

## Class-6 (Science)

### Chapter-12

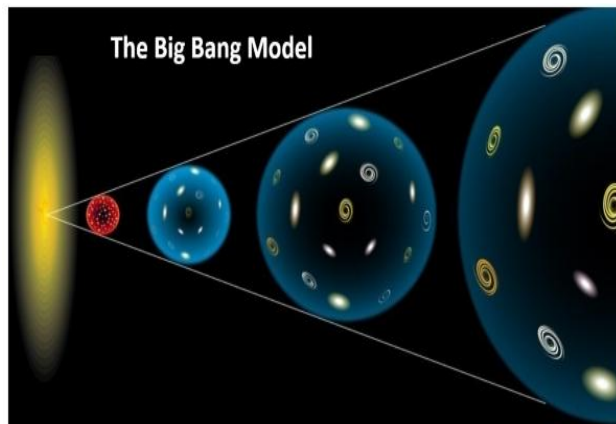
### Origin and formation of the earth

#### Origin of the universe and the earth

#### The Big Bang Theory



Vigorous explosion or Big Bang



Expansion of universe

The most widely accepted explanation is the Big Bang theory about the origin of the universe and the earth. The event of big bang took place approximately 13.7 billion years before the present. This theory states—

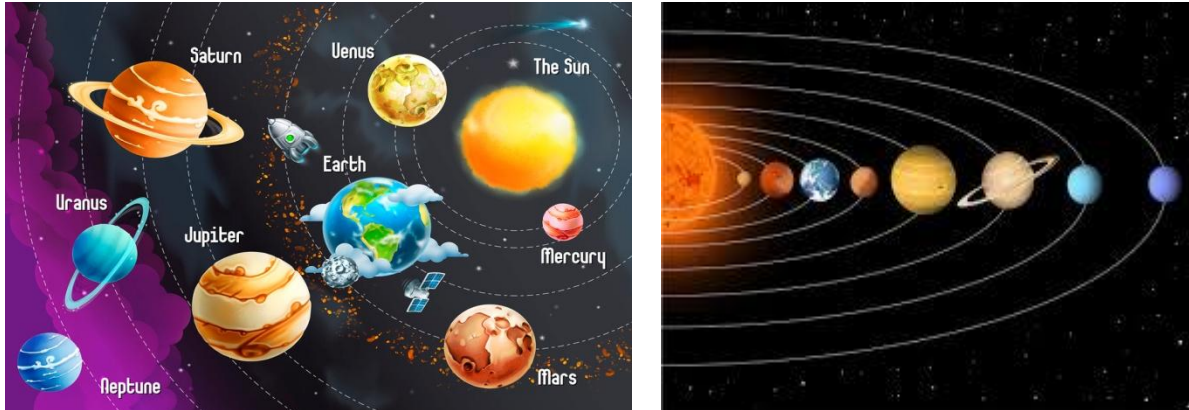
- In the beginning, all matter forming the universe existed in one place in the form of a lump of small but severely heavy and hot body.
- At the Big Bang this tiny body exploded vigorously and scattered in all direction. This explosion is called vigorous explosion.
- After the explosion a very small particle (singular atom) was converted into minute particles.
- This minute particle became a bit cool and came together to form the astronomical bodies (the sun and other stars).
- The universe was expanding more in course of time.
- The galaxy and the stars in space are moving away from one another and the universe is expanding till now.
- The energy, matters, space everything of the universe is created from this vigorous explosion or big bang.

#### How was the earth created?

When the sun was created then its remaining portion of small particles was floating in the space like dust particles. After millions of years of that these dust particles came together and the earth was created about four billion years ago.

## Solar System

All the revolved luminaries and the huge space around the sun is called solar system. The sun is the centre-point of the solar system. There are 8 planets, more than hundred satellites, thousands of asteroids and millions of comets in the solar system.



