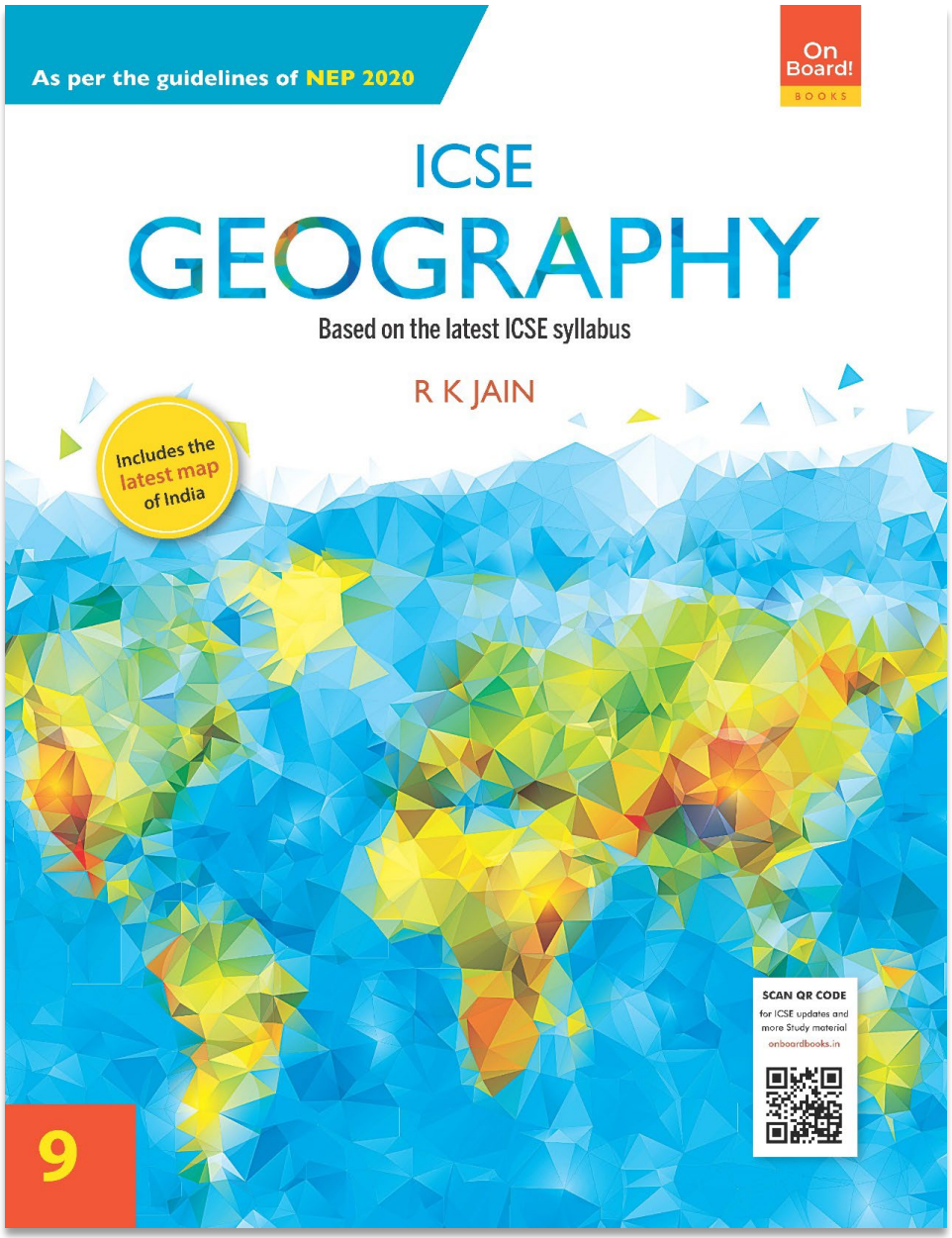
On Board!
BOOKS

On Board!

