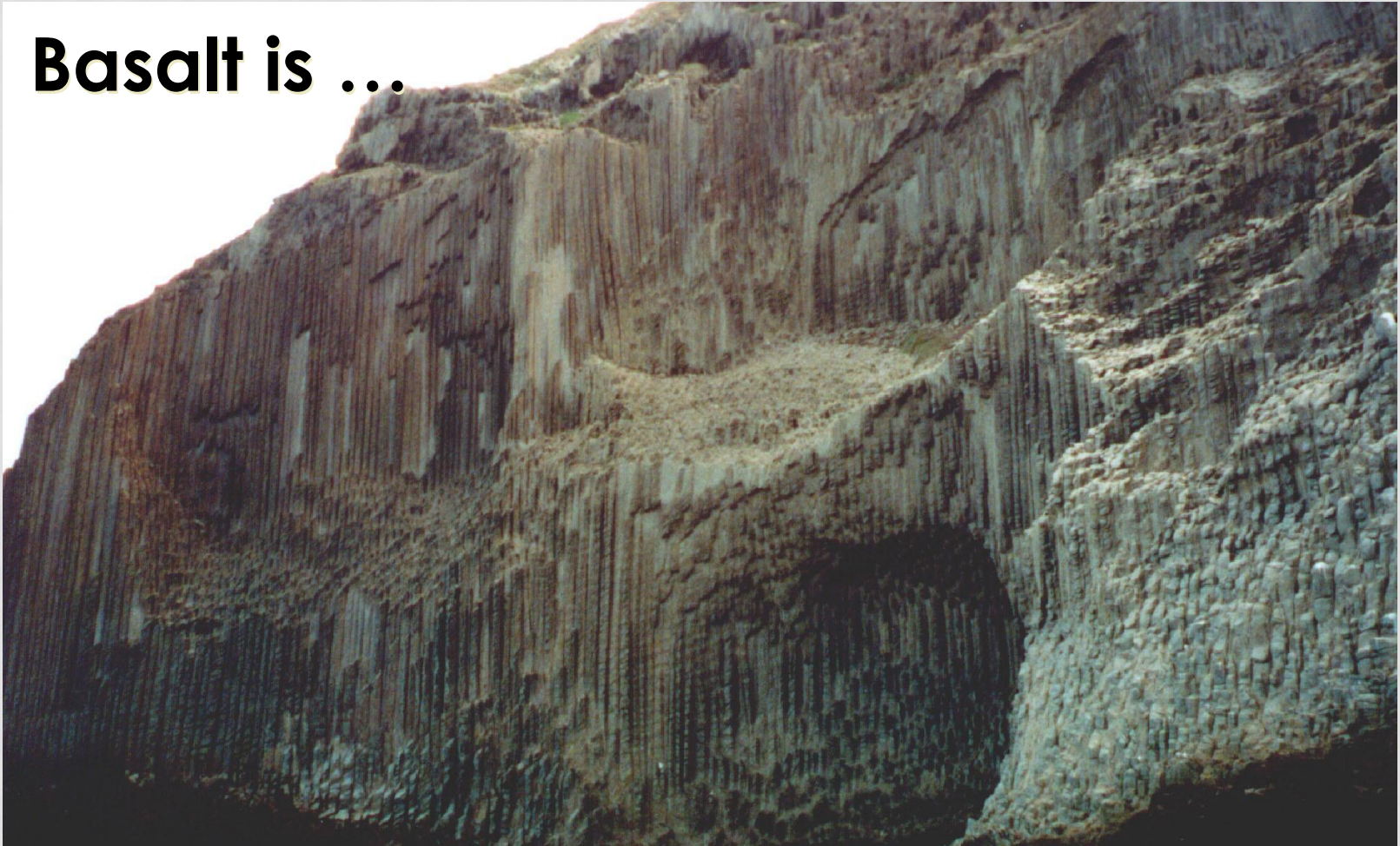
...a hard grey rock consisting of large crystals that are randomly arranged.

Pumice is ...



...a pale grey rock made up of very small crystals and is porous and extremely light.

Basalt is ...



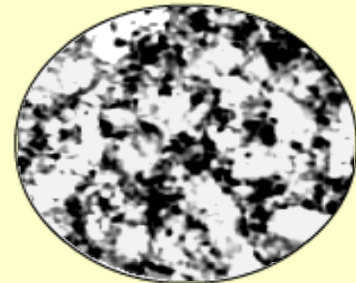
...a dark glassy rock which has very fine crystals and often forms as columns of rock.

PROPERTIES OF IGNEOUS ROCKS

What are the properties of igneous rocks?

- Igneous rocks contain **interlocking crystals** which are held together very strongly and make the rock hard.
- The crystals in igneous rocks have a **disorderly arrangement**.
- The size of the crystals depends on how quickly the igneous rock solidifies.
- Igneous rocks never contain fossils.

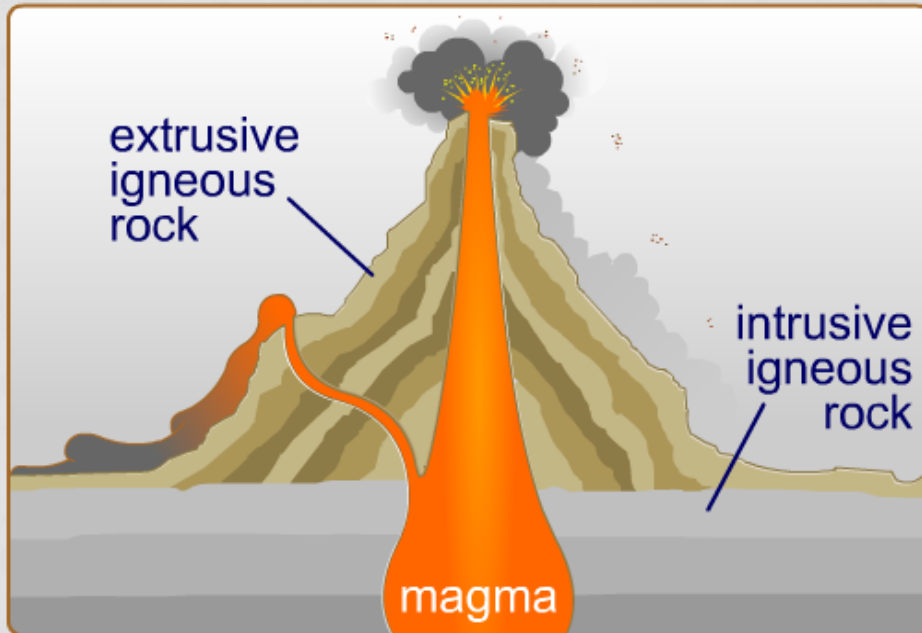
Igneous rocks consist of randomly arranged interlocking crystals.