**Figure-Solar system**

## The identity of the sun, the earth and the moon

### Sun:

- The sun is one of the stars of Milky Way galaxy. Sun is a star because it has its own light. That's why sun is also called luminous object.
- The sun is a lump of burning gases. Hydrogen gases and other gases (mainly helium gas) held together in it due to gravitational forces. The atoms of hydrogen gas mixing with one another turn into the atoms of helium and produces huge amount of heat and light. Then that heat and light is scatted in all directions.
- The planets, satellites, comets etc. astronomical bodies orbit round the sun keeping it in the centre.
- The sun is 13 lac times greater than the earth.
- It is situated approximately 15 cores kilometers away from the earth, so it looks much smaller than its actual size.

### Earth:

- The earth is one of the eight planets of the solar system.
- It orbits round the sun keeping it in the centre.
- It is the third closest planet to the sun.
- The shape of the earth is like a sphere.
- There are various gaseous substances in the earth.
- The earth cannot produce heat and light like sun. That's why the earth depends on the sun for light and heat.

- The earth is the only planet in which there are atmosphere and temperature necessary elements for the survivals of the plants and animals in the world.

### **Moon**

- The moon is the only natural satellite of the earth.
- The moon orbits round the earth keeping it in the centre. The moon takes 27 days 8 hours to orbit the earth once.
- The moon itself cannot produce heat and light. It is a non-luminous object.
- The volume of moon is one-fifth of the earth.

### **Why does the moon appear to be luminous?**

The moon is a non-luminous object. It cannot produce heat and light itself. Originally the light from the sun fall on the moon and it is reflected and that's why the moon is seen to be luminous.

### **Why do the sun and moon appear to be of the same size?**

The sun is too far away from us, so it looks much smaller than its actual size.

### **Atmosphere:**

The gaseous segment which surrounds and covers the surface of the earth is the atmosphere implicated in the surface of the earth being attracted by the gravity and being rotated along with the earth.

### **Properties of atmosphere:**

- The atmosphere is mainly formed by nitrogen and oxygen.
- There are also water-vapour, dust particles, argon, methane, carbon-dioxide and some other gases in the atmosphere.
- The atmosphere near to the earth surface is denser because earth attracts gases towards it by gravity.
- The atmosphere will be lighter and thinner moving above the earth's surface.

### **Layers of atmosphere:**

Earth's atmosphere is divided into few layers. The first two layers are—

#### **Troposphere:**

- The atmosphere up to 11 kilometers from the earth surface is called troposphere.
- It is the most essential level for human beings, because gases, moistness, clouds, fogs, rains, Steams of air, etc. are noticed in this layer.

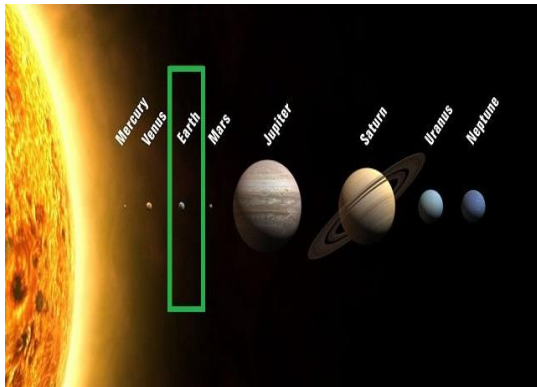
#### **Stratosphere:**

- The atmosphere up to 39 kilometers from the end of troposphere is called stratosphere.
- It is extended up to 50 km from the earth surface.

- This layer contains a gas named ozone which protects living beings from the injurious rays (ultra-violet rays) of the sun.
- There is a very small amount of gases.