BOOKS


As per the guidelines of NEP 2020
On Board! BOOKS
ICSE
GEOGRAPHY
Based on the latest ICSE syllabus
R K JAIN
Includes the latest map of India
SCAN QR CODE
for ICSE updates and more Study material
onboardbooks.in
9

CONTENTS

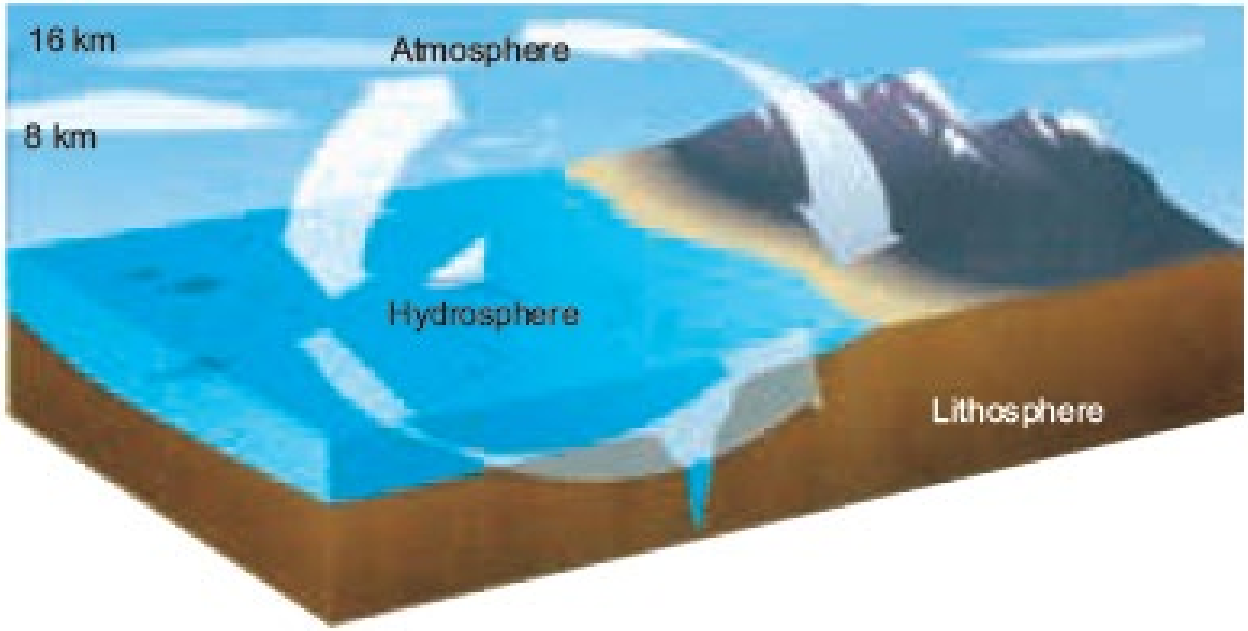
ICSE GEOGRAPHY

Class 9

Chapter 4: Structure of The Earth

The existence of life on the Earth is possible due to its three realms – land, water and air.

- The landmass is the solid realm, called the **lithosphere**. The lithosphere is the outer solid layer of the Earth. The Greek word **lithos** means rocks.
- The water bodies are the liquid realm, called the **hydrosphere**.
- The air around the Earth is the gaseous realm, called the **atmosphere**.
- The narrow zone of contact between land, water and air, where all forms of life exist, is called the **biosphere**.



The realms of the Earth

INTERIOR OF THE EARTH

The indirect sources of information to the interior of the Earth are:

1. Temperature inside the Earth,

2. Pressure inside the Earth,

3. Density of different layers of the Earth, and

4. Behaviour of earthquake waves.

Temperature inside the Earth

Hot springs and volcanic eruptions provide evidence of very high temperature inside the Earth. As we go down from the surface of the Earth to the interior of the Earth, the temperature increases at an average rate of about 1 °C for every 32 m of descent.

Pressure inside the Earth

The interior of the Earth is under a tremendous pressure from the outer layers. It does not permit the rocks in the interior of the Earth to reach the liquid state. The area around the centre of the Earth has probably acquired the properties of a solid due to the enormous pressure, from the outside layers.

