

**SAMPLE CONTENT**

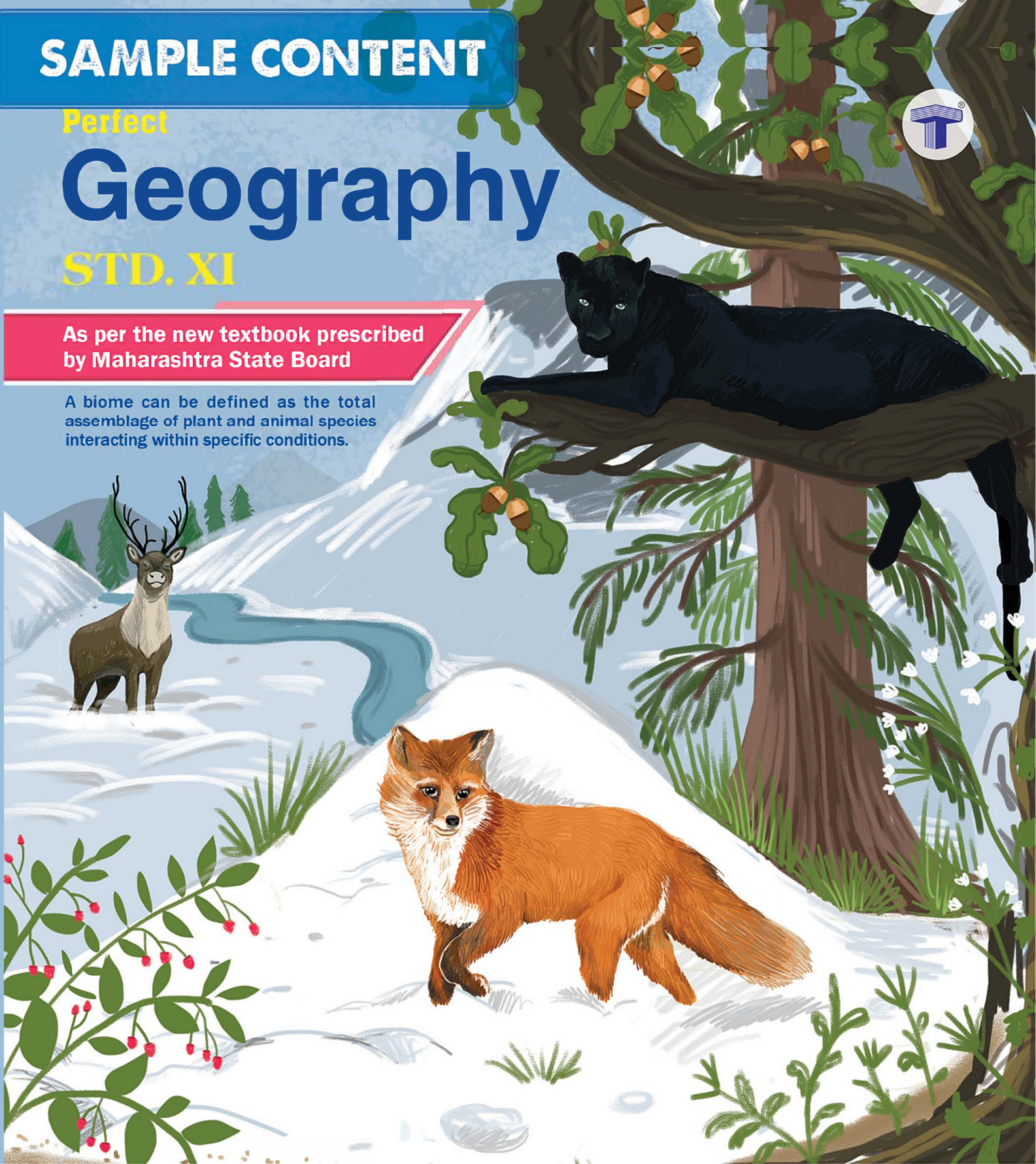
Perfect

# Geography

STD. XI

As per the new textbook prescribed  
by Maharashtra State Board

A biome can be defined as the total  
assemblage of plant and animal species  
interacting within specific conditions.