**Why the earth is suitable for habitation of living beings?**

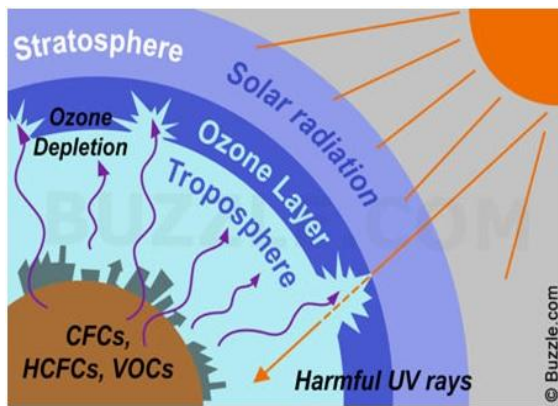
There are many factors which are responsible for the existing life on the earth are discussed below:



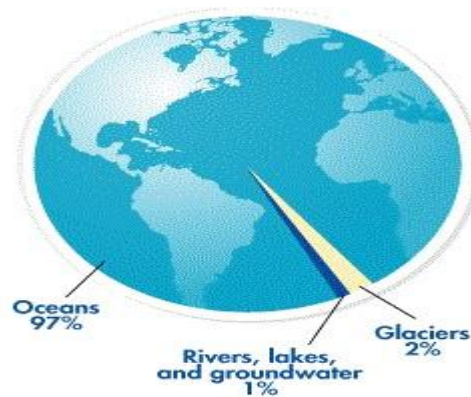
Distance of the earth from the sun



Importance of earth's atmosphere



Importance of ozone layer



Presence of water

- At the time of cooling down of the earth, the heavy particles went towards the centre and light particles remained near the surface of the earth. Gaseous substances such as carbon dioxide, water vapor, methane, nitrogen, etc. formed the atmosphere. The atmosphere plays a vital role in order to help all creatures live in the earth. The air content of carbon dioxide on the earth is less than that of planets like Venus and Mars. Hence, the less air content of carbon dioxide helps to moderate the earth's temperature and is absorbed by plants during photosynthesis to produce oxygen. The increased amount of oxygen and nitrogen in the atmosphere are essential for plants and animals.

- Ozone gas makes a level in the atmosphere which protects living beings from the injurious rays (ultra-violet rays) of the sun.
- Water is very important for life. The earth is covered by three-fourth of the water. Earth is the only planet which hosts liquid water on its surface. It has unique surface which neither too hot nor too cold.
- Earth is the only planet that uses the sun's light as a source of energy. The distance of the earth from the sun makes it a perfect reason for the life because it receives the perfect amount of heat and light to allow life to be created and to support it.

## Oceans

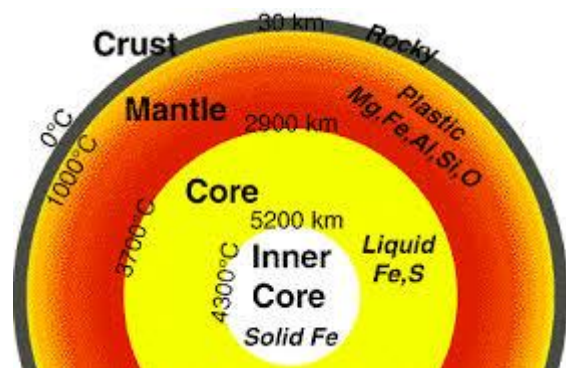
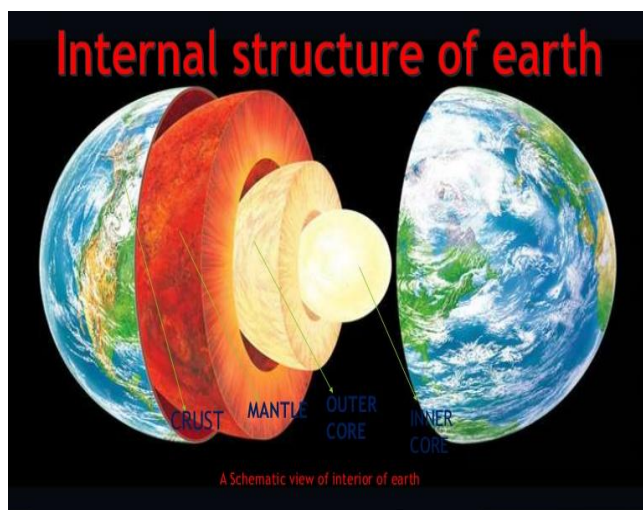
There are five oceans in the earth surface. The names of them are—