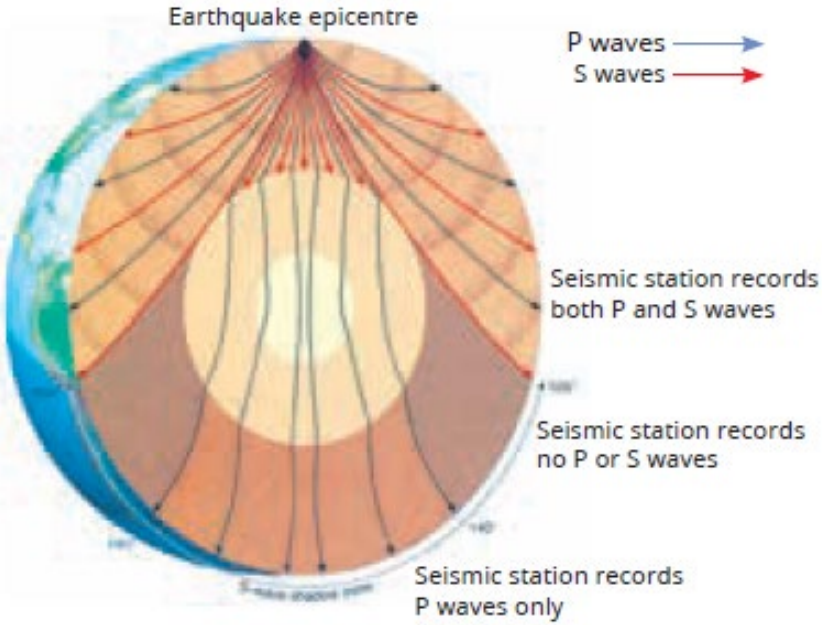
Density of different Layers of the Earth

The density of rocks increases slowly towards the centre of the Earth, because the area around the centre of the Earth has heavy metals like **nickel** and **iron**. Thus, the Earth has a layered structure with varying density of materials.

Behaviour of Earthquake Waves

The study of the behaviour of earthquake waves provides accurate information about the Earth's structure. The graphic recording of earthquake waves by a seismograph, shows that there are three types of earthquake waves. These are:

1. the longitudinal or primary waves (P waves),
2. the transverse or secondary waves (S waves), and
3. the surface or long waves (L waves).



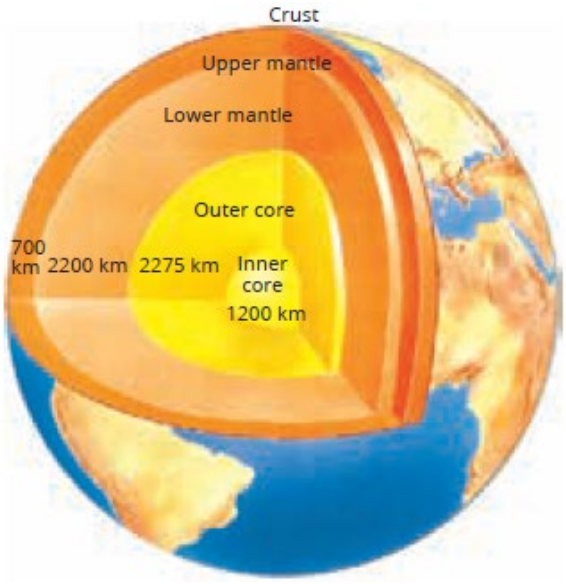
The behaviour of earthquake waves tells us about the structure of the Earth

The P and S waves can penetrate deep into the Earth, while the L waves travel along its circumference.

- The study of a seismogram reveals that the velocities of P and S waves increase with depth, up to about 2900 km below the surface of the Earth.
- The S waves do not pass beyond this layer. Actually the S waves cannot pass through a liquid.
- It was concluded that the Earth behaves like a solid up to a depth of about 2900 km from the surface.
- The inner part of the Earth, with a radius of about 3478 km, has the properties of a liquid.

