

Chapter 1

The Earth's Structure

KEYWORDS

- › the Earth
- › mantle
- › oceanic crust
- › lithosphere
- › core
- › crust
- › continental crust
- › asthenosphere

LEARNING OBJECTIVES

By the end of this chapter, you should be able to understand:

- › The internal structure of the Earth
- › The make-up of the crust.

The Earth's layers

The Earth is about 4.6 billion years old. It was formed from a large cloud of dust and gas. This cloud gradually cooled, shrank and solidified to form the planet that we have today.

As the Earth cooled, the heavier materials, such as iron and nickel, sank to the centre. The lighter, rocky materials floated upward. Due to this, the Earth is made up of a number of different layers.

The Earth's crust

There are two different types of crust: thin oceanic crust under the oceans and thicker continental crust under the continents. They differ in age, thickness and the minerals they are made of.

Oceanic crust

- › **Oceanic crust** is 6–10 km thick.
- › On top is a thin blanket of sedimentary rocks. It consists of sands, clays and shells.
- › Beneath this blanket, the oceanic crust contains ancient, heavy igneous rocks such as basalt.
- › The rocks of the oceanic crust are often referred to as **sima**. This is because the most abundant minerals in it are silica and magnesium.

ACTIVITY

Skills

Examine Figure 1.1. Identify each of the following layers:

- (i) The hottest layer
- (ii) A fully solid layer
- (iii) The widest layer.

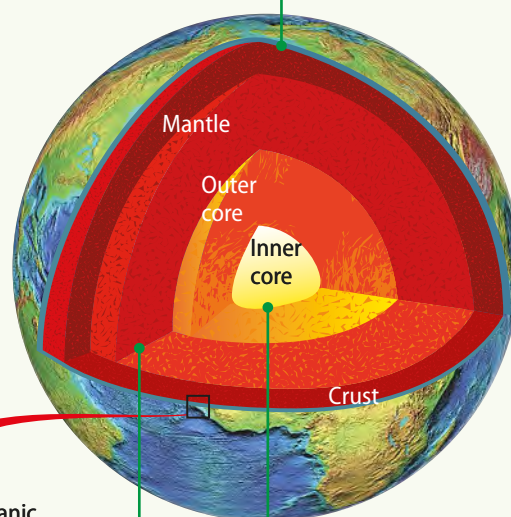
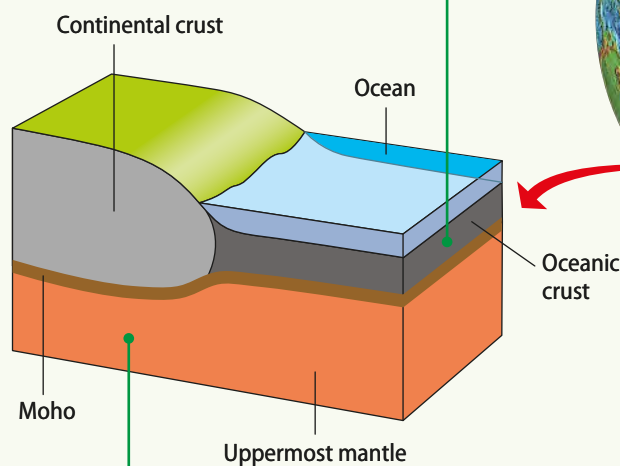
GEOFACT

If the Earth was the size of a football, the crust would only be about 0.5 mm thick.

Crust

The outermost layer, made of solid rocks and minerals, is called the crust. It consists of two zones: oceanic crust and continental crust.

The crust is broken into sections called plates.



Mantle

The mantle makes up over 75% of the Earth's volume and consists of several layers of rock.

It is rigid at its uppermost section (see Figure 1.3). As it goes deeper, it varies from semi-molten to molten. Thus, it is able to flow.

Core

The core is made up of two sections: a liquid outer core and a solid inner core. Both consist of iron and nickel. Each core is also extremely hot, with temperatures ranging up to 6,000°C.

