

Rocks, their formation and the rock cycle

How can rocks change from one form to another?

D: Identify examples and features of igneous, sedimentary and metamorphic rocks

C: Describe how different rock types are formed

B: Explain how rocks are recycled

A: Analyse which rocks metamorphic rocks originate from

A*: Link how rate of cooling affects igneous rock structure

Starter:

Can you sort the rock types and name them?

The Earth's Structure



The core

The core extends to about half the radius of the Earth.

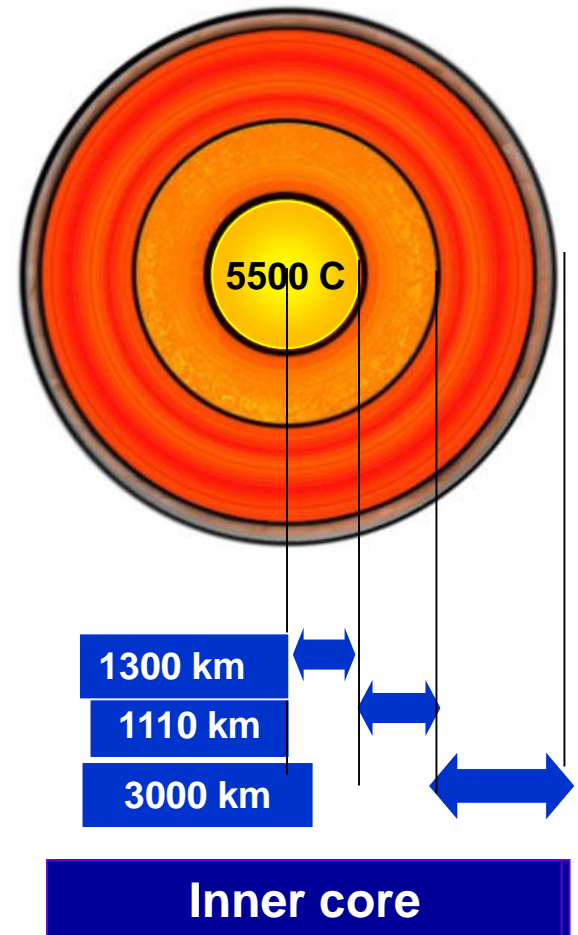
It is made mostly from *iron and nickel* and is where the Earth's magnetic field comes from.

It is very dense.

The temperature is high and the outer core is *molten*.

Towards the centre high pressure makes the inner core *solid*.

Intense heat is generated in the inner core by decay of radioactive elements like uranium.

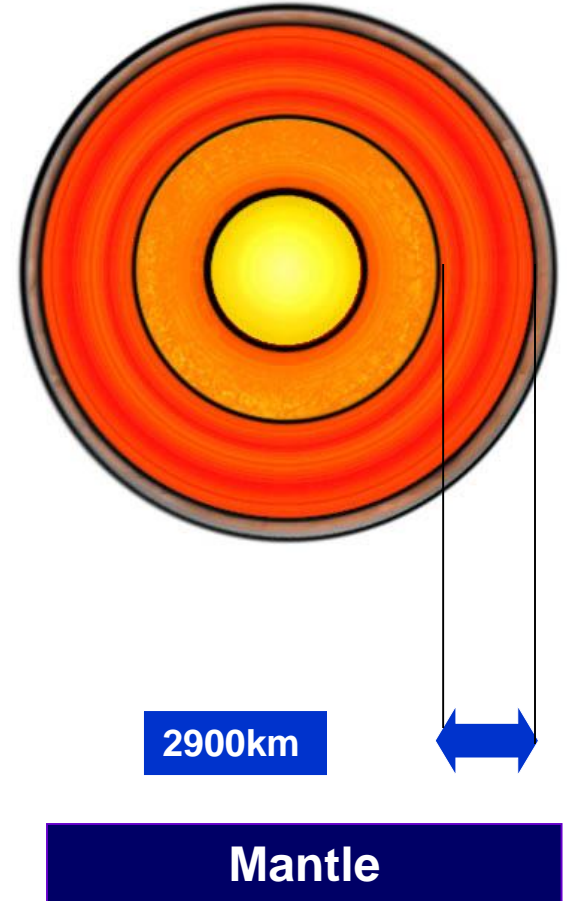


The mantle

The mantle extends outwards from the core to the crust: a distance of about 2,900 km.

It is mostly a semi-molten liquid upon which the Earth's crust floats.