LAYERS OF THE EARTH

On the basis of the study of earthquake waves, varying density and other physical and chemical properties of rocks, the Earth can be divided into three concentric layers – the **crust**, the **mantle** and the **core**. This arrangement can be compared to an onion with its layers, one inside the other.



The layers of the Earth

THE CRUST

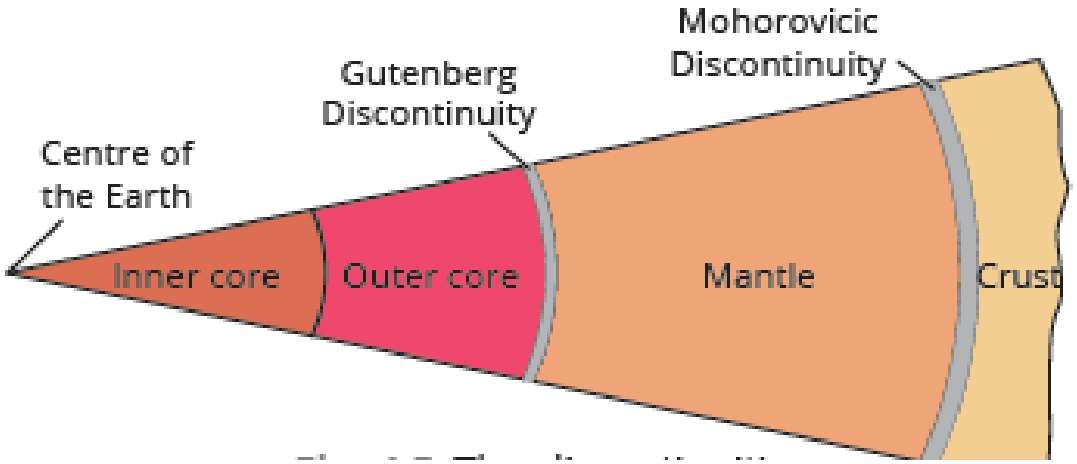
- The crust is the outermost solid layer of the Earth. It is also called the lithosphere, or rocky crust.
- The crust is a relatively thin layer with an average thickness of about 60 km (the average radius of Earth is about 6378 km).
- The crust comprises two parts – the upper part is the **continental crust** and the lower part is the **oceanic crust**.
- The main elements of the crust are **silica**, **aluminium** and **magnesium**.
- The upper continental layer is lighter (average density 2.5 g per cubic cm) and consists of silicates and aluminium (**SIAL**).
- The lower layer is dense (average density 3.0 g per cubic cm) and consists of silicates and magnesium (**SIMA**).
- The outer crust has valuable soils and provides us with most of the minerals.

THE MANTLE

- The mantle is a very thick layer and extends up to an average depth of about 2900 km.
- It lies between the crust and the core of the Earth.
- The boundary between the crust and the mantle is called **Moho** or the **Mohorovicic discontinuity**.
- The mantle is made up of dense and heavy materials such as oxygen, iron and magnesium.
- The pressure of the overlying layers, keeps the lower part of the crust and the upper part of the mantle in an almost solid state.
- If cracks appear in the crust, the pressure is released and the molten matter from inside the Earth tries to reach the surface through volcanic eruptions.

THE CORE

- The core lies below the mantle and is around the centre of the Earth. It is also called **barysphere** (which means heavy metallic rocks).
- The boundary between the mantle and the core is called the **Gutenberg discontinuity**.
- The core is sometimes divided into the inner core and outer core.
- The average diameter of the core is about 6950 km. The outer core is about 2275 km thick.
- The core is made up of heavy metals such as nickel and iron. Thus it is also known as **NIFE** (NI for nickel and FE for iron)