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# PERFECT Geography

## Std. XI

### Salient Features

- Based on the new textbook
- Exhaustive content coverage in Question and Answer format
- Wide variety of questions in each chapter (including map based questions)
- 'Chapter Overview' enables quick revision of key points
- Includes 'Gyan Guru' (GG) that offers a practical touch to theory
- 'For your understanding' section in air' conceptual clarity
- Includes 'Smart Codes' to enable easy answer recall
- Includes 'QR Codes' to refer relevant content
- Coverage of the 'Apply Your Knowledge' section
- Chapter assessment at the end of every chapter for self evaluation with answer key

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## PREFACE

**Perfect Geography Std. XI** has been designed to provide accurate information regarding physical geography in accordance with the syllabus. It is based on the latest curriculum developed by the Maharashtra State Bureau of Textbook Production and Curriculum Research, Pune. It includes the fundamentals of geomorphology, oceanography, climatology and biogeography in a foundational framework for understanding development patterns in different parts of the earth.

The study of physical geography becomes imperative because it is the study of structure, processes and interactions between physical and human environment. The key features of the book include *Chapter Overview, Gyan Guru, For your understanding, Map based question, Smart Codes, QR Codes and Chapter Assessment*. These concepts would not only help the student remember and understand the basics but also help them internalise and evaluate it with utmost amount of involvement.

Also, the latest education policy recommends that students' life at the educational institution must be linked to their life outside it as well. This principle marks the departure of the legacy of rote learning which continues to shape our system and causes a gap among the school, home and community. The syllabi and textbooks developed on the basis of the new education policy signify an attempt to implement this basic idea and enhance a student's learning experience.

We hope that the students as well as teachers find this book lucid and purposeful.

- Publisher
- Edition** : First

The journey to create a complete book is replete with triumphs, failures and near misses. If you think we've nearly missed something or want to applaud us for our triumphs, we'd love to hear from you. Please write to us at: [mail@targetpublications.org](mailto:mail@targetpublications.org)

### Disclaimer

This reference book is transformative work based on textbook 'Geography': First edition: 2019 published by the Maharashtra State Bureau of Textbook Production and Curriculum Research, Pune. We, the publishers are making this reference book which constitutes as fair use of textual contents which are transformed by adding and elaborating, with a view to simplify the same to enable the students to understand, memorize and reproduce the same in examinations.

This work is purely inspired upon the course work as prescribed by the Maharashtra State Bureau of Textbook Production and Curriculum Research, Pune. Every care has been taken in the publication of this reference book by the Authors while creating the contents. The Authors and the Publishers shall not be responsible for any loss or damages caused to any person on account of errors or omissions which might have crept in or disagreement of any third party on the point of view expressed in the reference book.

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## FEATURES

### Chapter Overview

#### Biomes

1. A biome is an area where different types of flora and fauna live together in the same region in the same type of climatic conditions.
2. The boundaries of different biomes on land are mainly determined by climatic conditions such as rainfall, temperature, humidity, amount of insolation received and soil conditions.

### Chapter Overview

After reading a chapter from textbook, students may want to revise all key points quickly before attempting questions based on the chapter. 'Chapter overview' gives a bird's eye-view of the entire chapter.

### Map based question

Map based questions are included as per the necessity of the chapter.

### Apply Your Knowledge

#### 1. Make friends with maps. (Textbook pg. no 75)

Look at figure and answer the following questions:

- i. What does the map show?

**Ans:** i. This map shows the relief of Indian Ocean floor.



### GG - Gyan Guru

Water displays unusual behaviour when cooled below  $4^{\circ}\text{C}$ . Instead of contracting, it expands. Hence, ice, being less dense, floats on water.