The **outer core** is in a molten or liquid state. The **inner core** is solid because it is under intense pressure.

Figure 1.1 The structure of the Earth

Continental crust

- **Continental crust** varies in thickness. It is 30 km thick where the continents have been stretched and over 60 km thick in the mountain belts where the continents have been squashed together.
- It is made up of younger, lighter rocks such as granite.
- The rocks of the oceanic crust are often referred to as **sial**. This is because the most abundant minerals in it are silica and aluminium.
- The continental crust does not begin at the coastline, but in ocean water far beyond the shore. This submerged area of continental crust is known as the **continental shelf**.

DEFINITIONS

The boundary where the crust meets the uppermost mantle is called the **Moho**.

Continental shelf: The edge of a continent that lies under relatively shallow water. The shelf descends towards the ocean floor by the continental slope.

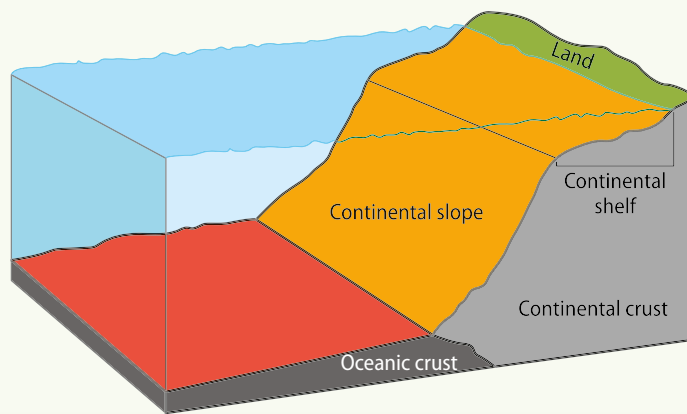


Figure 1.2 The continental crust stretches out past the shoreline. It extends under the ocean as far as the edge of the continental shelf and the continental slope.

ACTIVITY

Research

Look up images of the continental shelf in Europe on the internet.

The lithosphere

The **lithosphere** is the solid, outer part of the Earth.

- › It is composed of the crust and upper section of the mantle.
- › It forms a solid and relatively rigid shell, averaging about 100 km in thickness.
- › The rocks here can bend but they cannot flow.

The **asthenosphere** is the section of the mantle that is found just below the lithosphere.

- › The rocks here are hotter and have partially melted. This gives them the texture of putty.
- › As a result, they are able to flow, setting the lithosphere floating on them into motion.