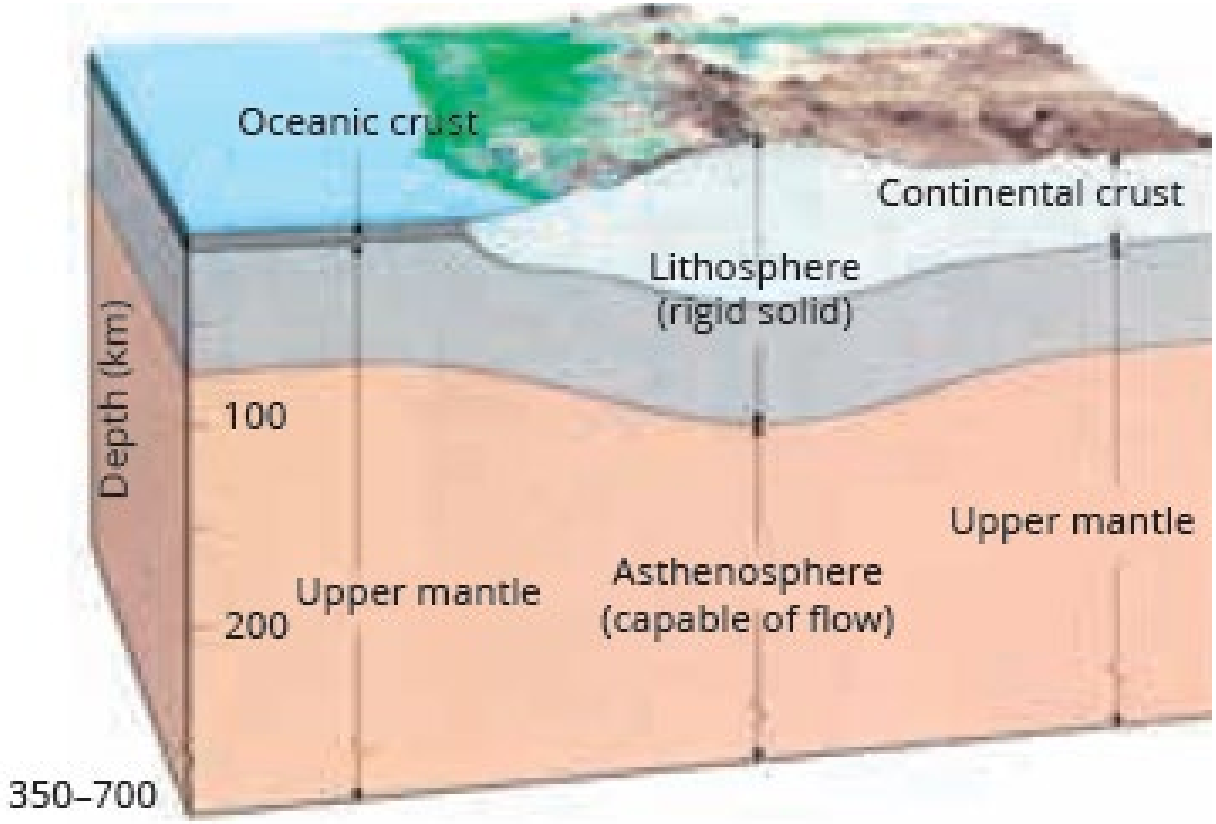


The discontinuities

- The average diameter of the core is about 6950 km. The outer core is about 2275 km thick.
- The core is made up of heavy metals such as nickel and iron. Thus it is also known as **NIFE** (NI for nickel and FE for iron).
- The average density of the core ranges between 5.0 g per cubic cm and 13.0 g per cubic cm. It increases towards the centre of the Earth.
- The temperature of the outer core is about 2200 °C while it may be as high as 5000 °C of the inner core.
- The outer layer is in molten state, whereas the inner core is firm and solid due to very high pressure.
- The presence of heavy metals and iron may be responsible for the Earth's magnetism.

The asthenosphere

The asthenosphere is the soft layer of the Earth under the lithosphere. The temperature of the Earth's interior increases with the increase in depth. About 100 km below the surface of the Earth, the temperature is about 1400 °C. This is enough to melt the material in the mantle. The molten rocks in the mantle flow slowly, creating a softer layer, about 200 km thick. This soft layer is called the asthenosphere. The rigid lithosphere floats on asthenosphere like ice in a pond.



The asthenosphere

THANK YOU