

## **8**

# **EVOLUTION OF LANDFORMS DUE TO INTERNAL FORCES**

### **8.1 INTRODUCTION**

We live on an unstable earth, the surface of which is uneven. While travelling, we come across a variety of landforms such as mountains, hills, plateaus, plains, cliffs and ravines. We also come across tilted, broken and twisted layers of rocks which are originally deposited in horizontal forms. You have already studied about different types of rocks, their formation and characteristics. There is a close relationship between rock types and the shape of landforms. But all deformation on the face of the earth are due to the continuous struggle between internal and external forces. In this lesson, we will study about the internal forces deriving their strength from earth's interior and playing their role in shaping what we see on earth's crust :

### **8.2 OBJECTIVES**

After studying this lesson you will be able to :

- explain the endogenetic forces and the landforms produced by them ;
  - distinguish between sudden and slow movements ;
  - differentiate between vertical and horizontal movement;
  - differentiate between folding and faulting ;
  - explain the causes of volcanic activity ;
  - describe the different types of volcanoes ;
  - locate on the outline map of the world, important volcanoes and areas affected by earthquakes ;
  - explain the causes of earthquakes and their effects.
-

### 8.3 INTERNAL FORCES

The variety in the types of land forms on the earth is the end result of two types of forces working simultaneously and continuously both inside and outside on its surface. The forces which originate from within the earth's crust or inside the earth are called internal or endogenetic forces. The sources providing them energy are the internal heat, chemical reactions taking place within the earth, and the transfer of rock materials on the earth's surface by external forces.

### 8.4 EARTH MOVEMENTS

Though we generally hear people using phrase like "as hard as rock" and "as stable as the earth", but these phrases are not true. Neither the earth is stable nor are the rocks of which its crust is made, are so hard. Since the origin of earth, there have been major changes in the distribution of continents and oceans, the land and the oceans. The earth has experienced innumerable earth movements which have brought about vast changes in its surface. Some of the examples of these movements are submergence of forest in Bombay harbour, the Mahabalipuram temple now standing on the sea and changes in the ground level in Rann of Kutch in India.

The forces working from inside the earth in turn cause movements in its crust. These movements are called earth movements. Since, these movements pertain to or rise from, the movements of the actual structure of the earth's crust, they are also called tectonic movements. The word tectonic is derived from the Greek word, "tekton" which means builders. This word is true to its meaning because these are the earth movements which are constructional and have been responsible for buildings of different types of land forms.

From the figures 8.1. (a) and 8.1. (b) it is quite evident that the physiography of India was entirely different about 60 million years ago. The vast Tethys sea existed in that area where the Himalayan ranges and Indo-Gangetic plain exist. The Tethys sea was gradually filled up by the sediments brought by rivers from the surrounding regions. Later, the sedimentary rocks formed in the beds of this sea gradually enlarged in the form of the Himalayas in the north and Indo-Gangetic plain to its south.

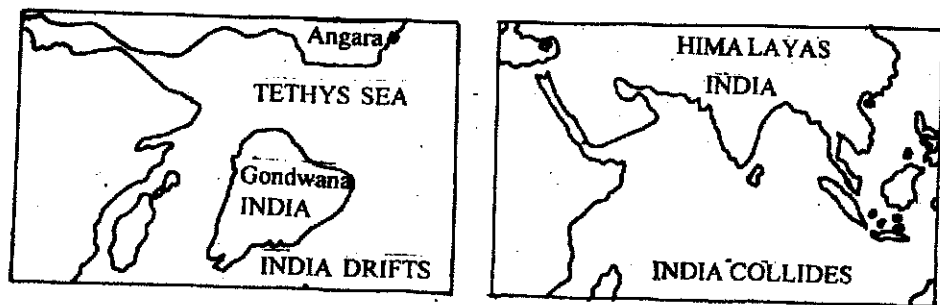


Fig. 8.1 (a) 60 Million Years ago Fig. 8.1 (b) Present configuration

The Malwa plateau and Deccan traps of India, Columbia and Snake Rivers Plateau of North America, Kimberley Plateau of Australia and Parana and Patagonian Plateaus of South America were also formed by the solidification of molten lava which had escaped from the earth's interior to its surface of different geological

times. The evidences clearly show that the surface of our earth never remained same as it is today and neither it will be the same in future.

- \* Movements caused by internal or endogenetic forces affecting the earth's crust are known as Earth Movements.
- \* Earth movements are also called tectonic movements as they help in building the relief features on earth's crust through subsequently or simultaneously undergoing changes.

### 8.5 CLASSIFICATION OF EARTH MOVEMENTS

The earth movements are classified on various basis. On the basis of time taken by such movements, they are divided into :

- (a) slow movement and
- (b) sudden movement.