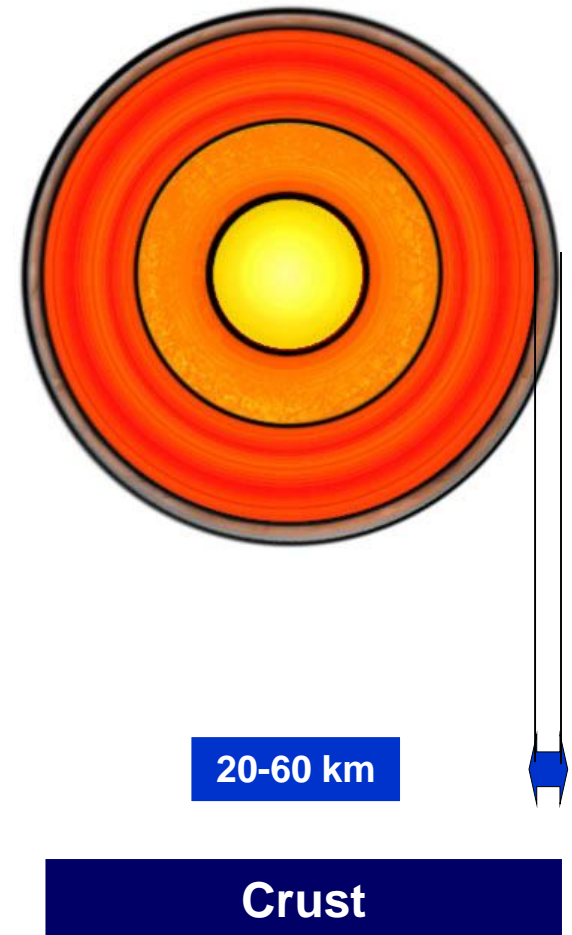
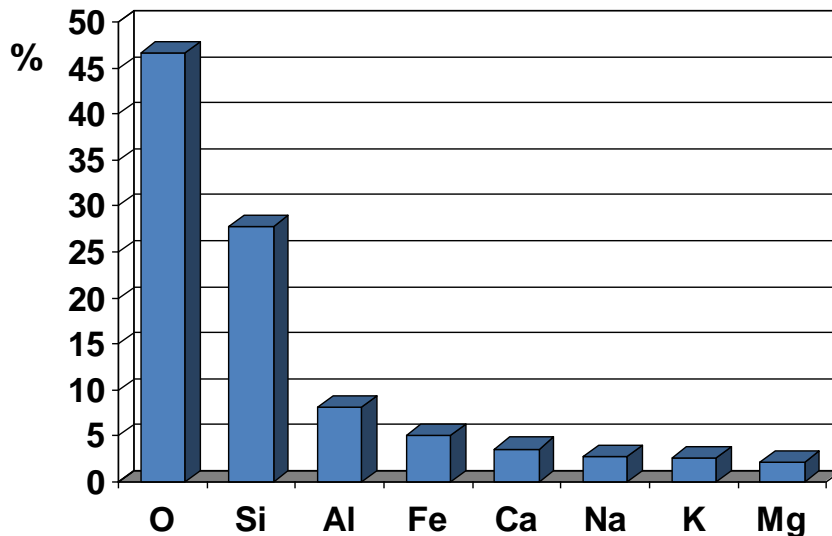
The heat coming from the core generates convection currents in the viscous mantle that cause the crust above to move.



The crust

The crust is the thin layer of rock at the surface upon which we live.

Eight elements make up over 98% of the Earth's Crust – although they are virtually entirely in the form of compounds.



What am I?

- I am dense, very hot, made mostly of solid iron and nickel. Inner core
- I'm iron and nickel too, but I'm liquid. Outer core
- I'm really very thin and am mostly silicon, oxygen and aluminium. Crust
- I'm a viscous semi-solid with convection currents circulating in me. Mantle
- I just hang around on the outside. Atmosphere

Attach labels to the correct part of the diagram.