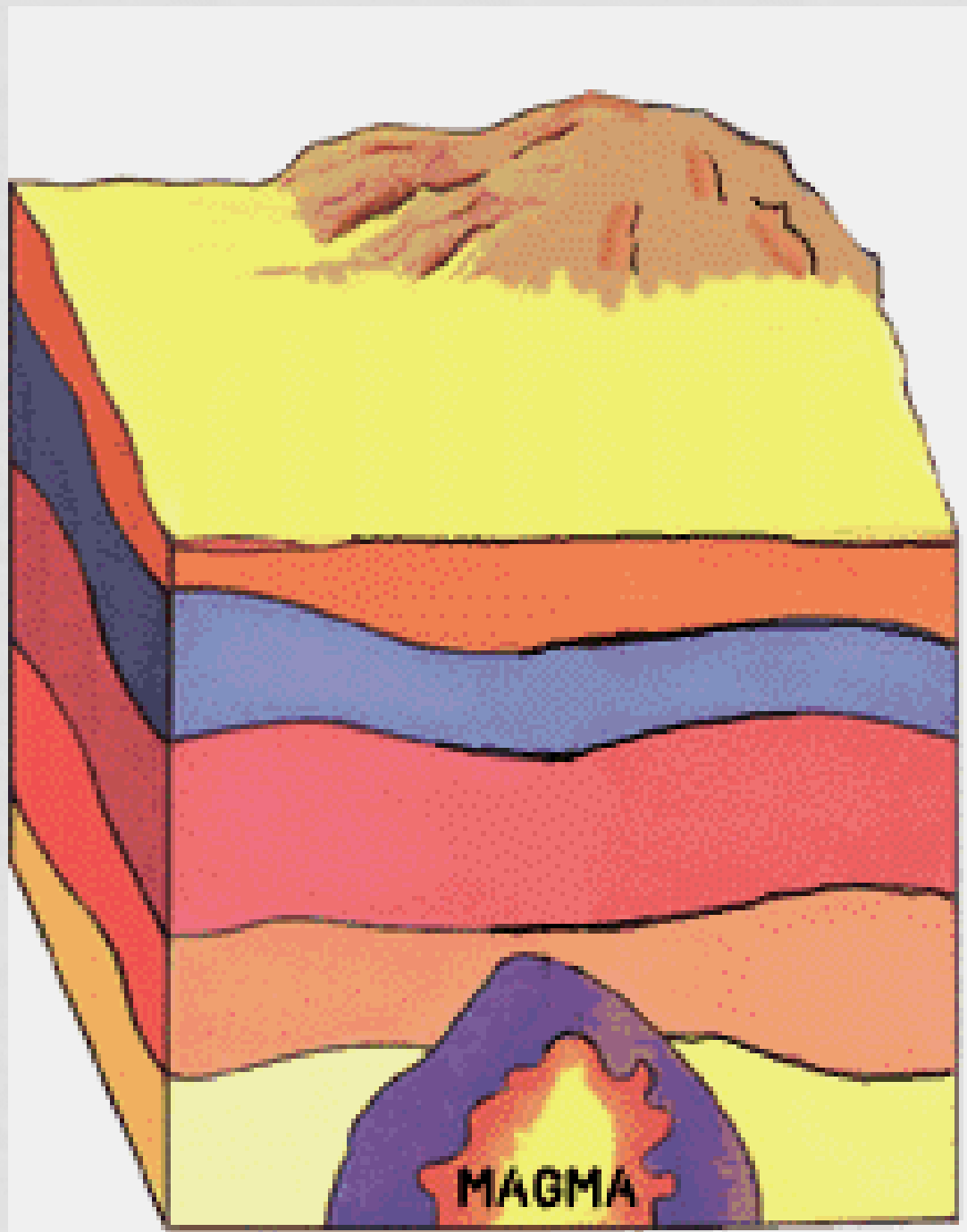
FORMATION OF IGNEOUS ROCKS

How are igneous rocks formed?

- Deep in the ground is molten rock called **magma**. Sometimes, magma bursts through the surface causing volcanic eruptions.
- Igneous rocks are formed when **magma cools and solidifies**.



- When magma cools above the surface, **extrusive igneous rocks** are formed.
- When magma cools below the surface, **intrusive igneous rocks** are formed.



SIZE OF CRYSTALS IN IGNEOUS ROCKS

How is the size of crystals in igneous rocks determined by the rate at which magma cools and solidifies?

- Magma above the Earth's surface **cools quickly**. Only **small crystals** are formed as the magma solidifies.

This is how **extrusive igneous rocks** like pumice and basalt are formed.

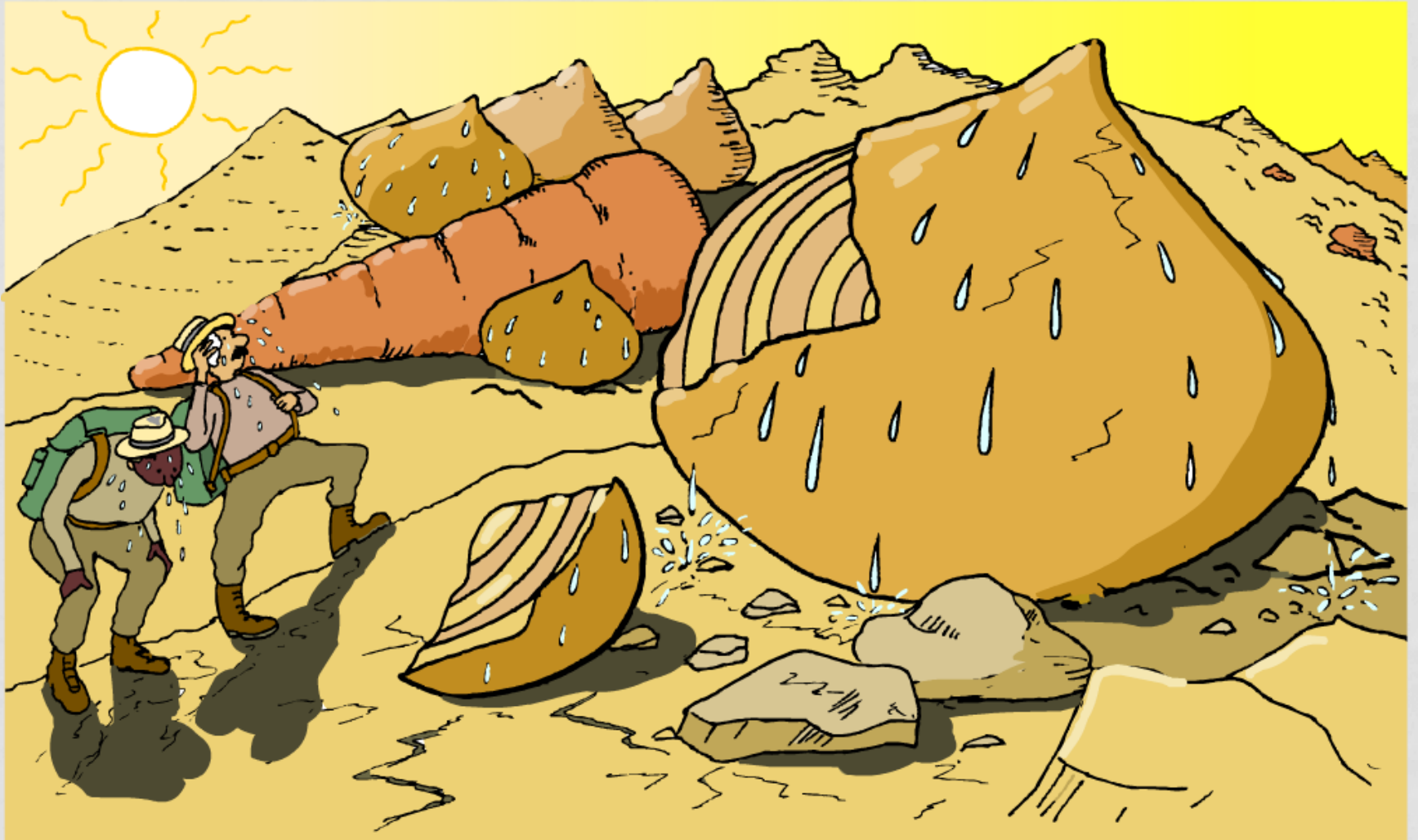


- Magma below the Earth's surface **cools slowly**. There is time for **large crystals** to grow as the magma solidifies.

This is how **intrusive igneous rocks** like granite are formed.



Why are rocks all different shapes and sizes?



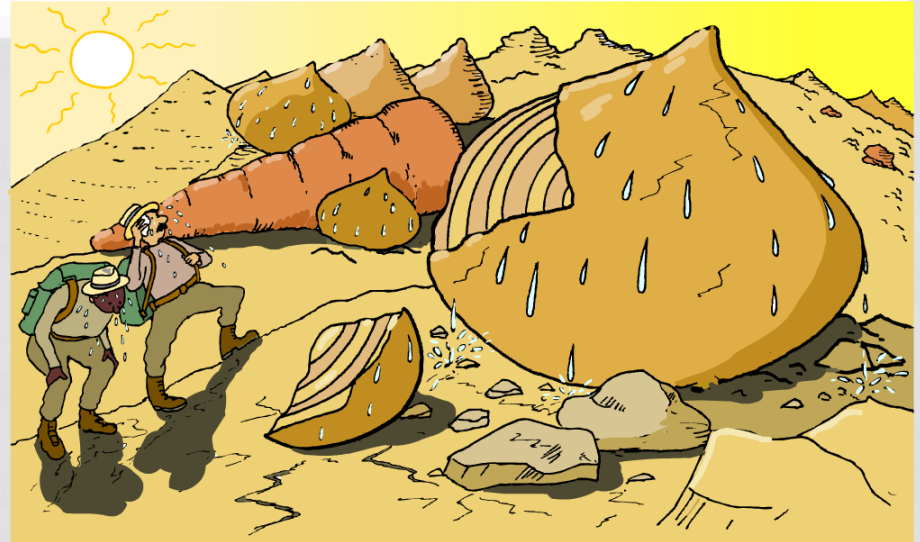
PRAC: MODELLING CHEMICAL WEATHERING



ROCKS AND WEATHERING

Rocks are different shapes and sizes because they are changed by the conditions in their environment.