- The Pacific Ocean
- The Atlantic Ocean
- The North Ocean
- The South Ocean
- The Indian Ocean

## How are the rivers created?

Generally ice melted water and rain water flows down creating rivers. The Himalayan range of mountains is situated to the north of our country. A huge amount of ice accumulates on the top of this mountain-range. When this ice melt, water comes down alongside the mountain and a narrow river is created. The river becomes wider when more rain water is added to this. There is excessive rain fall in Nepal, India, Bhutan and Bangladesh. The rivers created in the Himalayan range are responsible for bringing the rain water. So the rivers such as the Padma, the Jamuna and the Meghna are very large and wide.

## The internal formation of the earth



The Geologists have divided the interior structure of the earth into three layers:

### 1. Lithosphere:

- Below the earth's surface lies the solid layer covering the interior portion of the earth known as lithosphere.
- The lithosphere may spread up to 100 kilometers below the earth's surface.
- The upper portion of lithosphere is known as earth crust.
- The three-fourth portion of the earth-crust is covered by water and only one-fourth is covered by dust particles or stone chips or soil.
- The lithosphere is divided into many separate plates.
- The mentionable elements of the lithosphere are oxygen, silicon, aluminium, iron, calcium, sodium, potassium, etc.

### 2. Mantle:

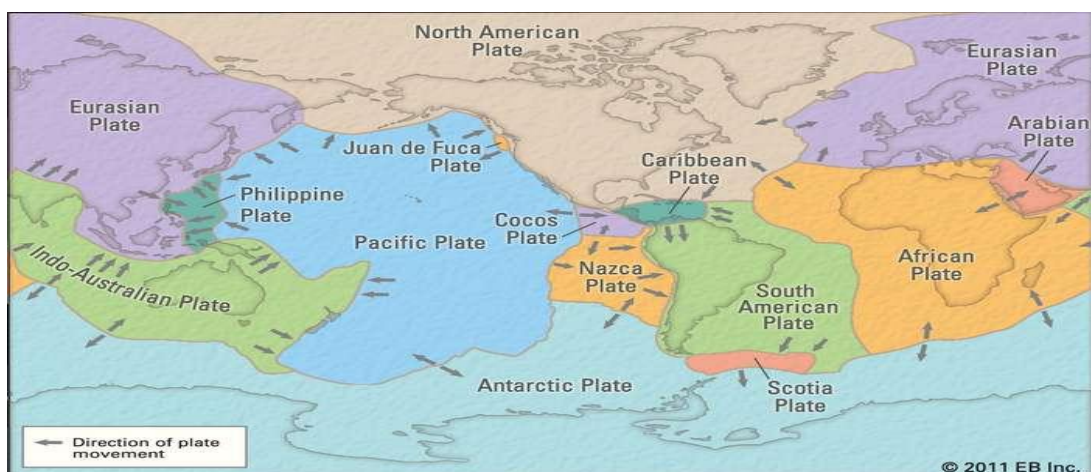
- In the middle of lithosphere and centrosphere there is mantle zone.
- Major portion of mantle is solid.
- But some portion of it is semi-liquid or half-melted state.
- Melted lava springs out by volcanic eruption from mantle.
- It contains heavy metals like silicon and magnesium.

### 3. Centrosphere or core:

- The spherical layer of about 3500 kilometers radius from the centre of the earth is the centrospheres or core.
- The core is composed of some heavy metals like nickel, iron, lead, etc.
- The centrospheres or core is divided into two parts, a solid inner core composed of solid metals and a liquid outer core composed of melted metals.

### Plate Tectonic Theory

Plate tectonics theory dealing with the dynamics of Earth's outer shell, the lithosphere by providing a uniform context for understanding mountain-building processes, volcanoes, and earthquakes and this theory is accepted by all to a great extent.