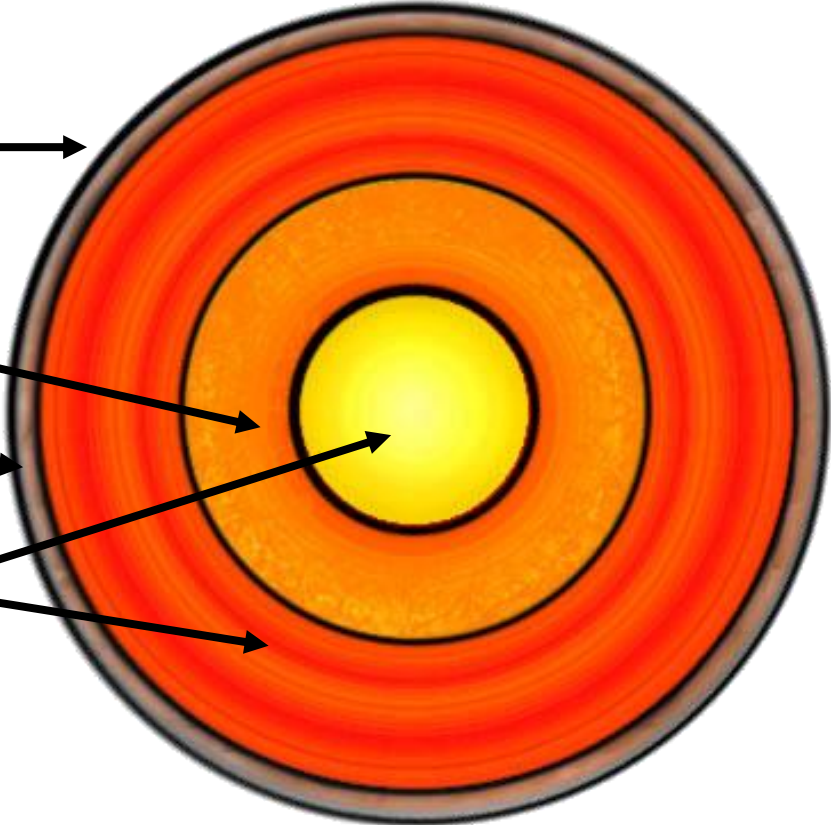
Atmosphere

Outer core

Crust

Mantle

Inner core



Rocks

Types of rocks

There are three main types of rocks:

1. Igneous - formed when molten rock cools.

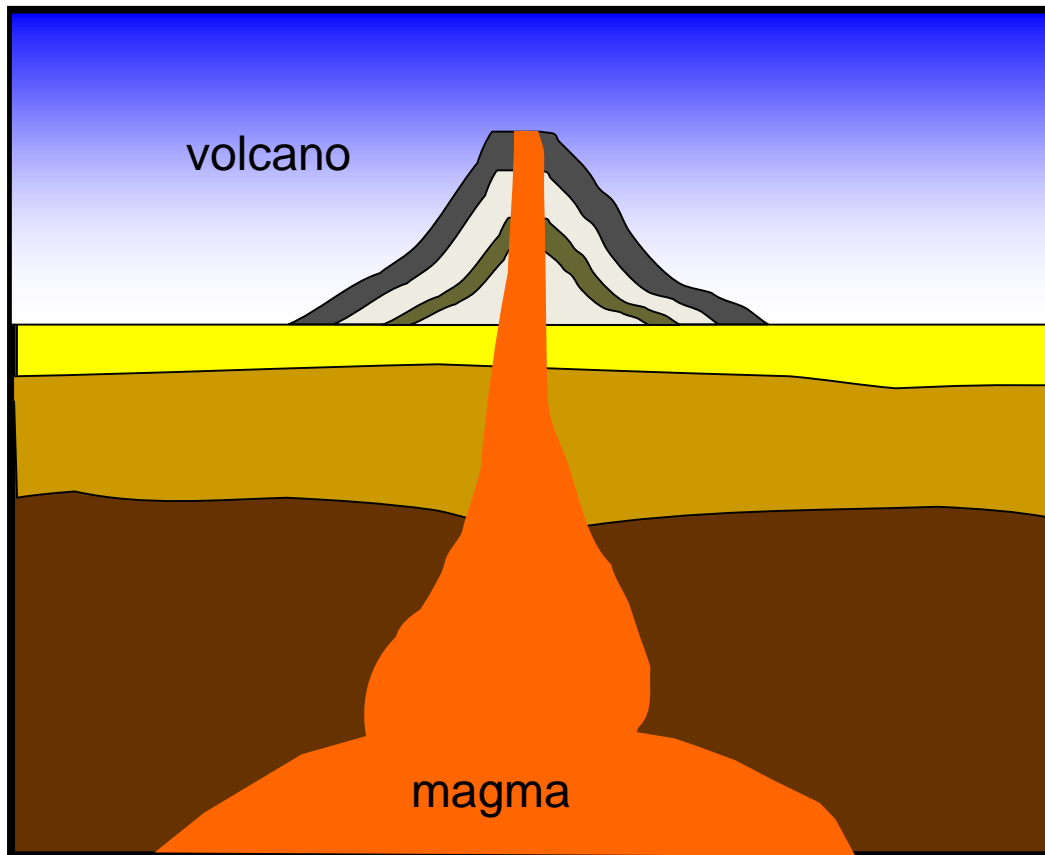
2. Sedimentary – formed by the “cementing together” of small grains of sediment.