#### (a) Slow Movement

The movement which bring about changes on the Earth's crust very gradually or slowly taking hundreds or thousands of years and which cover a period much longer than a human life span are called slow movements. These movements act on the earth's crust either vertically or horizontally. Acting vertically, they cause uplift or subsidence of a part of the crust. The raised sea-beaches along the Kathiawar coast of India which contain the shells of marine life clearly point out that this coast was once below the sea level. Similar raised beaches are found in Orissa, Andhra Pradesh, and Tamil Nadu along the eastern coast of India as well. These beaches have been uplifted to a height ranging between 15 to 30 metres above the mean sea level.

On the other hand there are numerous examples of submergence. Such as the presence of peat and lignite beds found below the sea-level in Sunderban Delta, the submerged forest in Tirunelveli in Tamil Nadu and the submerged forest on the east coast of Bombay Island.

Contrary to this, a change in sea level also takes place periodically due to alternating advance and retreat of continental glaciers and ice caps. The sea level rises with the advance of these glaciers and falls down with their retreat. Many times it can not be said whether the rise or fall in sea level is due to advance or retreat of the glaciers or due to uplift or submergence of coastal areas.

#### (b) Sudden Movements

Contrary to the slow movements, there are certain movements which bring about abrupt changes in the crust. The examples of such movements are volcanic eruptions, and earthquakes. The changes brought about by these two events are so sudden that the courses of rivers undergo a change, and the lava flow result in the formation of mountains, uplands and plateaus in a matter of days. Landslides occur in mountainous regions due to these movements.

- \* Sudden movements bring about abrupt changes on the earth's surface
- \* Volcanic eruptions and earthquakes are the result of sudden movements
- \* The movement which bring changes slowly and gradually over a long period of time are known as slow movement.
- \* Uplift, submergence and subsidence of the earth's crust are the result of slow movement.

### INTEXT QUESTIONS 8.1

1. Give geographical term for internal forces

2. Fill in the blanks

Landforms are the result of continuous work of

(a) \_\_\_\_\_ (b) \_\_\_\_\_ forces.

3. Fill in the blanks with appropriate word given in the brackets.

(a) Sudden movements bring \_\_\_\_\_ changes. (abrupt, gradual)

(b) Uplift of landmass is associated with \_\_\_\_\_ movements. (Sudden, Slow)

### 8.6 VERTICAL AND HORIZONTAL MOVEMENTS

The slow movements can further be divided into vertical and horizontal movements on the basis of the uplift or subsidence of a part of the Earth's surface.

#### (a) Vertical movements

Vertical movements originate from the centre of the earth and affect its surface. Consequently large scale uplift or subsidence of a part of the earth's surface takes place. These movements are slow and wide spread and do not bring changes in the horizontal rock strata. These movements are mainly associated with the formations of continents and plateaus, hence these are also known as continent building or plateau building movements. Besides, these movements are also called epeirogenetic movements. 'Epeiros' in Greek language means 'continent' In the previous lesson on rocks, you have studied that sedimentary rocks are deposited and formed in the oceans and seas. The presence of these sedimentary rock is wide-spread in continents. This clearly shows that these were uplifted or raised to form continents.

Contrary to the above, there are countless evidences of submerged buildings, river valleys and cities due to subsidence into the sea. Some of such examples include the submerged ancient buildings in Mediterranean in its Crete Island and the ancient city of Dwaraka in Saurashtra, India. These changes clearly point out the downward movement of the Earth's surface.

- \* Large scale uplift or subsidence create continents, plateaus and oceans.
- \* Vertical movements are also known as epeirogenetic movements.

### (b) Horizontal Movements

There are forces which act on the earth's crust from side to side i.e horizontally or tangentially. Naturally, they cause a lot of disruption in the horizontal layer of strata as they do involve a good deal of compression and tension of the pre-existing rocks since these forces act horizontally or tangentially to the earth's spherical surface. These are known as horizontal or tangential movements.

We can divide them into two types :

- (i) Forces of compression, and
- (ii) Forces of tension.

(i) **Forces of compression** involve pushing of the rock strata against a hard plane from one side or from both sides. To understand their working, let us take a piece of cloth and spread it on the table. Push the cloth with your both hands towards its centre, it will form wrinkles rising into up and down folds. Likewise rock strata also bend in the same fashion when forces of compression act on them from opposite directions. In this way, the compressional forces lead to the bending of rock layers and thus lead to the formation of fold mountains. In them the rock strata primarily of sedimentary rocks get folded, into wave like structure. This process of bending, sometimes warping and twisting of rock strata is referred to as their folding. The upfolds are called anticlines and downfold are called synclines. (Fig 8.2).