### GG – Gyan Guru

Gyan Guru, our very own mascot, keeps popping up throughout the book. He offers real-life example or an interesting fact associated with the topic.

### For your understanding

Certain concepts are tricky and difficult to understand. In such cases, 'For your understanding' offers better conceptual clarity.

### For your understanding

'Tsunami', in Japanese, means 'harbour wave'. They are colossal waves, caused mostly by earthquakes or volcanic eruptions, in water bodies. These waves can reach heights of up to 100 feet. Their impact is limited to coastal areas but their destructive power is enormous.



Smart Code A

I S R O

- i. **Asymmetrical:** The axial plane is inclined. The limbs are inclined at different angles.
- ii. **Isoclinal:** The limbs slope in the same direction with same amount. The axial plane may be vertical, inclined or horizontal. Slope of some portion of limbs is near vertical.
- iii. **Symmetrical:** The axial plane is vertical. Limbs are inclined at same angle.

### Smart Code

At times, answers are lengthy and it's difficult to remember all the points. Hence, we have created Smart Codes for a few questions to aid you in remembering and recollecting these points.

## FEATURES

### QR Code

QR codes given throughout the book enable students to access relevant content for the given topic.

**[Note:** Scan QR code to watch key messages from the IPCC's special report on the impact of global warming.]



### Chapter Assessment

**Time: 1.00 Hr.**

**Total Marks: 20**

**Q.1. (A) Fill in the blanks with appropriate alternatives given below and rewrite the sentences. [3]**

1. \_\_\_\_\_ is a submarine canyon found near Africa.  
 (A) Madagascar canyon (B) Zaire canyon  
 (C) Congo canyon (D) Egypt canyon

### Answers

**Q.1. (A) 1. (C)**

### Chapter Assessment

Chapter assessment at the end of every chapter enables students to evaluate themselves. This evaluation becomes more effective with the help of the answer key.

## CONTENTS

No.	Topic Name	Page No.
1.	Earth Movement	1
2.	Weathering and Mass Wasting	17
3.	Plate Tectonics	31
4.	Climatic Regions	49
5.	Global Climate Change	70
6.	Ocean Resources	83
7.	Indian Ocean - Relief and Strategic Importance	97
8.	Biomes	111
9.	Disaster Management	134

- Note:**
- All textual questions are represented by \* mark.
  - All questions based on intext content are represented by # mark.

# 1

# Earth Movements

## Chapter Overview

<b>Earth movements</b>	<ol style="list-style-type: none"> <li>1. Landforms like hills, mountains, plateaus, valleys, etc., are developed and shaped by the internal and external forces of the earth.</li> <li>2. Evidence suggests that landforms are never permanent and earth movements have always affected them.</li> <li>3. The internal processes are classified into slow movements and sudden movements.</li> </ol>
<b>Slow movements</b>	<ol style="list-style-type: none"> <li>1. Based on the direction of earth's slow movements, they can be epeirogenic (i.e., vertical / continent-building) or orogenic (i.e. horizontal / mountain-building).</li> <li>2. Orogenic movements may be due to tensional forces (forming faults) or compressional forces (forming folds).</li> <li>3. Fold mountains are formed due to the following types of folds: symmetrical, asymmetrical, overturned, recumbent and isoclinal.</li> <li>4. Block mountains and rift valleys are formed due to the following types of faults: normal, reverse, tear and thrust.</li> </ol>
<b>Sudden movements</b>	<ol style="list-style-type: none"> <li>1. Sudden movements cause earthquakes and volcanoes.</li> <li>2. The waves associated with earthquakes are: P-waves, S-waves and L-waves.</li> <li>3. Shadow zones are specific areas where these seismic waves are not reported.</li> <li>4. The strength of an earthquake can be expressed in the Mercalli or the Richter scale.</li> <li>5. Some causes of earthquakes are: Volcanicity, Tectonic Movements and Anthropogenic causes.</li> <li>6. Volcanoes are of various types: (i) Conical and (ii) Active, Dormant and Dead</li> <li>7. Materials which come out of volcano: liquid, solid, gaseous</li> <li>8. Volcanic landforms include: Lava domes, Lava Plateaus, Calderas, Crater lakes, Volcanic plugs, Cinder cones and Composite cones</li> <li>9. Areas most prone to earthquakes and volcanoes are: Circum-Pacific Belt, Mid-Atlantic belt and Mid-Continental belt.</li> </ol>