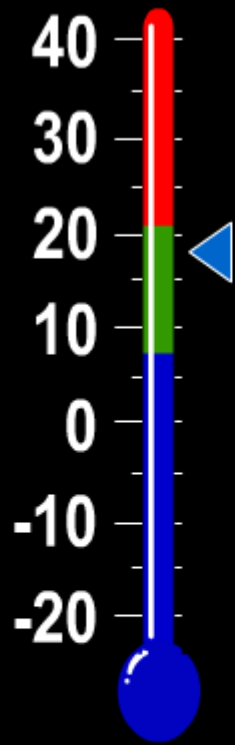
The breakdown of rocks into smaller fragments is called **weathering**.



There are three types of weathering:

- **physical weathering**
- **chemical weathering**
- **biological weathering**

What factors cause these different types of weathering?



What is
freeze-thaw
weathering?



0 years

What is
chemical
weathering?



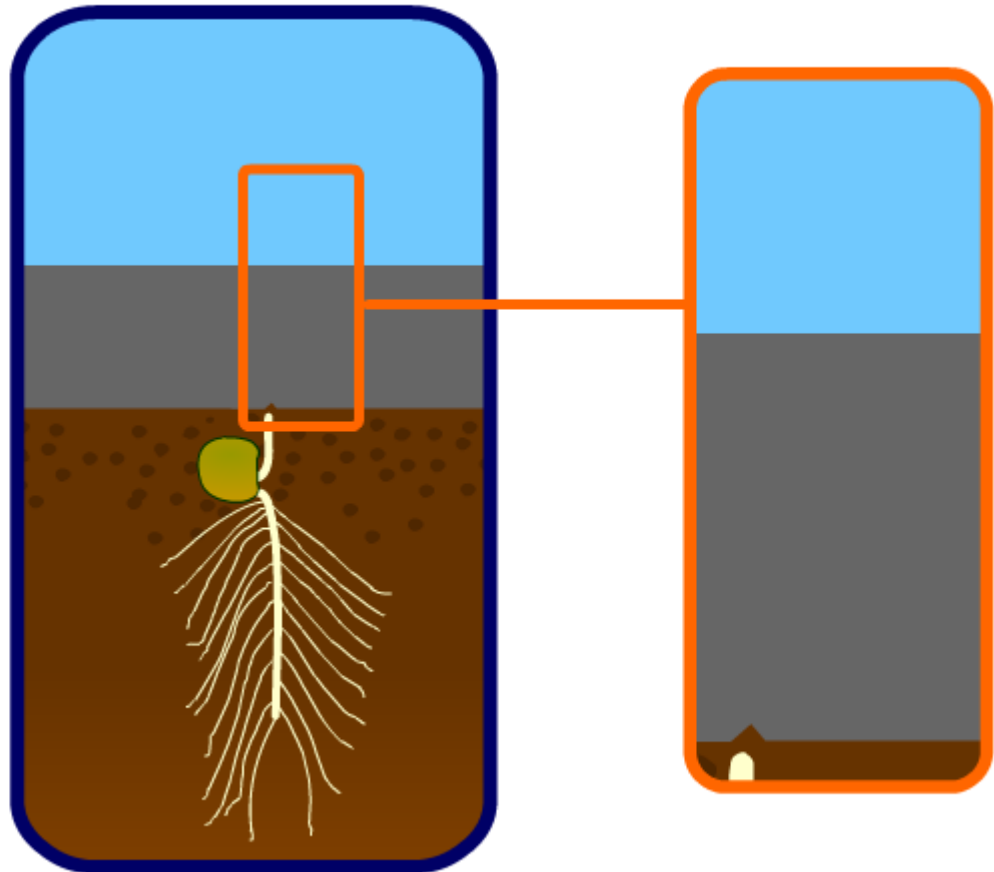
EXAMPLES OF CHEMICAL WEATHERING

How has **chemical weathering** affected these rocks?



What is biological weathering?

Plant roots and shoots can get into tiny cracks in rocks.



EXAMPLES OF BIOLOGICAL WEATHERING

How has **biological weathering** caused these cracks to form?



ROCKS & WEATHERING

Which rocks are affected most by chemicals (eg. acid rain)? Small Rocks or Large Rocks?

ACTIVITY: MODELLING CHEMICAL WEATHERING

Aim: to determine which size chalk (large or small) is effected most by vinegar.

Hypothesis? What do YOU think will happen?

Results: Describe what happened to the chalk in both containers?

Analysis:

- What was the chalk simulating?
- What was the vinegar simulating?
- Which rock is affected the most from acid rain – small rocks or large rocks?
- Why do you think this happened?

WHAT HAPPENS TO WEATHERED ROCK?



Click on the numbers to find out what happens to weathered rock.



WHAT IS EROSION?

Erosion is the movement of rock fragments from one place to another.
The rock fragments can be transported in different ways:

by strong winds



by rivers



by glaciers



WHAT IS DEPOSITION?

Deposition occurs when pieces of weathered rock sink to the bottom of the river bed or sea forming sediment. Dead creatures can get trapped in sediment and form fossils.

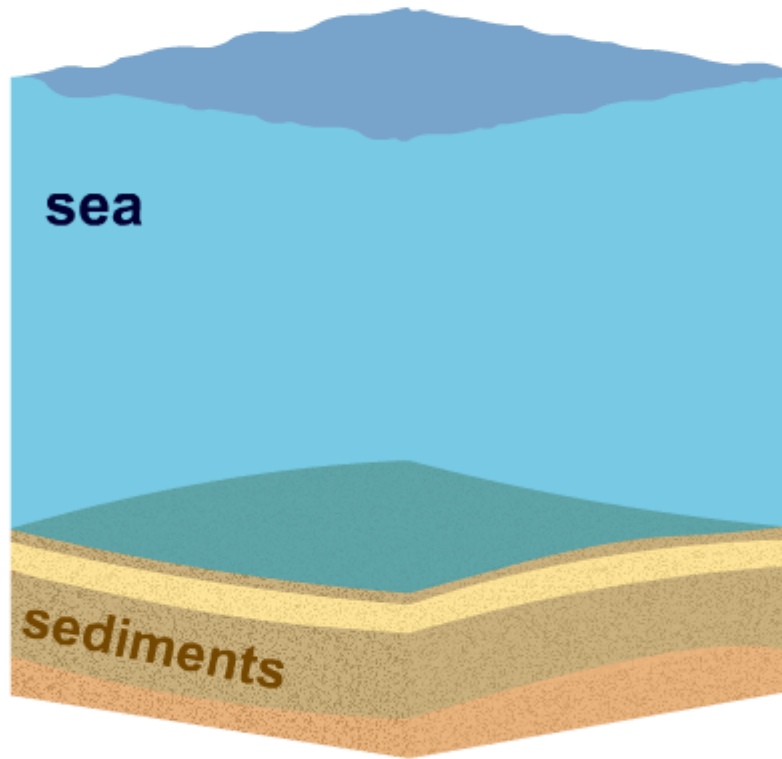


ACTIVITY: MODELLING EROSION

- Put 10 sugar cubes and 10 pebbles into the container and put on lid.
- Shake the container and then pass the container around the room allowing students to shake the container.
- **What has happened to the sugar cubes?**
- **What is this showing us?**

HOW ARE SEDIMENTARY ROCKS FORMED?