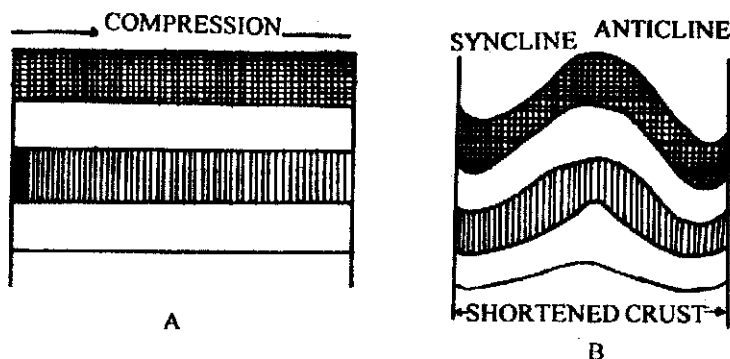


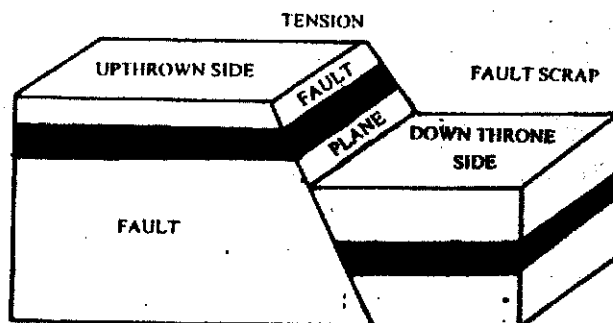
Fig. 8.2 The Earth crust before and after folding

When folding takes place on a gigantic scale, it represents the mountain building process. most of the great mountain chains of the world viz, the Himalaya, the Rockies, the Andes, the Alps and others of this sort have been formed by compressional forces result in mountain building on a large scale, these are also called Orogenetic Movements.

- \* Horizontal movements are produced by forces of compression and tension.
- \* Folding is the bending of rock strata due to compression.
- \* Upfolds are called anticlines and downfolds synclines.
- \* Folding on gigantic scale results in mountain building movement -generally referred as orogeny.

(ii) **Forces of tension** are produced when these forces are working horizontally in opposite direction i.e away from a given plane or point. Under the operation of intense tensional forces the rock strata is broken or fractured. As a result cracks and fractures developed. The displacement of rocks upward or downward from their original position along such a fracture is termed as faulting. The line along which displacement of the fractured rock strata takes place is called the fault line. Like wise the plane along which displacement of rock strata takes place is known as fault plane (Fig. 8.3)

- \* Forces of tension produce faults.
- \* The plane along which displacement of fractured rock strata takes place is called its fault plane.



*Fig. 8.3 A Fault*

Forces of compression give rise to the operation of the forces of tension. Thus faults are closely related to the formation and occurrence of folds. It implies that

folding generally leads to or is accompanied by fracturing and faulting in rock strata.

Faulting results in the formation of well known relief features such as rift valleys and the block mountains. A rift valley is formed by sinking of rock strata lying between two almost parallel faults. (fig 8.4). The classical examples of rift valleys in the world include the Midland Valley of Scotland, the Rhine Valley, the Valley of Nile, the Dead Sea basin and the Great Rift Valley of East Africa comprising few lakes of this region. Some geographers are of the opinion that the Narmada and Tapi valleys are also rift valleys. The coal deposits of the Damodar valley are said to be originally laid in a synclinal trough resembling a rift valley.

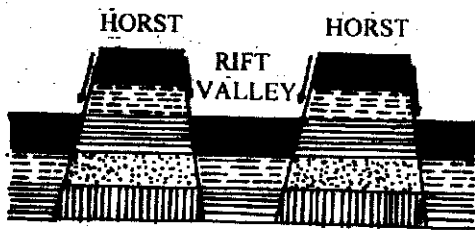


Fig. 8.4 A Rift valley and Block mountain

A rift valley is a trough with steep parallel walls along the fault lines. Such a valley is also called a graben. A rift valley may also be formed by upliftment of two blocks along the fault line. These uplifted blocks are called horsts or block mountains. The well known examples of horsts are the Vosges and the Black forest mountains on both sides of Rhine rift valley and the Plateaus of Palestine and Trans Jordan.

The escarpments (escarp-faces see Fig 8.3) are the characteristic features of rift valleys and horsts. They are very steep or have highly precipitous slopes in a continuous line facing one direction. The escarpments of Western Ghats ones looking the Arabian Sea are thought to be the result of faulting. The escarpments of Vindhyaal Mountain are also ascribed to the faulting and formation of narrow Narmada Valley.

