

## 4. STRUCTURE OF OCEAN FLOOR

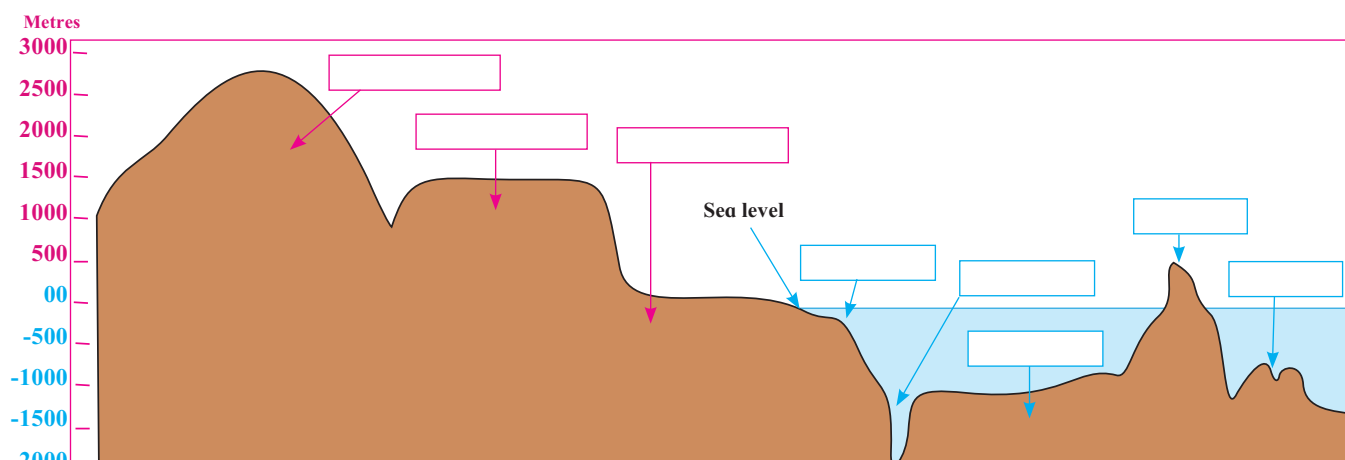


Figure 4.1 : Various landforms



### Can you tell?

- Continents and oceans are a part of the lithosphere and hydrosphere respectively.
- Continents and oceans lie on plates
- During low tides, the level of ocean water goes down and the land below the water near the coast is exposed.
- Ships wreck when they strike against the rocks in the ocean.

If the above points are correct, then select the most appropriate option from the following:

- ❖ The surface of the earth is occupied by land and water
- ❖ There is land below the ocean too.
- ❖ Even if the water has the same level, the land submerged is not even.
- ❖ The level of water and land is uneven.

Discuss in the class regarding the choice of your options. Know from your teachers about the correct option.

### Geographical explanation

We know that the proportion of water and land is uneven on the earth. Around 71% of the surface is covered by water but there is land even below this water. But like water, it is not at the same level.

We classify the various landforms on the earth on the basis of altitudes. A similar classification can be done for landforms submerged under the water.



### Think about it.

If the classification of landforms on land can be done on the basis of altitude and size, then how can the landforms submerged under water be classified?



### Can you tell?

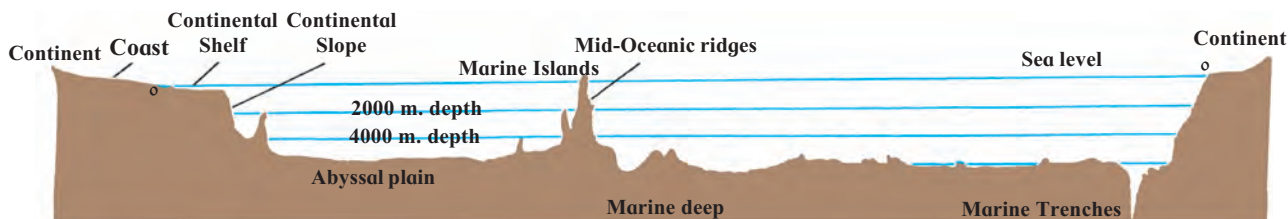
- Try to name the landforms shown in figure 4.1
- What parameters were used for classifying the landforms on the earth?
- What parameters were used for naming the landforms below water?