### Q.1. [A] Fill in the blanks with appropriate alternatives given below and rewrite the sentences

1. Earth movements are \_\_\_\_\_.
  - (A) very complex and interrelated
  - (B) simple and independent of each other
  - (C) hypothetical
  - (D) non-dynamic
2. The \_\_\_\_\_ earthquake of 1819 submerged the coastal areas and gave rise to a raised land called Allah's Bund.
  - (A) Uttarkashi
  - (B) Kachchh
  - (C) Assam
  - (D) Himachal
3. Tectonic movements are defined as movements of \_\_\_\_\_.
  - (A) fold mountains
  - (B) air currents in different strata of atmosphere
  - (C) the earth's surface due to internal forces
  - (D) block mountains
4. Orogenic movements are also known as \_\_\_\_\_ movements.
  - (A) slow
  - (B) sudden
  - (C) horizontal
  - (D) vertical
5. \_\_\_\_\_ forces operate towards each other and cause compression.
  - (A) Converging
  - (B) Tensional
  - (C) Sudden
  - (D) Diverging
6. In case of \_\_\_\_\_, limbs of the fold slope upward while the central portion is lower.
  - (A) syncline
  - (B) anticline
  - (C) folds
  - (D) faults
7. The height of Mt. Everest is \_\_\_\_\_ (AMSL).
  - (A) 10,200 m
  - (B) 4,568 m
  - (C) 6,023 m
  - (D) 8,848 m
8. Limbs slope in the same direction with the same amount in case of \_\_\_\_\_ folds.
  - (A) isoclinal
  - (B) overturned
  - (C) asymmetrical
  - (D) recumbent



9. Graben means \_\_\_\_\_.  
 (A) rift valley (B) block mountain  
 (C) fold Mountain (D) volcano
10. The earthquake waves are recorded by an instrument called \_\_\_\_\_.  
 (A) seismograph (B) anemometers  
 (C) Richter Scale (D) barometer
- #11. An imaginary line on a map, connecting the places of uniform intensity of earthquake is called \_\_\_\_\_ line.  
 (A) isothermal (B) isobar  
 (C) isoseismal (D) iso quake
- #12. The energy released in an earthquake of magnitude 5 is \_\_\_\_\_ times more than that of magnitude 4.  
 (A) 2 (B) 4 (C) 10 (D) 32
- #13. In 1927, a new island was created near Java due to volcanic eruption, where the island of Krakatoa had disappeared earlier. This new island was named \_\_\_\_\_.  
 (A) Anak Krakatoa (B) Child Island  
 (C) Java Krakatoa (D) Sumatra
14. Deccan trap in India is an example of \_\_\_\_\_.  
 (A) block mountain (B) rift valley  
 (C) lava plateau (D) caldera
15. The highest volcanic mountain in the world is \_\_\_\_\_.  
 (A) Cotopaxi (B) Mt. Everest  
 (C) Fujiyama (D) Chimborazo

**Answers:**

1. (A)                      2. (B)                      3. (C)  
 4. (C)                      5. (A)                      6. (A)  
 7. (D)                      8. (A)                      9. (A)  
 10. (A)                     11. (C)                     12. (D)  
 13. (A)                     14. (C)                     15. (A)