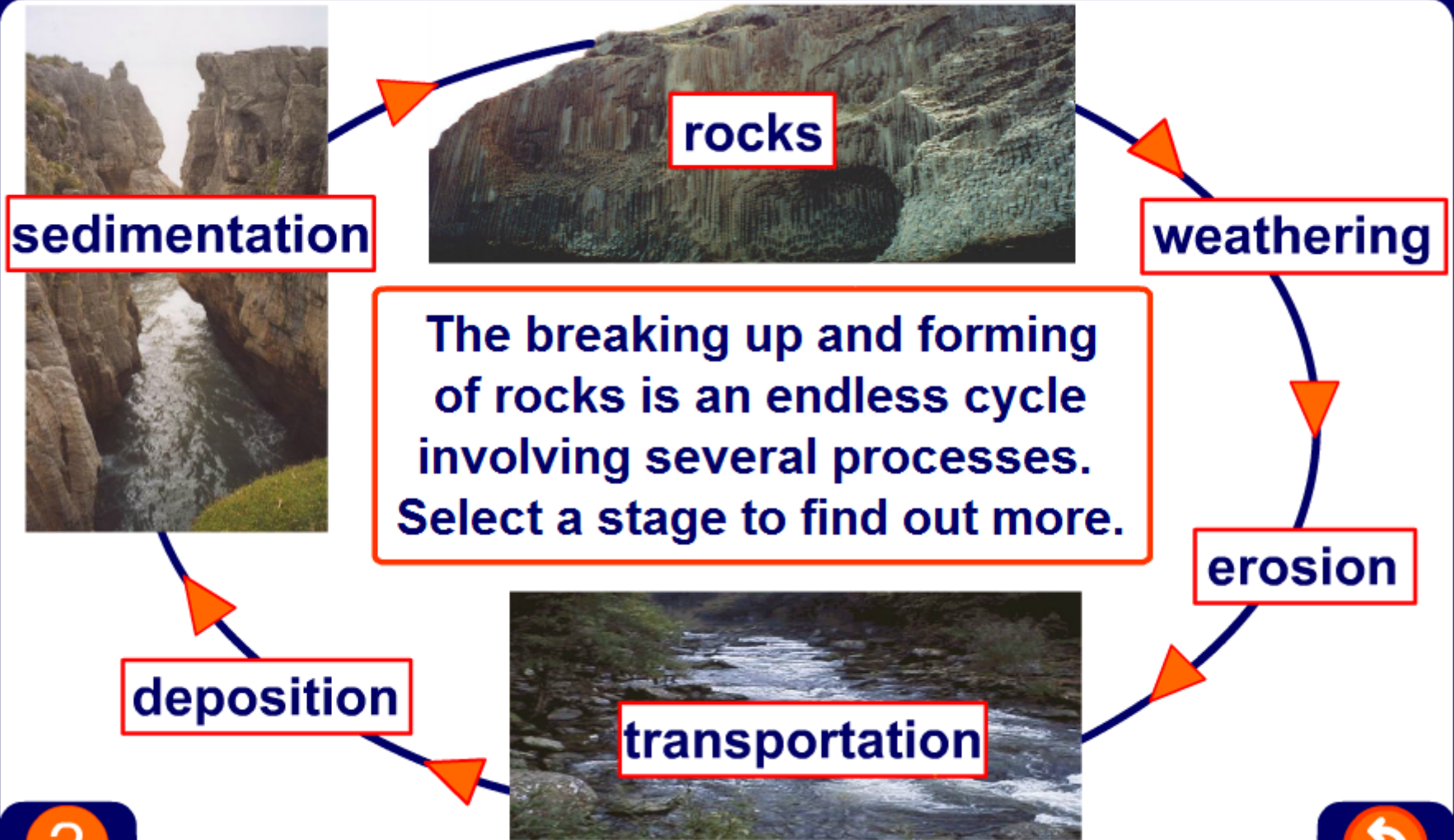
How are sedimentary rocks formed?



How can you tell that these are sedimentary rocks?

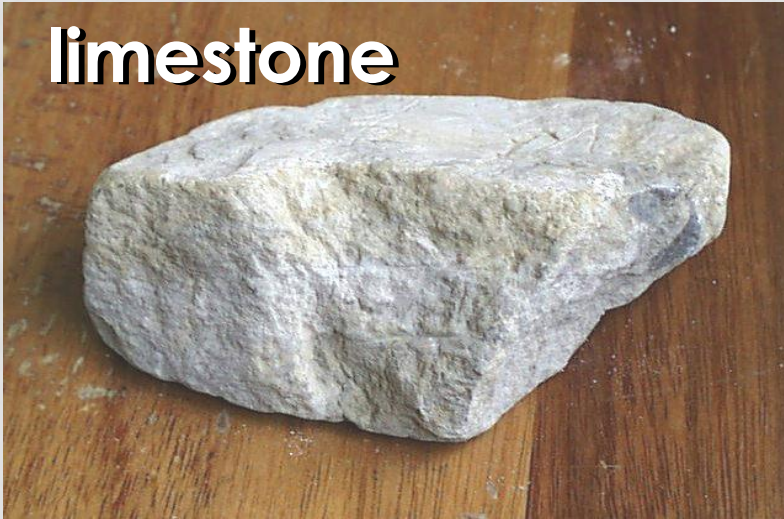


FROM WEATHERING TO SEDIMENTATION

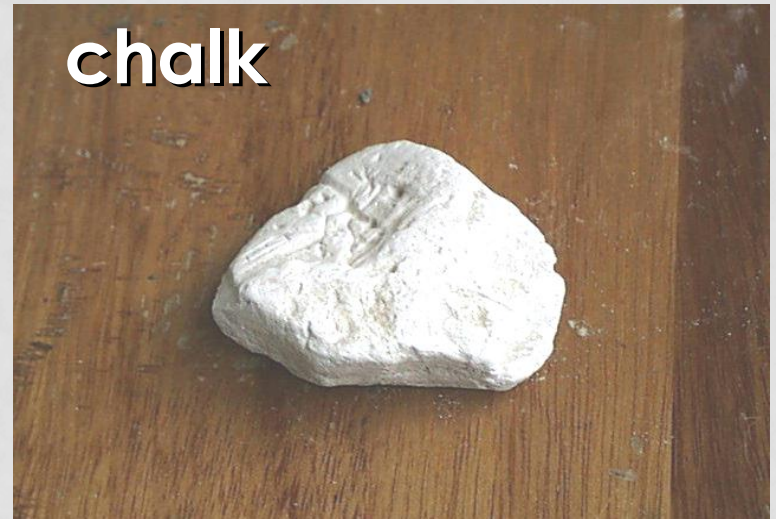


EXAMPLES OF SEDIMENTARY ROCKS

limestone



chalk



sandstone



sandstone



Sandstone is ...



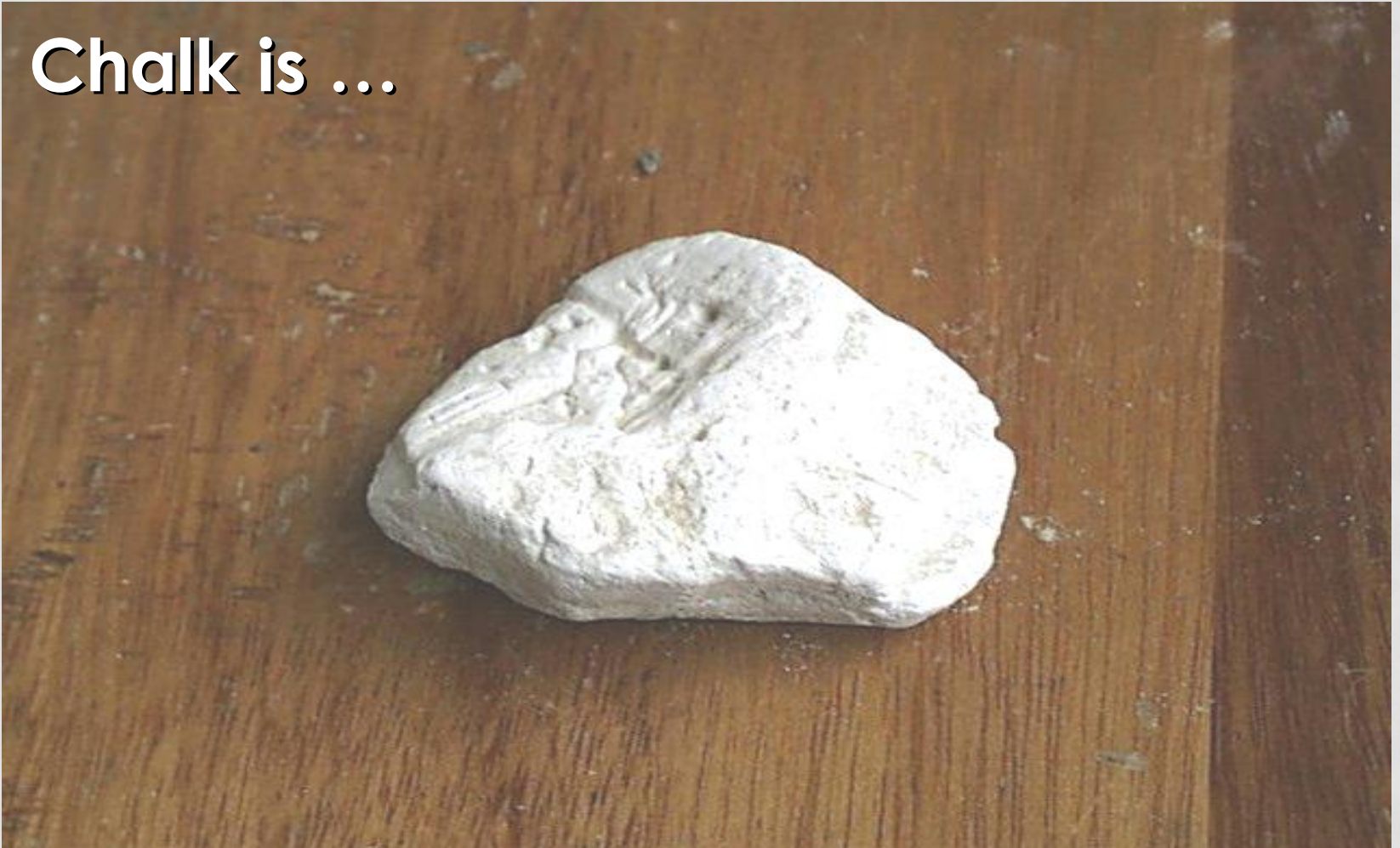
...an orangey-coloured rock which looks like lots of sand grains stuck together. It is quite soft.