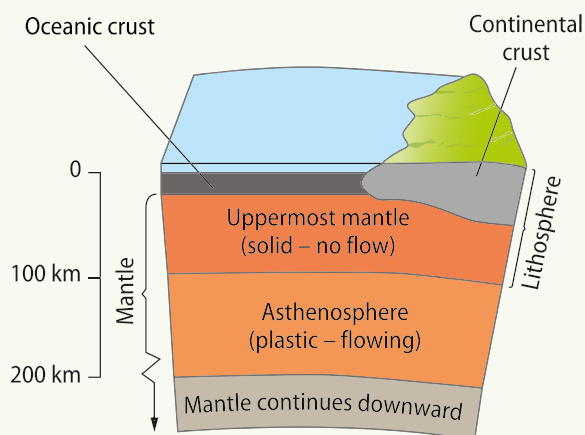
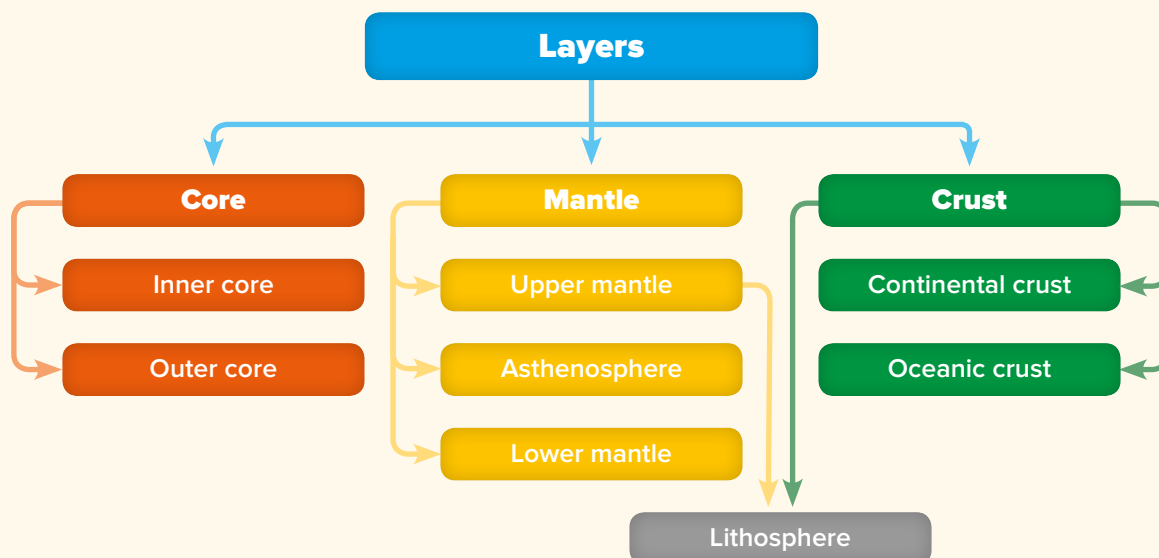


Figure 1.3 The lithosphere consists of the crust and the uppermost layer of the mantle

SUMMARY CHART



Leaving Cert exam questions

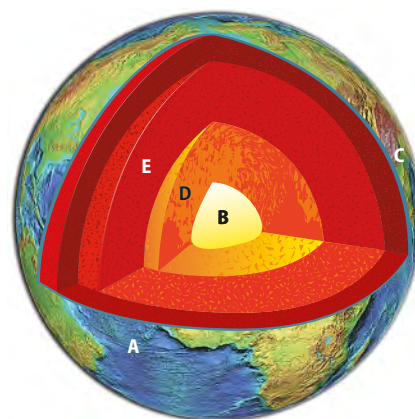
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SHORT QUESTIONS: HIGHER LEVEL

1 Structure of the Earth (8 marks)

Examine the diagram of the structure of the Earth. Match each of the following terms with its correct letter in the diagram.

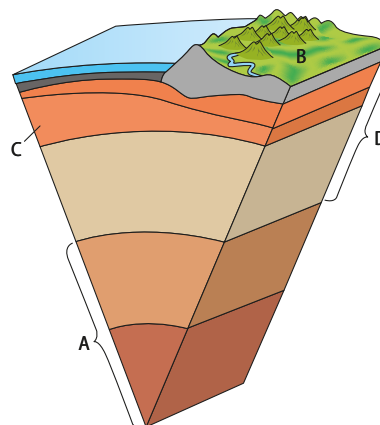
Mantle	E
Outer core	
Oceanic crust	
Continental crust	
Inner core	



2 Structure of the Earth (8 marks)

Examine the diagram of the structure of the Earth. Match each of the letters A to D with its correct name in the table.

Name	Letter
Mantle	
Asthenosphere	
Core	
Crust	

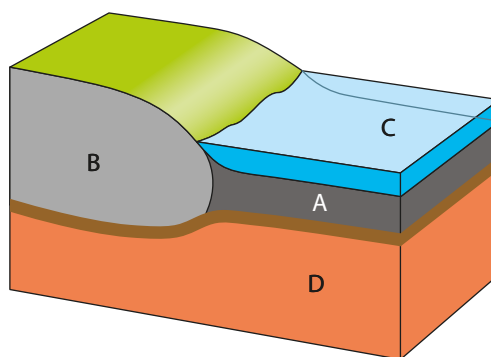


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3 Structure of the Earth (8 marks)

Examine the diagram of the structure of the Earth. Match each of the letters **A** to **D** with its correct name in the table.