- \* Faulting leads to the formation of rift valleys, horsts and escarpments.
- \* A rift valley is a trough with steep parallel walls along the fault line.
- \* A horst is a uplifted land mass with steep slopes on both the sides.
- \* An escarpment is a very steep slope in a continuous line along a fault.

## INTEXT QUESTIONS 8.2

(1) Name the earth movements caused by forces of compression.

(2) Give geographical term for mountain building movements.

(3) Fill in the blanks :

- (i) Forces of compression result in the formation of \_\_\_\_\_ in the horizontal rock strata.
- (ii) Compressional forces working on a gigantic scale give rise to the formation of \_\_\_\_\_ mountains.
- (iii) Upfolds of rock strata are called \_\_\_\_\_ and the downfolds are known as \_\_\_\_\_.
- (iv) A trough with steep parallel walls along its sides is called \_\_\_\_\_.
- (v) An uplifted landmass with steep slopes on both the sides is known as \_\_\_\_\_.
- (vi) Upward and downward sliding of rock strata along cracks is called \_\_\_\_\_.
- (vii) A rift valley is also called a \_\_\_\_\_.

### 8.7 VOLCANOES

A volcano is a vent or an opening in the earth's crust through which molten rock material, rock fragments, ash, steam and other hot gases are emitted slowly or forcefully in the course of an eruption. These materials are thrown out from the hot interior of the earth to its surface. Such vents or openings occur in those parts of the earth's crust where rock strata are relatively weak.

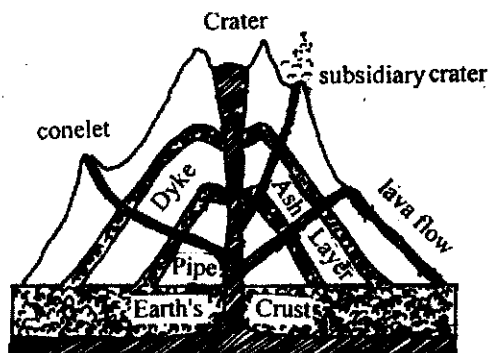


Fig. 8.5 A Volcanic Cone



You may be wondering why such eruptions take place. Actually, volcanoes are evidence of the presence of the intense heat and pressure existing within the earth. Hot molten rock materials beneath the solid outer crust is known as magma. When this magma is thrown out from the magma chamber to the earth's surface it is known as lava (Fig 8.5). The magma and the gases stored within the earth's surface keep trying to come out to the surface through a line of weakness anywhere in the crust. The tremendous force created by magma and its gases create a hole in the crust and the lava spreads out on the surface along with ash and fragmented rock material. The process by which solid liquid and gaseous materials escape from the earth's interior to the surface of the earth is called vulcanism.

- \* A volcano is an opening in the earth's crust through which molten rock material are thrown out slowly or force fully depending upon the force of eruption.
- \* The cause of volcanic eruption is the excessive pressure exerted by the magma and hot gases on the earth's crust.
- \* The process by which solid, liquid and gaseous materials escape from the earth's interior to its surface is known as Vulcanism.

The volcanic materials accumulate around the opening or hole taking the form of a cone. The top of the cone has a funnel shaped depression which is called its crater (Fig 8.5)

#### (A) TYPES OF VOLCANOES

Volcanoes are classified on the basis of the nature of vulcanism. The basis include the frequency of eruption, mode of eruption or fluidity and the manner in which volcanic material escapes to the surface of the earth.

On the basis of the frequency of eruption, volcanoes are of three types:

- (i) Active
- (ii) Dormant and
- (iii) Extinct.

The volcanoes which erupt frequently or have erupted recently or are in action currently are called active volcanoes. Important among these include Stromboli in Mediterranean, Krakatoa in Indonesia, Mayon in Philippines, Mauna loa in Hawaii Islands and Barren Island in India. The volcanoes which have not erupted in recent times are known as dormant volcano. They are as such the 'sleeping volcanoes'. Important among these are Vesuvius of Italy, Cotopaxi in South America.

Contrary to these two, there are volcanoes which have not erupted in historical times. These are called extinct volcanoes. Mount Popa of Myanmar (Burma) and Kilimanjaro of Tanzania are important extinct volcanoes. It is not always very simple to categorise a volcano as dormant or extinct. For example the Vesuvius and Krakatoa became suddenly active after lying dormant for hundreds of years.

- \* On the basis of the frequency of eruption, volcanoes are classified into active, dormant and extinct volcanoes.
- \* Active volcanoes are erupting currently or have erupted recently.
- \* Dormant are those volcanoes which have erupted at least once in human history and are not active now.
- \* Extinct volcanoes are those which have not erupted during long human history.