3. Metamorphic – rocks changed by the effect of heat and pressure.

All of these are involved in a continuous flow of rock from the surface underground only to emerge again later as part of the on-going rock cycle.

Igneous rocks

- These are rocks formed by the cooling of molten rock (magma.)



Magma cools and solidifies forming igneous rocks.

Types of igneous rocks

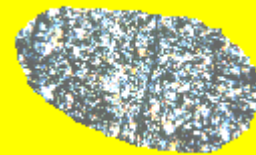
Igneous rocks divide into two main groups:

- Intrusive igneous
- Extrusive igneous.

- Intrusive igneous rocks, like granite, are formed when magma solidifies within the ground.



- Extrusive igneous rocks, like basalt, are formed when magma solidifies above the ground.



Igneous rocks and crystal size

The more slowly a rock changes from liquid to solid the bigger the crystals grow.

Intrusive igneous rocks, like granite, usually have clearly visible crystals.

Extrusive igneous rocks, like basalt, have crystals that are usually small.

Intrusive igneous rocks that cool *really* slowly can have very big crystals.



Extrusive igneous rocks that cool *really* quickly can have a glassy appearance.

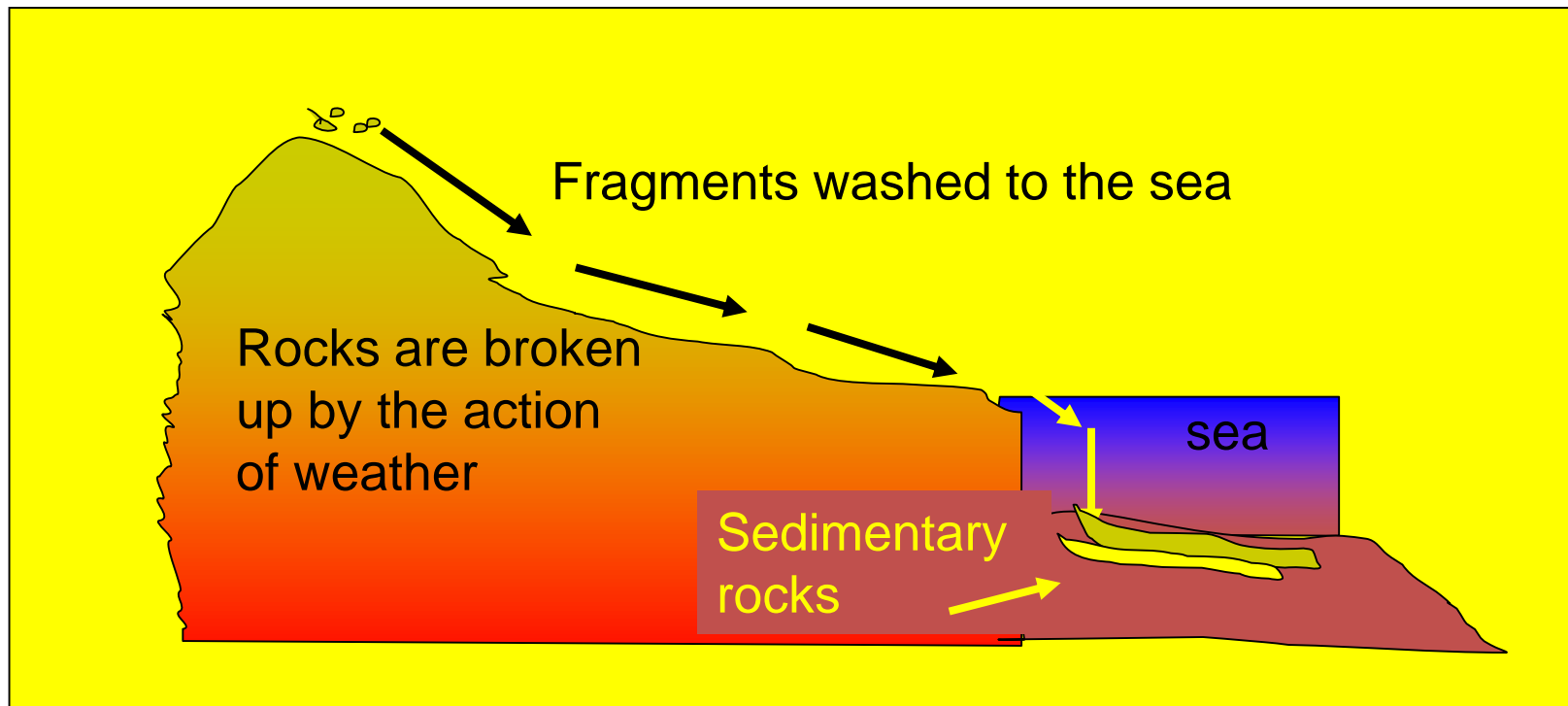


Chemical and Physical Weathering

- Surface rocks seem to be gradually reduced in size by weathering processes.
- Chemical weathering is when chemicals, such as those in acid rain, 'eat' away certain rocks.
- Physical weathering is to do with the rocks being broken down by the action of wind, rain and sun. For example, during the freezing and thawing of water in the cracks of rocks, the expansion of water makes the rocks splinter.
- The small broken fragments wash into rivers and, eventually, reach the sea where they settle as sediment.

Sedimentary rocks

Sedimentary Rocks are rocks formed when particles of sediment build up and are “cemented together” by the effect of pressure and minerals.



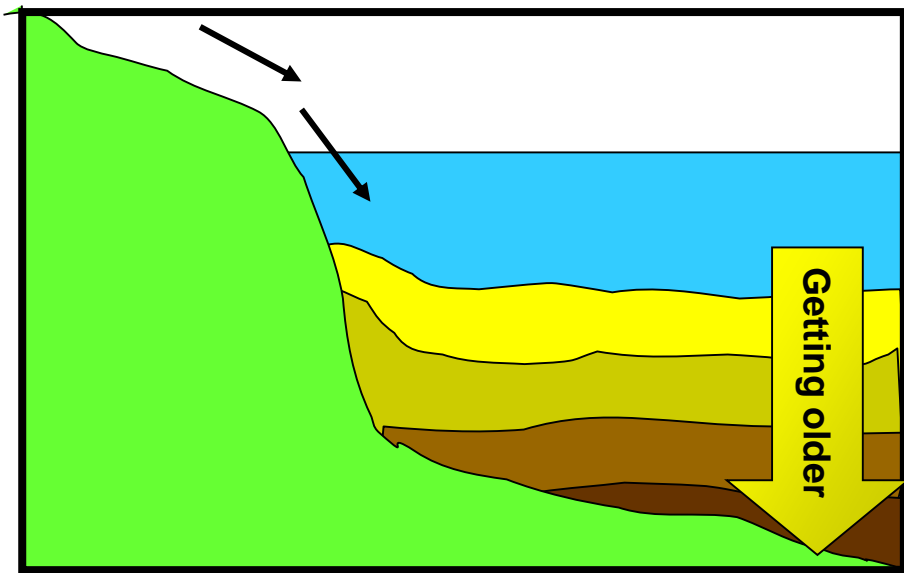
Sedimentary rocks

Sedimentary Rocks tend to have visible grains of sediment.

Sometimes they contain fossils.

They are usually softer than igneous rocks.

Examples of sedimentary rocks are sandstone and mudstone.