### Geographical explanation

#### The Relief of Ocean Floor :

Land submerged below oceanic water is called the **ocean floor**. The relief of ocean floor is decided upon by the depth from the sea floor and the shape of the land there.

The average depth of the oceans is around 3700 metres. The ocean bed is also uneven like the land on the continents. The ocean floor



**Figure 4.2 : Ocean relief**

relief consists of all submerged landforms. The structure of the ocean floor differs from ocean to ocean. We will look at the sequence of landforms and the details of major landforms on the ocean floor. As we go away from the coast, the structure of the ocean floor changes. Study the explanation below and figure 4.2 together.

**CONTINENTAL SHELF :** The land near the coast and submerged under the sea is called continental shelf. This is the shallowest part of the ocean bed. It is also called submerged coastland. Its slope is gentle.

The extent of the continental shelf is not uniform everywhere. It is narrow along the coasts of some continents while it is broad for hundreds of kilometers at others. Its depth is upto 200 meters below the sea level.

The continental shelf is very important from the point of view of humans. Extensive fishing grounds are found in the continental shelf. As this part is shallow, the sunlight reaches its bed. Algae, plankton, etc. grow here. This is food for fish. Natural gas, mineral oil and various minerals can be obtained by mining the continental shelf. For example, Mumbai High located on the continental shelf of the Arabian Sea. It is a source from where we obtain mineral oil and natural gas.

**CONTINENTAL SLOPE :** After the extent of continental shelf is over, the slope of the sea bed becomes steeper. This is called continental slope. The depth of the slope is from 200 m to 3600 metres. In some places, it is more. The continental slope is narrow. The lower boundary of continental slope is considered to be the boundary of continents.

**ABYSSAL PLAINS :** Beyond the continental slope lie the abyssal plains which are the flat part of the sea bed. The abyssal plains consist of various submerged landforms like hills, plateaus, etc

**MOUNTAIN RANGES AND PLATEAUS :** The hills and mountains found on the ocean-bed are called **submerged hills and mountains**. These hills are hundreds of kilometers wide and thousands of kilometers long. Peaks of some of the submerged hills come above the sea level. They are visible to us as marine islands. Iceland in the Atlantic Ocean, Andaman and Nicobar Islands in the Bay of Bengal are examples.

The summits of some marine islands are flat and extensive. They are called oceanic or submarine plateaus. For instance, Chagos Plateau in the Indian Ocean.

**MARINE DEEPS AND MARINE TRENCHES :** On the ocean-bed, there are some landforms which are deep, narrow and steep. They are called marine deeps or trenches. Generally, the shallower ones are called marine deeps while deeper ones and extending for longer distance are called trenches. The trenches are thousands of meters deep from the sea level. The Mariana Trench, in the Pacific Ocean, is the deepest trench in the world. Its depth is around 11034 metres. The mid-oceanic submerged hills and marine trenches are geologically the most active areas of the ocean-bed in the world. There are many active volcanoes here. These areas are also earthquake-prone areas. Earthquakes and volcanic eruptions occurring in the ocean-bed give rise to tsunamis in the nearby coastal areas.

### **MARINE DEPOSITION :**

The marine-beds are the deep parts of the world in respective regions. Hence, various deposits are found in these parts. The deposits are as follows:

- (1) Pebbles, clay, soil etc. brought by rivers, glaciers, etc. from the continents.

The deposition occurs mainly on the continental shelf. These are called **marine deposits**.

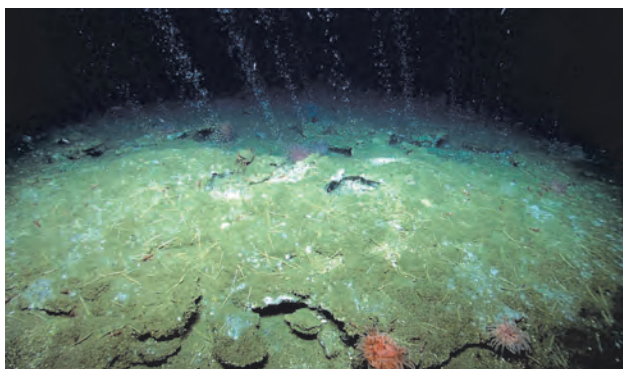
(2) Lava and ash erupting out of volcanic eruptions is also found here. Fine soil particles are deposited on a large scale. Remains of marine plants and animals are mixed in these deposits. This mixture is made up of fine particles and lies in the form of fine clay. This is around 30% of the deposits. These are called **marine oozes**. To understand the form of the marine life in the ocean and the availability of minerals on the ocean bed these deposits are

very important. Sedimentary rocks are formed due to the depositing of layers over layers of the sediments and the pressure of sea water.