Limestone is ...



...a grey/white rock which is mostly made from crushed sea shells.
Limestone often contains fossils.

Chalk is ...



...a white or grey powdery rock with very fine grains. Chalk often contains fossils.

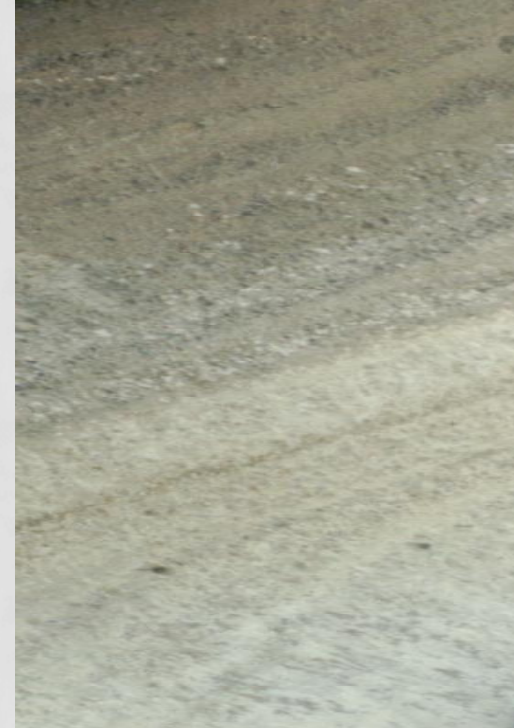
PROPERTIES OF SEDIMENTARY ROCKS

What are the properties of sedimentary rocks?

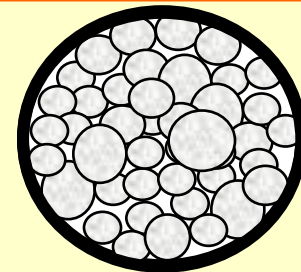
Sedimentary rocks often have **layers** showing the deposition of sediment at different time periods.

Sedimentary rocks consist of lots of **small grains**. These grains may be weakly held together so the rocks are often porous and may be soft and crumbly.

Sedimentary rocks often have **fossils** trapped within them.



Sedimentary rocks consist of layers of lots of small particles and are often porous.



Which type of sedimentary rock?



?

?

?

?

sandstone

limestone

mudstone

chalk

?