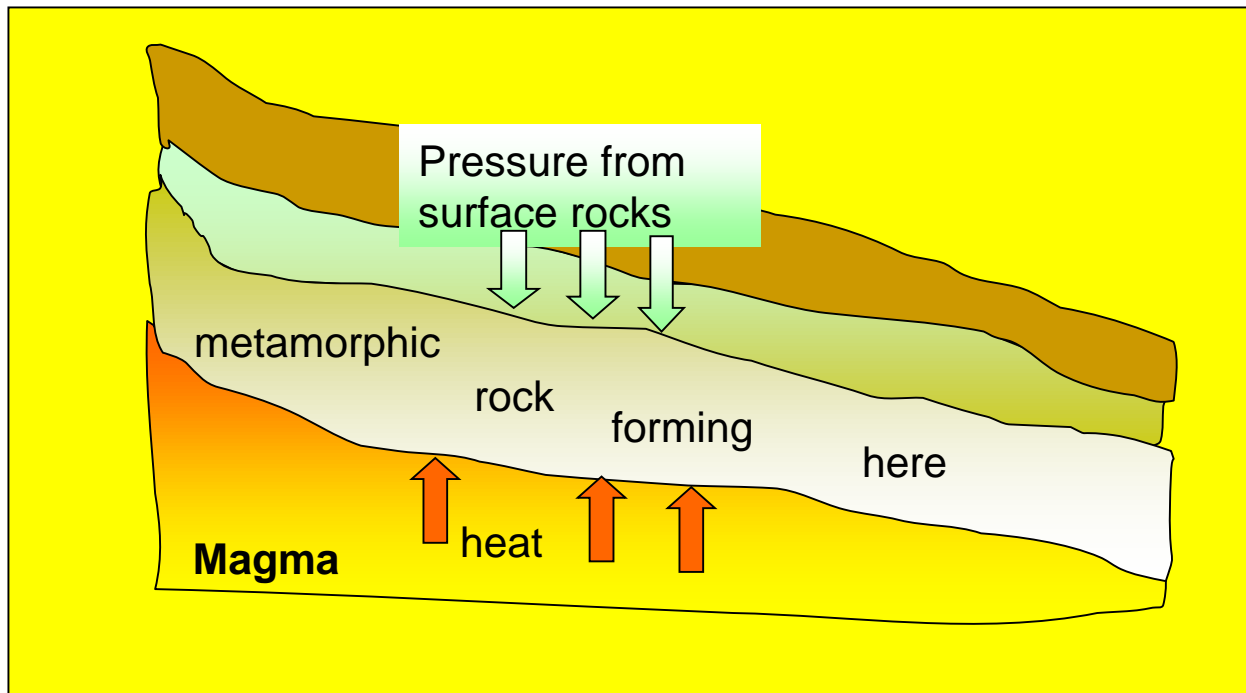
Sandstone is formed from the cementing together of grains of sand.



Metamorphic rocks

Metamorphic rocks are formed by the effect of heat and pressure on existing rocks.

This can greatly affect the hardness, texture or layer patterns of the rocks.



Metamorphic rocks

Marble, slate and schist are metamorphic.

- Limestone is a rock often formed from the sediment of shells. Temperature and pressure cause the rock to reform as small crystals that are much harder. It is used as a hard and decorative stone in buildings, sculptures etc.
- Slate is formed when pressure squeezes mudstone into plate like grey sheets. It is used in roofing.
- Schist and mica are formed when mudstone is subjected to very high temperatures as well as pressure. Again they contain layers which is typical of many (not all) metamorphic rocks.

Match the rock with the correct description.
Give an example of this type of rock.

<u>Rock type</u>		<u>Description</u>
intrusive igneous	→	Large crystals, hard rock
metamorphic	↗	Sandy texture, soft rock
extrusive igneous	→	Small crystals, hard rock
sedimentary	↘	Wavy layers of crystals

Crack the code! What should this really say?

- (Weathering) leads to fragments collecting in the sea and forming (sedimentary) rocks such as chalk, (mudstone) and (sandstone).
- Heat and (pressure) can lead to (metamorphic) rocks such as (slate) and (marble)
- Some of these will melt and eventually cool as they approach the surface to form (intrusive) (igneous) rocks such as (granite)

What layer of the Earth is around 50Km thick and high in silicon and oxygen?

1. Inner core
2. Outer core
3. Mantle
4. Crust

What layer of the Earth is mostly molten iron and nickel?

1. Inner core

2. Outer core

3. Mantle

4. Crust

What layer of the Earth is made of viscous semi-molten magma?

1.Inner core

2.Outer core

3.Mantle

4.Crust

What type of rock is formed by solidification of molten magma?

1. Igneous

2. Metamorphic

3. Sedimentary

4. Fossilised

What type of rock is formed by cementation of small particles of weathered rock?

1. Igneous
2. Metamorphic
3. Sedimentary
4. Fossilised

What type of rock is formed by the effect of heat and pressure upon other rocks?

1. Igneous

2. Metamorphic

3. Sedimentary

4. Fossilised

What type of rock is least likely to contain fossils?

1. Igneous

2. Metamorphic

3. Sedimentary

4. Fossilised