**Figure-** Earth's tectonic plates

The basic conception of this theory is based on the findings that—

- The lithosphere below the earth is separated into many portions or parts. These are called plates.
- These plates are in floating condition over a region of mantle zone.
- These plates are displaced by few centimeters per year toward any direction and interact along their boundaries.
- Sometimes, these plates move away from one another or diverge causing continents to fracture and oceans to form.
- Plate motions cause mountains to rise where plates come close to one another or converge. And these mountain and high hill areas become more prone to earth-quake and volcanic eruption.
- Even sometime plates move up or down by few millimeters per a year.

### **Magma:**



During volcanic eruption the substances inside the earth get melted due to the excessive heat and this melt substance gashes out from below the earth's surface due to the pressure. This split, melted and hot liquid or semi-liquid substances (rocks) are known as magma.

### **Soil and its importance**

- Soil is the loose soft surface material of the earth consisting of organic matters, minerals, gases, liquids, and organisms that together support life.
- Soil provides a substrate for plants (roots anchor in soil), a source of food for plants, and a home for many animals (insects, spiders, centipedes, worms, burrowing animals, bacteria, and many others).
- There are minerals in the soil which are used for different purposes.

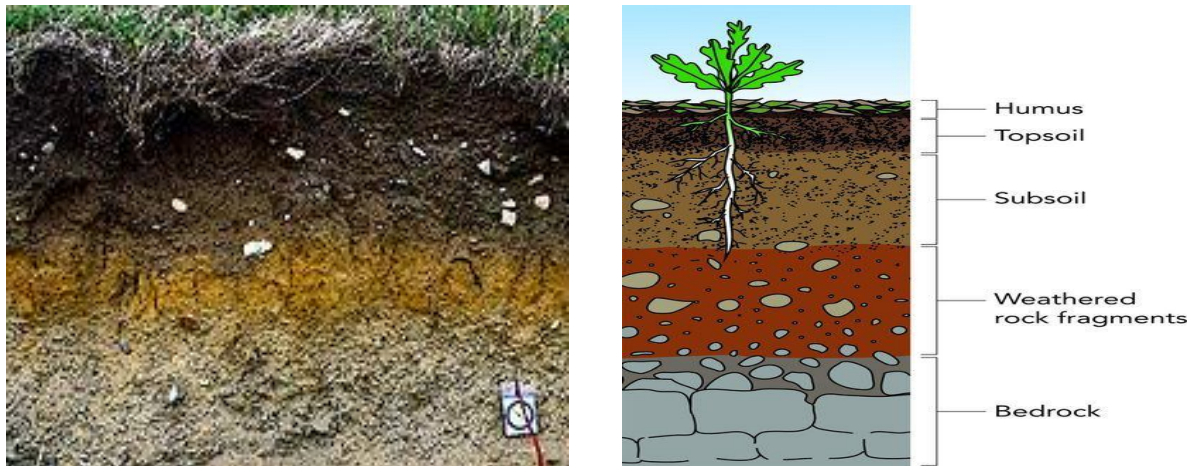
## Soil formation process

Soil is formed by stone, stone chips, dust particles, sands, mud, etc. mixed with the remains of plants and animals. The earth-crust is formed by the solids known as rocks. Generally the soft soils are formed from the hard rocks in two phases:

**First phase:** For an extended period of time hard rocks and minerals are converted to minute particles due to heat, rain, cyclone, earth-quake, etc. Moreover these small rock particles are concentrated at one place from another due to the flow of wind, ice, water and volcanic eruptions.

**Second phase:** With the minute particles of rocks and minerals water, air, small living creatures like bacteria and remains of plants and animals get mixed up to form soil.

## Layers of soil:



**Figure-** Layers of soil

The soil is arranged in layers during its formation. It is the vertical section of the soil that is exposed by a soil pit. The layers of soil can easily be identified by the soil colour and size of soil particles. Each layer of soil has distinct characteristics:

- The top layer is called topsoil. In this layer of soil remains of plants and animals are mixed up. Humus is found more in the upper layers of the soil. The black or non-bright elements formed due to the mixing of plant and animal ruins are called humus. Plants get their essential nutrients from the humus. This layer also contains mineral particles. Seeds germinate and plant roots grow in this dark-colored layer.
- The second layer is called subsoil. In this layer humus decreases, for this it is less black and looks brighter to some extent. It contains clay and mineral deposits that it receives from layers above it when mineralized water drips from the soil above.