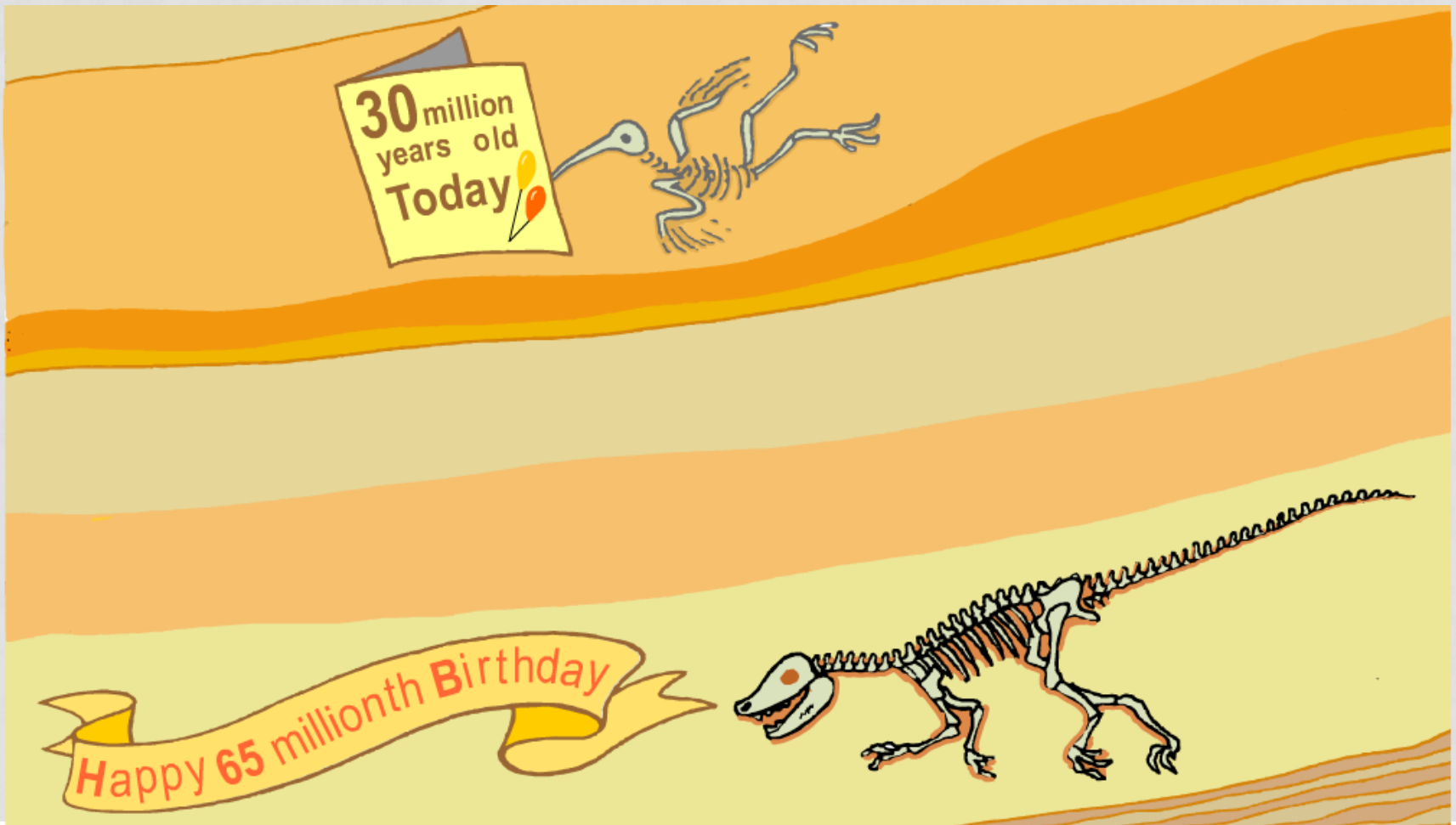
C

solve

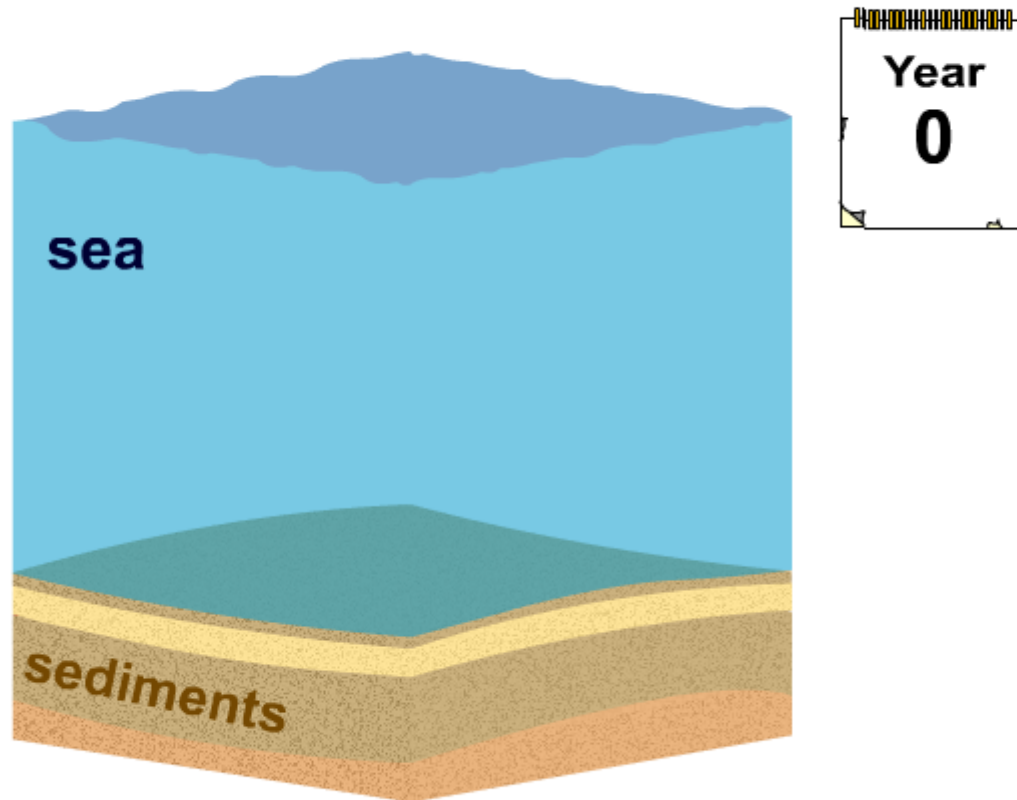
↶

COMPARING AGES OF SEDIMENTARY ROCKS

Why are sedimentary rocks near the surface younger than sedimentary rocks deeper down?



How are sedimentary rocks formed?



EXAMPLES OF METAMORPHIC ROCK

marble



slate



WHAT IS MARBLE?

Marble is ...



...a hard smooth rock made from sedimentary limestone or chalk in conditions of strong heat and low pressure.

WHAT IS SLATE?

Slate is ...



...a grey rock with fine grains made from sedimentary shale in conditions of low temperature and low pressure. Slate can be split into thin sheets.

PROPERTIES OF METAMORPHIC ROCKS

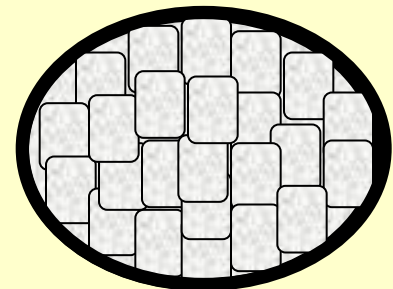
How are the properties of metamorphic rocks different from sedimentary rocks?

Metamorphic rocks often have layer structures of **crystals** caused by the effect of heat and pressure.

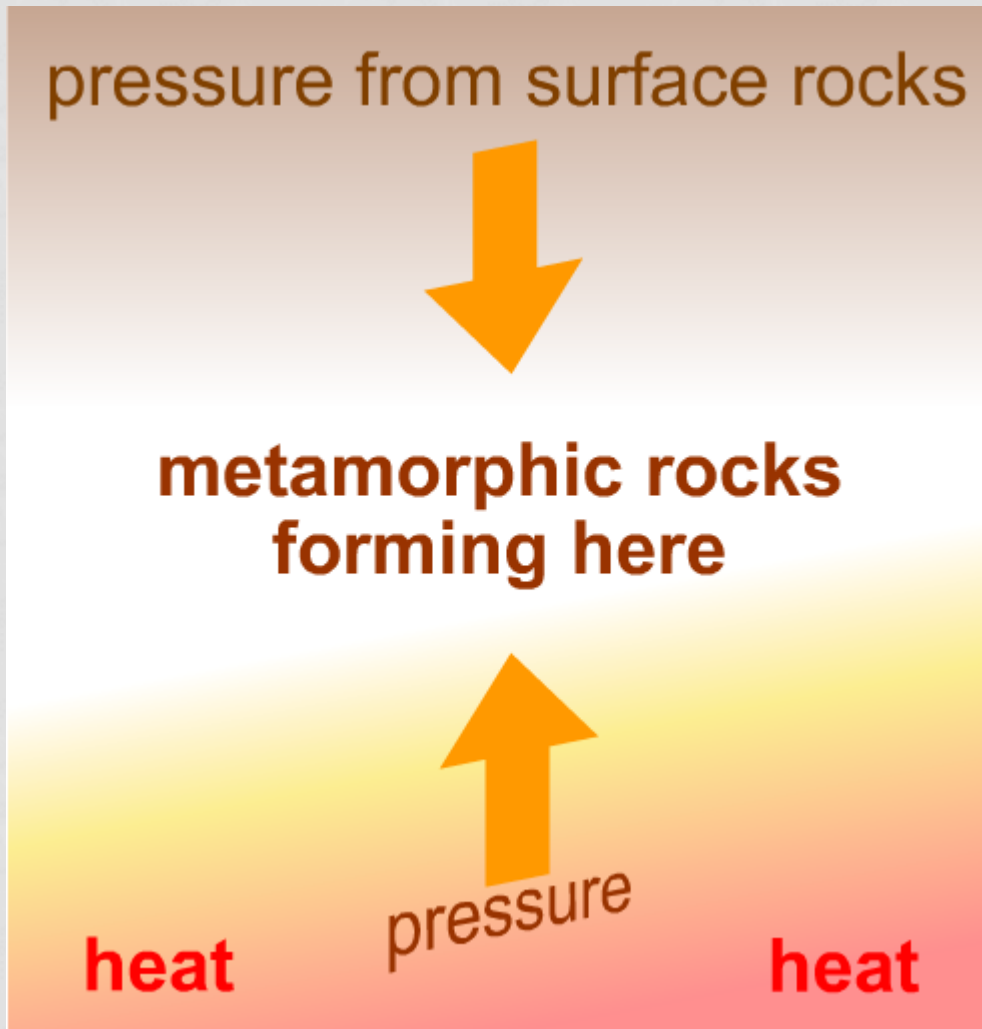
Metamorphic rocks are usually **denser and harder** than sedimentary rocks.

Metamorphic rocks sometimes show **distortions** caused by the movements that led to their formation. This may give rise to **wavy or zig-zag patterns** within the rock.

Metamorphic rocks contain regular layers of crystals that sometimes have a wavy or zig-zag arrangement.



FORMATION OF METAMORPHIC ROCKS



- Metamorphic rocks are formed by the effect of extreme pressures and temperatures deep within the Earth.
- These conditions change the structure of existing rocks so that new rocks are formed.

WHICH TYPE OF METAMORPHIC ROCK?

Which type of metamorphic rock?