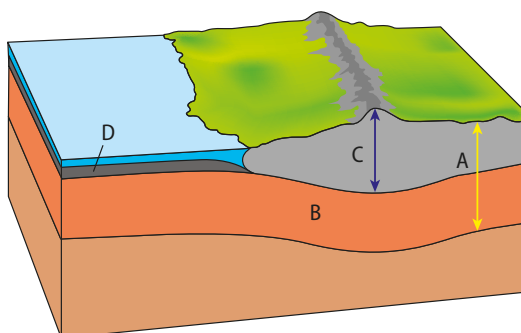
Name	Letter
Ocean	
Continental crust	
Upper mantle	
Oceanic crust	



4 Structure of the Earth (8 marks)

Examine the diagram of the structure of the Earth. Match each of the following terms with its correct letter in the diagram.

Name	Letter
Lithosphere	
Upper mantle	
Oceanic crust	
Continental crust	



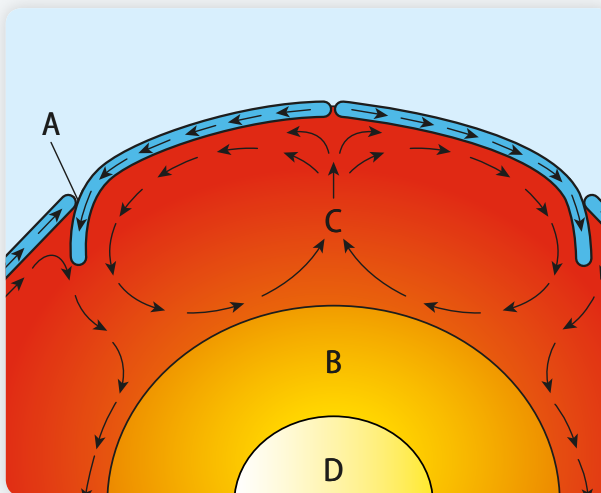
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SHORT QUESTIONS: ORDINARY LEVEL

1 Structure of the Earth (10 marks)

- (i) Examine the diagram and match each of the letters **A**, **B**, **C** and **D** with one of the terms in the table.

Term	Letter
Mantle	
Outer core	
Inner core	
Crust	



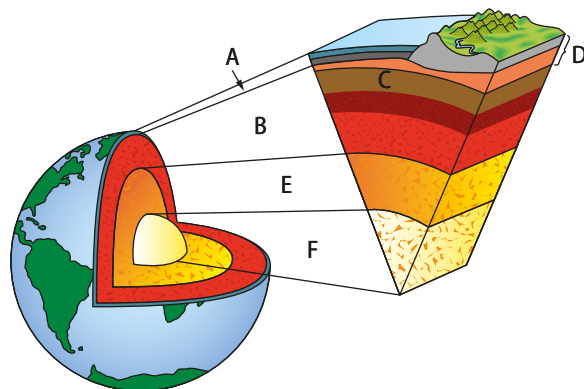
- (ii) Which letter shows the hottest layer?

HL

LONG QUESTIONS: HIGHER LEVEL**1 Internal structure of the Earth**
(20 marks)

Examine the diagram showing the internal structure of the Earth and answer each of the following questions.

- Name each of the layers of the Earth **A**, **B**, **C**, **D**, **E** and **F**.
- Describe briefly the main difference between the composition of layer **C** and layer **D**.
- Explain briefly why plates move.



OL

LONG QUESTIONS: ORDINARY LEVEL**1 Internal structure of the Earth**
(20 marks)

- Examine the diagram. Name each of the layers of the Earth labelled **A**, **B** and **C**.
- Explain briefly what is meant by the term *crust*.
- Describe **two** differences between continental crust and oceanic crust.