On the basis of mode of eruption, volcanoes are divided into two types:

- (i) Central type of volcanoes and
- (ii) Fissure types volcanoes

When the eruption in a volcano takes place from a vent or a hole, it is called a central type of volcano. Different types of domes or conical hills are formed by this type of eruption depending on the nature of erupted materials. Majority of volcanic eruptions in the world are of this type. The other characteristic of this mode of eruption is that it is marked by violent explosion due to sudden escape of gases and molten rocks through the hole. Visuvius and Fuji-yama belong to this group of volcanoes.

Sometimes, deep elongated cracks develop due to earthquakes or faulting. The magma starts flowing through them quietly. This mode of eruption is called fissure type of eruption. This eruption helps in the formation of thick horizontal sheets of lava or a low dome shaped volcano with broad base. It may also form what are identified as lava plateaus, and lava shields. Deccan Traps of India is one example of fissure type of eruption.

- \* Central type of volcanoes erupt from a vent or hole and result in the formation of a conical hill.
- \* Fissure type of volcanoes erupt through a crack or fissure and cause formation of plateaus and shields.

On the basis of the fluidity of lava there are two types of volcanoes

- (i) Volcanoes of basic lava and
- (ii) Volcanoes of acid lava.

Since the basic lava is rich in metallic minerals and has a low melting point, it has greater fluidity. In this type of eruption, lava flows far and wide quietly with greater speed and spreads out in thin sheets over a large area. Thus, it leads to the formation of shields and lava domes. The shield volcano of Hawaiian Island in Pacific ocean is one of these volcanoes.

Contrary to basic lava, acid lava is rich in silica and has a relatively high melting point. Therefore, it is highly viscous and solidifies quickly. Hence, the acid lava volcanoes cause the formation of usually higher land features with steeper slopes. Acid lava cones are of steeper slopes than basic lava shields. (Fig. 8.6).

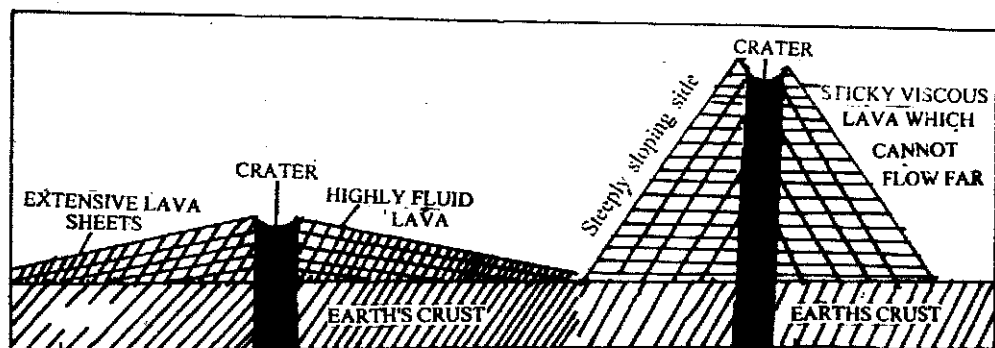


Fig. 8.6(a) Basic lava shield (b) Acid lava cone

- \* Basic lava is highly fluid and flows readily and extensively. It causes the formation of shields.
- \* Acid lava is highly viscous. This type of eruption results in the formation of steep sided cones.