(3) Besides, some human-induced material is also found here. This includes sewage, solid waste, radio-active material, waste chemicals, plastics, etc. These wastes prove hazardous to the hydrosphere. These materials are extremely harmful to the marine life and its environment. Though the polluting components are less, their nuisance value is more.



**Figure 4.3 : Marine deposits**



**Figure 4.4 : Marine sediments**



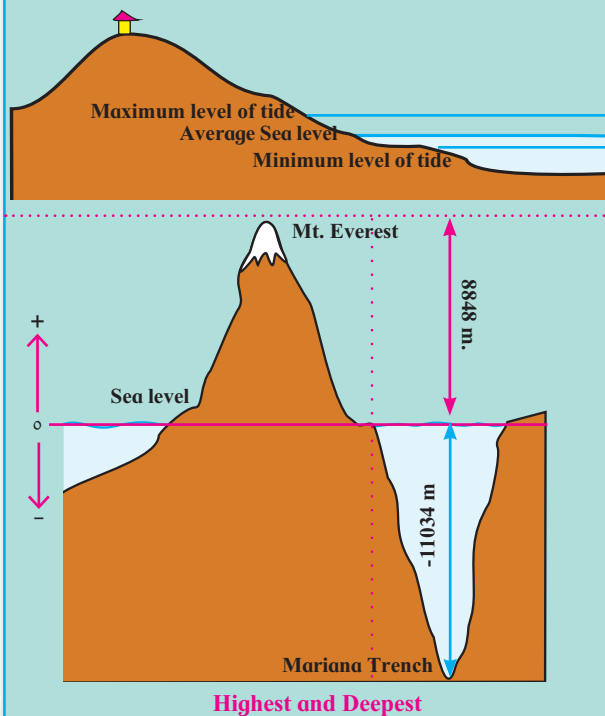
**Figure 4.5 : Anthropogenic deposits**



**Always remember -**

**Mean Sea Level :** Elevation or depth of any place is measured from the sea level. The average of the highest high tides and the lowest low tides is considered as sea level. This average is taken to be zero and altitudes or depths are measured and shown in positive or negative values. For example, Mount Everest is 8848 metres high and Mariana Trench is -11034 metres.

For survey purpose in India, the height of sea level at Chennai is considered to be zero and the elevation of any place in India is measured with reference to this.





### Give it a try.

- From the map of the ocean floor identify the ocean.
- Can you identify and name the submerged landforms shown in the diagram?
- Which region would be ideal for fishing and why?



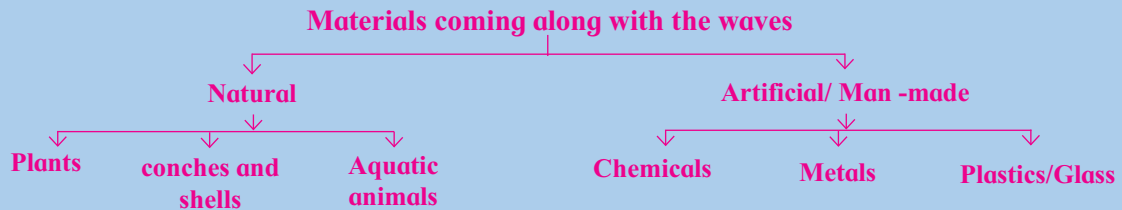
### Always remember -

Deposition of many materials coming from land keeps occurring in the seas and oceans. This is in the form of natural deposits and sediments. But, man disposes unwanted materials in the sea. This poses a hazard to the ocean bed and the sea-water. Also it is harmful to marine life. We must keep in mind that the biodiversity found in seas and oceans is higher than on the land.