Dark grey rock used for roofing since it easily splits into thin layers.

marble

Smooth and hard white rock widely used in building and sculpturing.

slate

Transparent sheets used as an insulator in some electrical devices.

mica

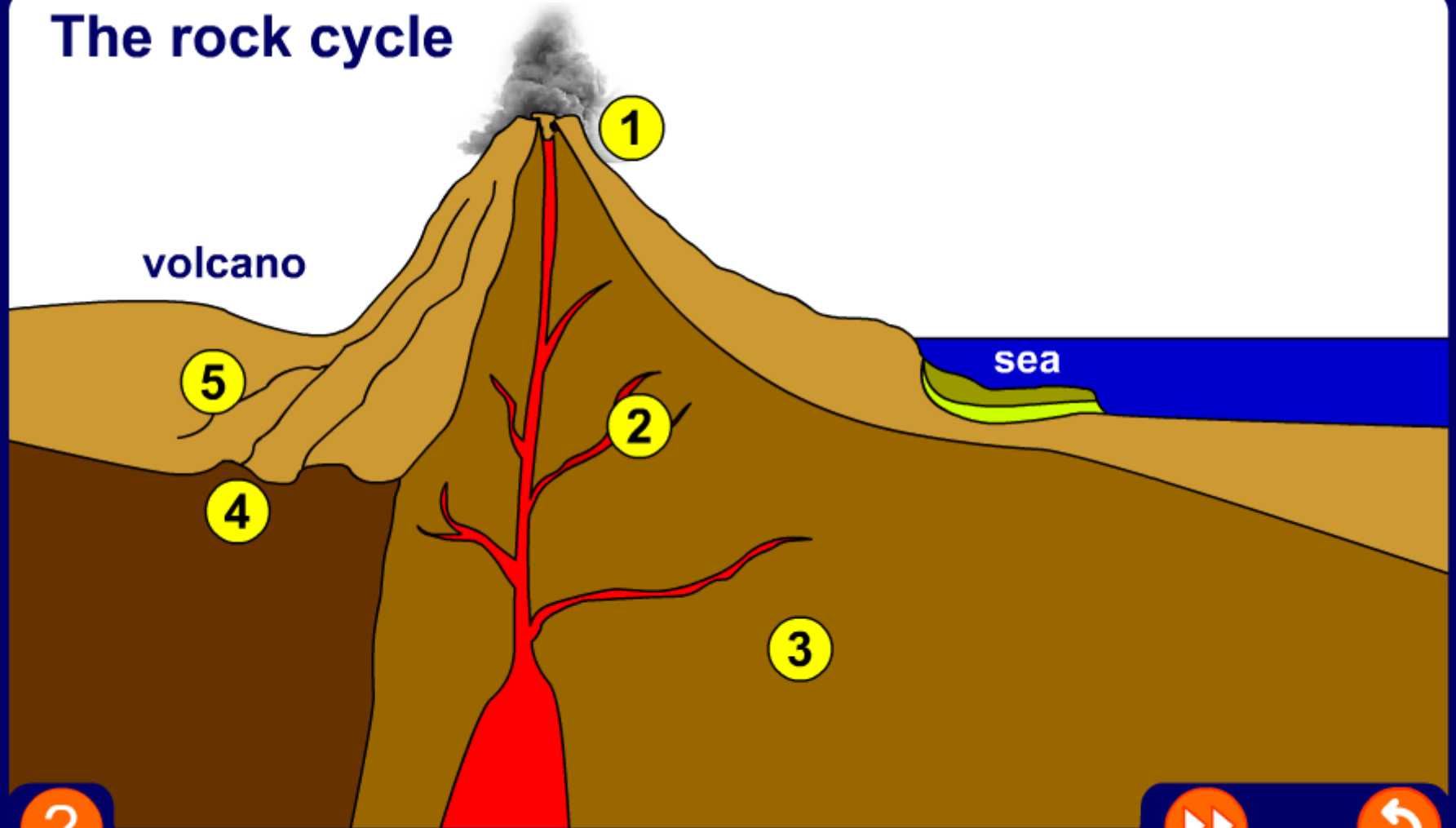


solve

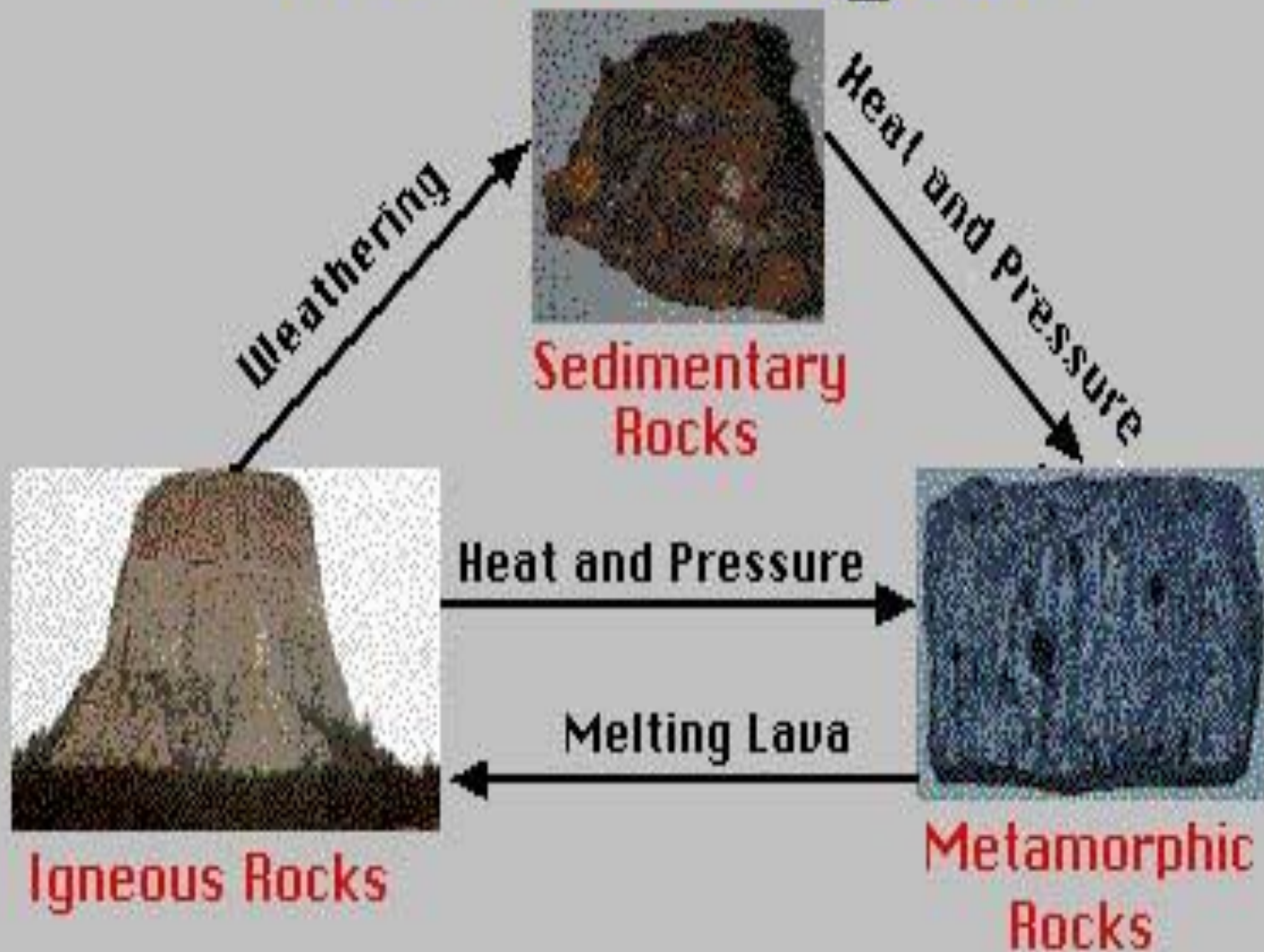


ROCK CYCLE ANIMATION

The rock cycle



The Rock Cycle



COMPLETE THE SENTENCES

Find the right words to complete the rock cycle.

When molten _____ solidifies on or close to the surface of the Earth, _____ rocks are formed.



Rocks on the Earth's surface are broken down by _____ which involves _____, chemical and biological processes.



magma

transported

pressure

metamorphic

igneous

sedimentary

weathering

magma

physical



How quickly can you unscramble
anagrams of words about

r o c k s

a n d

w e a t h e r i n g ?

Click "start" for the first of nine anagrams.

start



How quickly can you unscramble
anagrams of words about

t h e
r o c k
c y c l e ?

Click "start" for the first of eight anagrams.

start



Which type of rock am I?

Description	igneous	sedimentary	metamorphic
I am formed by heat and pressure.			
I contain many fossils.			
I contain some really big crystals.			
I do not contain any fossils.			
I contain many small grains "cemented" together.			
I have regular layers which are sometimes wavy.			