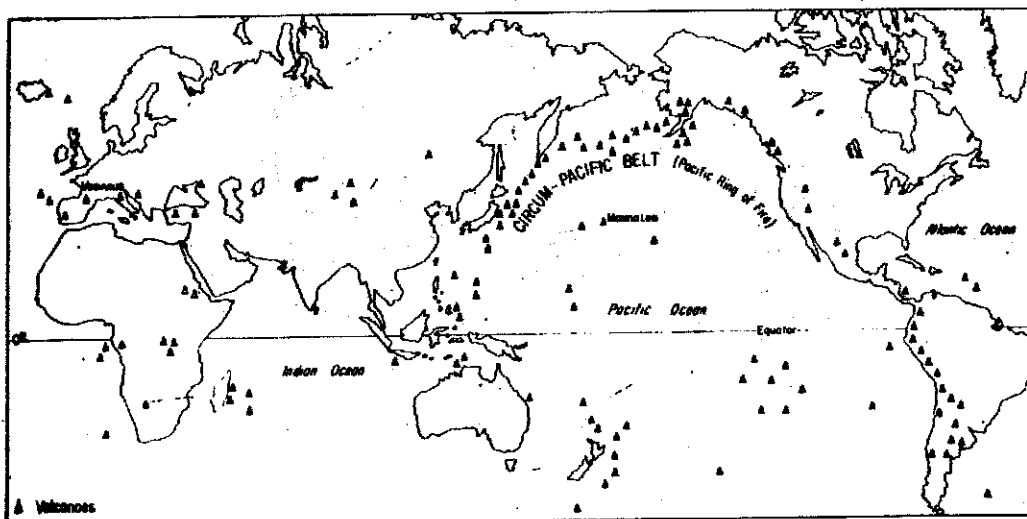
## (B) DISTRIBUTION OF VOLCANOES

There are about 500 volcanoes in the world. Most of these volcanoes are found in three well defined belts. The Circum-Pacific belt, the Mid-World Mountain belt and the African Rift Valley belt. Thus, volcanoes are closely related to the regions of intense folding and faulting. They occur along coastal mountain ranges, on islands and in the mid-oceans. Interior parts of continents are generally free from their activity. Most of the active volcanoes are found in the Pacific region. About 83 active volcanoes are located in Mediterranean region (Fig 8.7)

Circum-Pacific region has the greatest concentration of volcanoes, that is why, it is called 'Pacific Ring of Fire'. This ring extends along Andes mountains of South America to Alaska and from the Aleutian Islands to Japan, Philippines, Indonesia to New Zealand.

The Mid-world mountain belt occupies the second position with regard to the numbers of volcanoes. It runs from Alps in Europe to Asia Minor and crossing through Himalayan region joins the Circum-Pacific belt. The African rift valley region ranks

third. Most of the volcanoes are extinct here. Mt. Cameroon is the only active volcano which is situated in Central West Africa.



*Fig. 8.7 The Distribution of Volcanoes*

- \* There are about five hundred volcanoes in the world. They are located in three well defined belts namely the Circum-Pacific, the Mid World Mountain and East African Rift Valley belts.
- \* Most of the active volcanoes are located in Circum-Pacific belt which is known the Pacific Ring of Fire.

### INTEXT QUESTIONS : 8.3

I. Answer the following questions :-

- (i) Name the process by which magma is ejected out of the earth's interior

- (ii) Name three types of volcanoes on the basis of the frequency of eruption.  
 (a) \_\_\_\_\_ (b) \_\_\_\_\_ (c) \_\_\_\_\_
- (iii) Name two types of volcanoes on the basis of the mode of eruption  
 (a) \_\_\_\_\_ (b) \_\_\_\_\_
- (iv) State two types of lava on the basis of their fluidity  
 (a) \_\_\_\_\_ (b) \_\_\_\_\_
2. Fill in the blanks with the most appropriate words :
- (i) Hot molten rock material inside the earth is called \_\_\_\_\_ and after reaching the earth's surface, it is known as \_\_\_\_\_
- (ii) Funnel shaped mouth of a volcano is called \_\_\_\_\_
- (iii) Two types of eruption are (a) \_\_\_\_\_ (b) \_\_\_\_\_
- (iv) Volcanic plateaus are formed by \_\_\_\_\_ type of eruption.
- (v) The Circum Pacific belt of volcanoes is popularly known as \_\_\_\_\_
- (vi) The only active volcano of India is \_\_\_\_\_

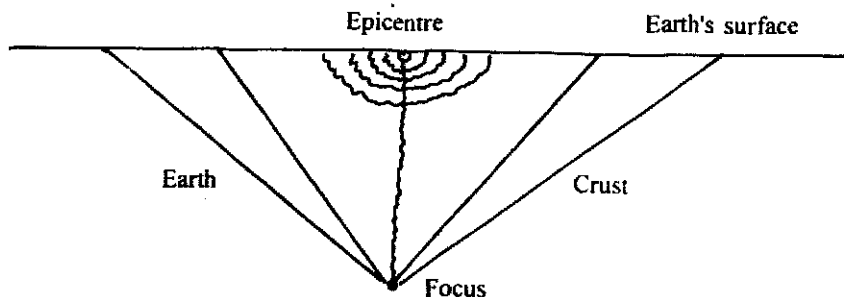
## 8.8 EARTH QUAKE

The vibrations or tremors in the earth crust are known as earthquakes. They are usually the result of operations of the internal forces and vulcanism.

All the earthquakes are not of the same intensity. Some of them are very severe, others are very mild and still others are not even noticed. Major or strong earthquakes are only a few. Though our earth experiences many earthquakes everyday, however the frequency of earthquakes varies largely from place to place. The network of seismographic stations all over the world records dozens of earthquakes every day. But, occurrence of severe earthquakes is limited to a few regions. The instrument used for recording the earthquakes is known as seismograph. 'Sesamos' is a Greek word which means an earthquake.

The point within the earth's crust where an earthquake originates is called the focus. It is also referred as seismic focus. It generally lies within the depth of 60 kilometres in the earth crust.