### Use your brain power!

Do this activity when you go to the sea-shore with your parents or teachers. Observe the materials which have come with the waves. Classify them as per the flowchart given below:

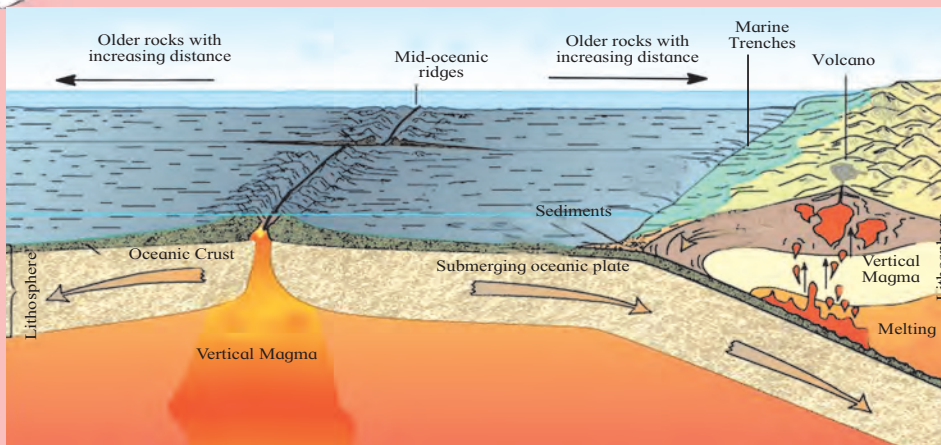


#### Answer the following:

- Which of these are perishable items?
- Which are non-perishable?
- What will happen because of perishable items?
- What will happen because of non-perishable items?
- Suggest measures to control deposition of non-perishable items on the coast
- How will you run a campaign of environmental conservation to keep the coasts clean?



### Do you know?



While studying the ocean floor, we must keep in mind the age of the ocean bed. By studying the deposits on the ocean bed, it occurred to the scientists that the deposits at the ocean floor are not older than 200 million years. The maximum age of the rocks on

the continents is supposed to be 3200 million years. Then where have the deposits on the sea bed which are older than 200 million years gone? This made the scientists restless. Then they started the study of the rocks along with the deposits. This made them realize that the

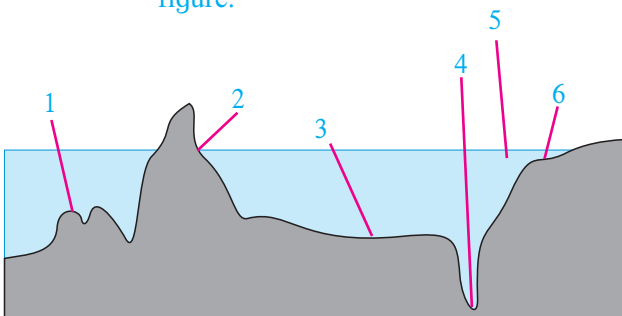
rocks are also not older than 200 million years. It was inferred that the ocean floor is very young as compared to the earth's surface. Now this is unanimously accepted. This research was then used in the study of the concept of plate tectonics.

## Exercises

### Q 1. Choose the correct option:

- (a) Like there are landforms on land, ocean floor also has submerged landforms because .....
- There is land under water
  - There are volcanoes under water
  - Land is continuous and there is water in deeper parts.
  - Though land is continuous, its level is not the same everywhere like that of water .
- (b) Which part of the ocean floor is most useful to the man ?
- Continental shelf
  - Continental slope
  - Abyssal plains
  - Marine deeps
- (c) Which one of the following option is related to marine deposits?
- Rivers, glaciers, remains of plants and animals
  - Volcanic ash, continental shelf, remains of plants and animals
  - Volcanic ash, lava, fine particles of soil
  - Volcanic ash, remains of plants and animals, abyssal plains

### Q 2. (a) Name the landforms shown in the figure.



- (b) Which of these landforms is useful for deep sea research?
- (c) Which of these are appropriate to be used for the protection of marine borders and naval-base building?

### Q 3. Give geographical reasons:

- The study of ocean floor is useful to man.
- The continental shelf is a paradise for fishing activity.
- Some marine islands are actually the peaks of sea mountains.
- The continental slope is considered to be the boundary of continents.
- The disposal of waste materials in the oceans by man is harmful to the environment.

### Q 4. Observe the map on Pg 27 in 'Give it a try' and answer the following questions:

- Madagascar and Sri Lanka are related to which landform of the ocean floor?
- Near which continent are these land forms located?
- Which islands in our country are examples of peaks of submerged mountains?

### ACTIVITY :

Prepare a model of the ocean floor.

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