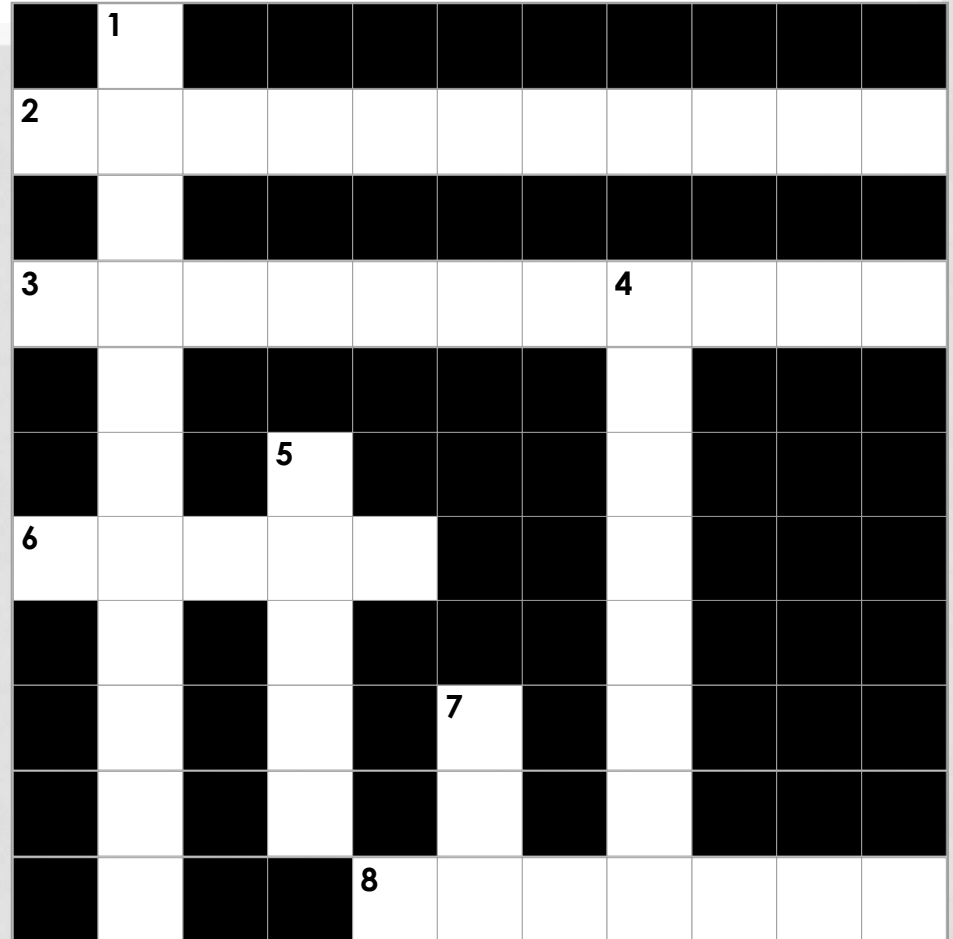
CROSSWORD

Across:

2. Rocks made from very small fragments of rock
3. Rocks changed by heat and pressure
6. Molten rock in the ground
8. Rocks formed when magma solidifies

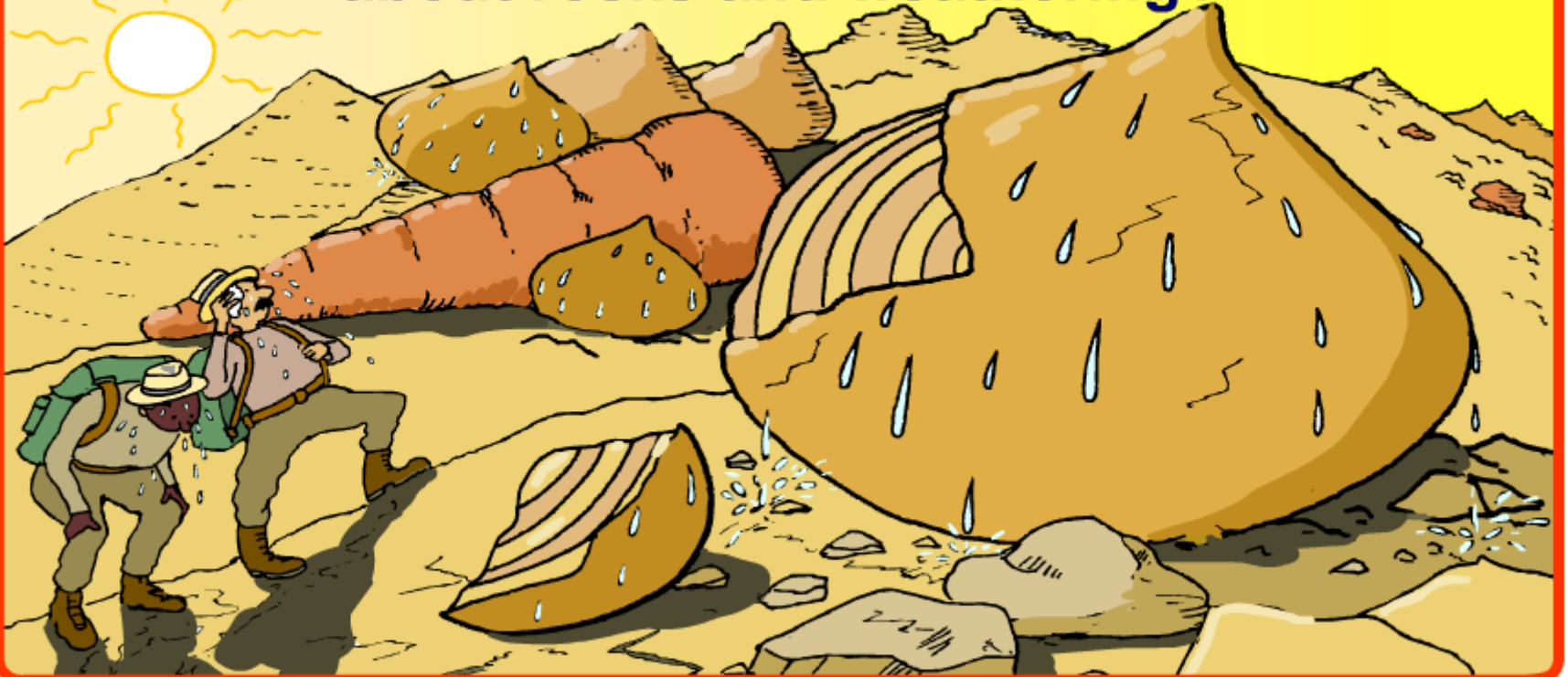
Down:

1. The process that glues sedimentary rocks together
4. One factor that causes rocks to change
5. The size of crystals in rocks that solidify quickly



7. The size of crystals in rocks that solidify slowly

Are you hard enough to try this quiz
about rocks and weathering?



start



30 million
years old
Today



Can you rock-and-roll your way
through this rock cycle quiz?

Happy 65 millionth Birthday



start



GLOSSARY

- **deposition** – The settling of rock fragments after transportation.
- **erosion** – The process of weathering and transportation.
- **exfoliation** – Weathering of rocks caused by repeated heating and cooling, also called onion-skin weathering.
- **freeze-thaw** – Weathering of rocks caused by the repeated freezing and thawing of water in cracks in rocks.
- **grain** – A small piece of a mineral which makes up a rock.
- **mineral** – A solid substance, usually a compound, which is found in rocks.
- **rock** – A mixture of minerals.
- **transportation** – Movement of rock fragments from one place to another.
- **weathering** – The breakdown of rocks into smaller pieces by physical, chemical and biological processes.

GLOSSARY

- **extrusive** – Igneous rock that formed above the Earth's surface and which is made up of very small crystals.
- **fossil** – The remains or traces of a plant or animal preserved in rock, common in sedimentary rock.
- **igneous** – Rocks made from magma that has cooled and solidified.
- **intrusive** – Igneous rock that formed below the Earth's surface and which is made up of large crystals.
- **magma** – Hot molten rock below the Earth's surface.
- **metamorphic** – Rocks formed under extreme pressure and temperature from existing rocks.
- **rock cycle** – The cycle linking the processes which form igneous, sedimentary and metamorphic rocks.
- **sedimentary** – Rocks made from layers of sediment and dead creatures pressurised and cemented together.