The point vertically above the focus on the earth's surface is known as 'epicentre'. The impact of the earth quake is carried from the point of its origin by earthquake waves. These earthquake waves originating from the focus travel in all directions. But their intensity is the highest at the epicentre. That is why the maximum destruction occurs at and around the epicentre. (Fig.8.3) The intensity of vibrations decreases as one moves away from the epicentre in all directions.



*Fig 8.8 Focus and epicentre of an earthquake.*

- \* An earthquake is the vibration of the earth's crust caused by internal forces.
- \* A seismograph is an instrument used for recording earthquakes.
- \* Focus is the point within the earth's crust where the earthquake originates.
- \* The epicentre is the point on the earth's surface vertically above the focus.

### **(A) CAUSES AND EFFECTS OF EARTHQUAKES**

Folding, faulting and displacement of rock strata are the main causes of earthquakes. Some examples of this type of earthquakes are the San Francisco earthquakes of California in 1906, the Assam earthquakes of 1951, the Bihar earthquakes of 1935.

The second important cause lies in the phenomenon of volcanic eruption. The violent volcanic eruptions put even the solid rocks under great stress. It causes vibrations in the earth's crust. But, these earthquakes, are limited to the areas of volcanic activity. Its important examples is the earthquake which continued for six days preceeding the eruption of Mauna Loa volcano of Hawaii Island in 1868.

Minor earthquakes often accompany or are the result of landslides, seepage of water causing the collapse of the rocks of cavern or underground mines and tunnel. These are least damaging earthquakes.

Violent earthquakes are generally very disastrous. They may themselves cause land-slides, damming of river course and occurrence of floods. Sometimes, the depressions leading to the formation of lakes. An earthquake often form cracks and fissures in the earth's crust. It changes the drainage system of an area as was witnessed in Assam after its 1951 earthquake. Earthquakes also cause vertical and horizontal displacement of rock strata along fault line. They prove most catastrophic and devastating when they cause fires and seismic sea waves. Such tidal waves are called Tsunamis. These waves may wash away coastal cities. Buildings and

bridges collapse causing death of the thousands of people. Lines of transport, communication and of electric transmission get disrupted. The after effect of earthquakes is spread of epidemics like cholera.

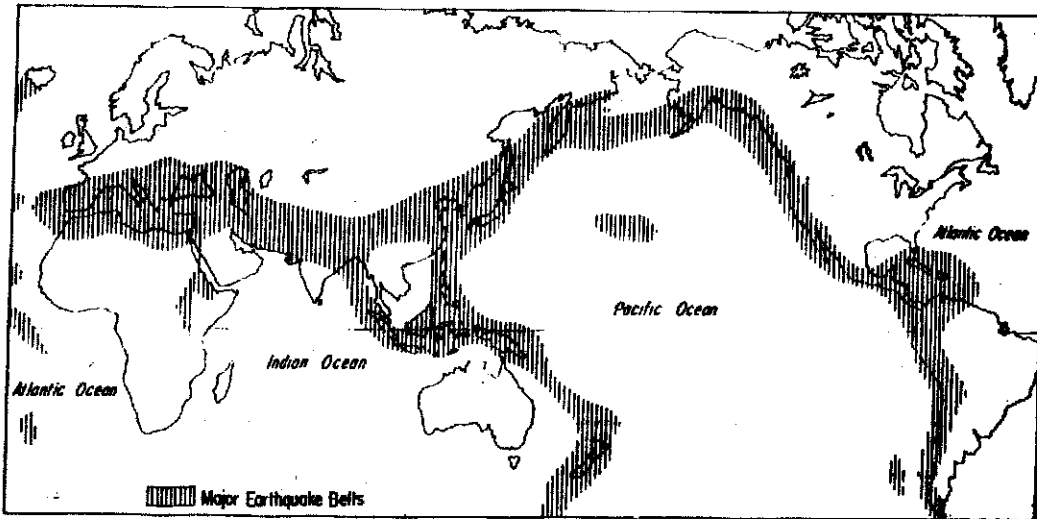
### (B) DISTRIBUTION OF EARTHQUAKES

The occurrence of earthquake is a phenomenon of almost every part of the world. But, there are two well-defined belts where they occur more frequently. These belts are the Circum-Pacific belt and the Mid-world mountain belt.

The first belt i.e. is the Circum Pacific comprises the western coast of North and South America. Aleutian Islands and island groups along the eastern coasts of Asia such as Japan and Philippines. As it encircles the Pacific Ocean from end to end, it is named as such. The earthquakes in this belt are associated with the ring of mountains and volcanoes. It is estimated that about 68 percent of earthquakes of the world occur in this belt alone.