- The third layer is called regolith or parent rock. This layer is originally formed by minute rock particles. Plant roots do not penetrate into this layer; very little organic material is found in this layer.
- The lowest layer is formed by bed-rock alone. It is a compacted and cemented layer. Different types of rocks such as granite and limestone are found here.
- In the coastal regions, the upper portion of the soil is formed by alluvial soil. The flood water carries alluvial soil to these lands. The upper layer of the soil in those places does not grow that sterile. This soil is suitable for cultivation.

### **Minerals**

The naturally occurring inorganic compounds of metals and non-metals which are generally mixed with other matter such as sand, soil, etc. are known as minerals.

[Inorganic means that it is not made of anything that was ever living.]

Minerals are most commonly associated with rocks due to the presence of minerals within rocks of earth-crust.

### **Uses of minerals**

Many minerals of essential metals and nonmetals are available in nature from which corresponding metals and nonmetals are extracted and used for various purposes. Some important metals found in the soil as minerals are iron, aluminium, copper, silver, gold, zinc, etc.

- Limestone is used as a raw material for manufacturing cement.
- The rods used to construct buildings are made from iron.
- Cars, buses, launches, etc are made of iron.
- Tube wells, plough share, nails, machineries, etc. are also made from iron.
- Some cooking utensils (pots, spoons, etc.) are made from aluminium.
- Electrical wires are made of copper.
- Ornaments are made of silver and gold.

### **Fossil fuels**

The ruins of plants and animals of ancient periods which are found underground are called fossil fuels. They are produced from the fossilized remains of living beings and dug out of the earth later.

Examples- Coals, petroleum and natural gas that we use as fuels are found as fossils under the earth's surface.

## **Uses of fossil fuels**

- The heat produced by burning these fuels is used to run mills and factories, public transports, and to produce electricity.
- Cooking is done with these fuels.
- Urea fertilizer is produced from natural gas.
- Polythene is produced from petroleum.
- Many other necessary materials are prepared from the fuels.

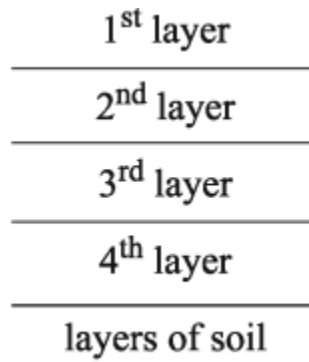
## **Why coal, petroleum and natural gas are not minerals?**

Coal, petroleum and natural gas are organic substances, specifically the remains of animals and plants body of ancient periods which are known as fossil fuels. Since these come from something that were once living these do not qualify as minerals. Though these substances are found underground, these are not inorganic and that's why these are not minerals.

## **Questions**

1. State the Big Bang Theory.
2. How was the earth created?
3. What is solar system?
4. Write down a short note on the sun.
5. How is the sun produced heat and light?
6. Why does the moon appear to be luminous?
7. What is atmosphere?
8. Describe the properties of troposphere and stratosphere.
9. Where do we find excessive rainfall?
10. Describe the interior structure of earth.
11. Why the earth is suitable for habitation of living beings?
12. Describe the Plate Tectonic Theory.
13. What is earth-crust?
14. Why does the volcanic eruption occur?
15. What are the reasons behind earth-quake?
16. What is magma?
17. What is soil? Give its importance in short.
18. What is rock?
19. What are minerals? Mention some uses of them.
20. What are fossil fuels? Mention some uses of them.
21. Why coal, petroleum and natural gas are not minerals?

**Creative question:**



- a) What are fossil fuels?
- b) Why coal, petroleum and natural gas are not minerals?
- c) Describe the process of formation of soil from hard rocks.
- d) Describe the four layers of soil mentioned in the above stem figure.

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