The second belt-extend from Alps with their extension into Mediterranean, the Caucasus and the Himalayan region and continues into the Indonesia. About 21 percent of total earthquakes of the world originate in this belt. Remaining 11 percent occur in the other parts of the world.

- \* Most of the earthquakes of the world occur in two belts namely the Circum Pacific and Mid world mountain belts.



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## INTEXT QUESTIONS 8.4

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1. Fill in the blanks with appropriate words :

- (i) Vibrations of the earth surface caused by earth movements are known as\_\_\_\_\_.
  - (ii) The instrument recording earthquake is called\_\_\_\_\_.
  - (iii) The point from where earthquake originate is called\_\_\_\_\_.
  - (iv) The point on the earth's surface directly above the point of origin of earthquake is called\_\_\_\_\_.
  - (v) The devastating sea waves caused by an earthquake are called\_\_\_\_\_.
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## WHAT YOU HAVE LEARNT

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Land forms of different types present on the earth's surface are the result of continuous work of both internal and external forces. Internal forces are responsible for creating inequalities in altitudes of different relief features. These forces originate in the interior of the earth. They are also known as endogenetic forces. These forces cause movements of the earth's crust which are called earth movements. Slow movements bring slow and gradual changes in the relief features while sudden movements bring abrupt and rapid changes. Internal forces affect the earth into two way radially and horizontally. When they effect radially they cause subsidence or upliftment of the earth's crust. Such earth movements are called vertical movements. Contrary to this, when these forces effect horizontally or side to side, they result in folding and faulting of the rock strata. These are called horizontal movements. A volcano is an opening or a hole in the earth's crust through which hot molten magma, gases and ash eject to the earth's surface. The shape and size of volcano depends on the frequency of size of volcano depends on the frequency of eruption; fluidity of lava and type of eruption. Earthquakes are vibrations of the earth's crust caused by the operations of the tectonic forces and volcanic activity. The volcanic activity is confined to three well defined belts of the world. The occurrence of earthquakes is also closely connected with two of these belts.

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## TERMINAL QUESTIONS

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1. What is meant by internal forces? List causes of the origin of these forces.
  2. Give four examples to prove that the earth's crust is unstable.
  3. Draw diagrams to show
    - (i) Displacement of rock strata along a fault plane.
    - (ii) Anticline and synclines of rock strata.
  4. Differentiate between vertical and horizontal movements.
-



5. Distinguish between folding and faulting.
  6. What is a volcano? Describe different types of volcanoes with examples.
  7. Distinguish between acid and basic lava and land forms developed by each of them.
  8. What causes an earthquake?
  9. List the effects of earthquakes on earth's surface.
  10. Define the following terms:  
(a) Fault plane (b) Central type eruption (c) Fissure type eruption (d) Dormant volcano.
  11. Locate and label the following in the outline map of the world :-  
(a) An active volcano in India (b) A volcanic plateau in south America.  
(c) A rift valley in Europe (d) An extinct volcano in Myanmar (e) An extinct volcano in Africa (f) A volcano in Hawaii island.
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## CHECK YOUR ANSWER

### INTEXT QUESTIONS

#### 8.1

1. Endogenetic forces 2. (a) Internal (b) external 3. (a) abrupt (b) Slow

#### 8.2

1. Horizontal movements 2. Orogenetic movements 3. (i) folds (ii) Fold (iii) anticlines, synclines (iv) rift valley (v) block mountain or horst (vi) faulting (vii) graben.

#### 8.3

- 1.(i) Vulcanism (ii) (a) Active (b) Dormant (c) Extinct (iii) (a) Central type (b) Fissure type (iv) Basic lava (b) Acid lava

2. (i) magma, lava (ii) Crater (iii) (a) Central type (b) Fissure type. (iv) fissure (v) Pacific ring of fire (vi) Barren island

#### 8.4

1. (i) earthquake (ii) seismograph (iii) focus (iv) epicentre (v) Tsunamis

### TERMINAL QUESTIONS

1. Refer to Section 8.3
2. Refer to Section 8.4
3. Refer to Figure 8.3
4. Refer to Section 8.6
5. Refer to Section 8.6 b (i) and (ii)
6. Refer to Section 8.7
7. Refer to Section 8.7 (A)
8. Refer to Section 8.8
9. Refer to Section 8.8 (A)
10. (a) The plane along which displacement of rock strata takes place is known as fault plane  
 (b) When the eruption in a volcano takes place from a vent or hole, it is called central type eruption  
 (c) When the eruption takes place through deep elongated cracks, it is known as fissure type eruption  
 (d) The volcanoes which have not erupted in recent times is known as dormant volcano.
11. Refer Maps.