**Q.1. [B] Choose the correct alternative**

1. Causes of earthquake:  
 (A) Landslide, Volcanicity, Vertical movements, Large scale mining  
 (B) Tectonic movements, Volcanicity, blasting, Atomic explosion  
 (C) Volcanicity, Horizontal movements, Compression, Large scale mining  
 (D) Drilling, Tectonic movements, Tsunami, Landslide
2. Volcanic landforms:  
 (A) Lava domes, Caldera, Crater lake, Cinder cone  
 (B) Lava domes, Lava river, Crater lake, Cinder cone

- (C) Lava domes, Caldera, Anticline, Cinder cone  
 (D) Lava domes, Caldera, Crater lake, Lava river

**Answers:**

1. (B)                      2. (A)

**Q.1. [C] Complete the chain**

\*1.

A	B	C
1. Widespread volcanic eruption	i. Zone V	a. I to III
2. Andaman and Nicobar Islands	ii. Fissure eruption	b. Block Mountain
3. Mercalli scale	iii. Intensity	c. very high seismic vulnerability
4. Slow movements	iv. Faulting	d. Solid
5. Philippines	v. Volcanic bombs	e. Deccan Trap
6. Volcanic material	vi. Circum-Pacific belt	f. Mayon

**Ans:** (1-ii-b), (2-i-c), (3-iii-a), (4-iv-b), (5-vi-f), (6-v-d)

**Q.1. [D] Identify the correct correlation**

\*A: Assertion, R: Reasoning

- (a) Only A is correct.  
 (b) Only R is correct.  
 (c) Both A and R are correct and R is the correct explanation of A.  
 (d) Both A and R are correct but R is not the correct explanation of A.

**[Note:** Above options are for all questions given below.]

1. **A:** Faulting leads to development of fold mountains.  
**R:** Faulting occurs when tensional forces move away from each other.  
**Ans:** (b)
2. **A:** Intensity of an earthquake is a measurement of the energy released during an earthquake.  
**R:** Mercalli scale is used to measure the intensity of an earthquake.  
**Ans:** (b)
3. **A:** South-East Asia, Japan and islands in the Pacific Ocean are most vulnerable to earthquakes and volcanic eruptions.  
**R:** They are located in 'Ring of Fire'.  
**Ans:** (c)

**Q.1. [E] Identify the correct group**

- \*1. i. a. Symmetrical fold  
b. Isoclinal fold  
c. Overtured fold  
d. Recumbent fault
- ii. a. Black Forest      b. Vosges  
c. Himalayas          d. Satpuras
- iii. a. Narmada Valley    b. African Valley  
c. Tapi Valley          d. Rhine Valley
- iv. a. Caldera            b. Crater Lake  
c. Cinder Cone        d. Lava plateau

**Ans:** iv.

**Q.1. [F] Identify the incorrect factor**

1. The mountain ranges in the Himalayas are:  
(A) The Siwaliks  
(B) The Aravallis  
(C) The Middle Himalayas  
(D) The Greater Himalayas
2. The nature of folding on the earth's surface depends on:  
(A) Nature of rocks  
(B) Intensity of force  
(C) Duration of force  
(D) Rotation of earth
3. The different parts of fold are:  
(A) Limb                      (B) Anticline  
(C) Fracture                (D) Syncline
4. The plane of the crack in rock strata during faulting, is called:  
(A) folds                      (B) rupture  
(C) fracture                (D) fault
5. The types of folds are:  
(A) Normal                (B) Reverse  
(C) Tear                      (D) Asymmetrical
6. Example of block mountains are:  
(A) Deccan Lava Plateau, India  
(B) Alps, Europe  
(C) Vosges, France  
(D) Black Forest, Germany
7. The waves associated with earthquakes are:  
(A) M-waves                (B) P-waves  
(C) S-waves                (D) L-waves
8. Earthquakes due to tectonic movements occur in:  
(A) Assam, India  
(B) Chile, South America  
(C) Doha, Qatar  
(D) California, USA

9. The materials which come out of volcano are:  
(A) Basic lava                (B) Volcanic bombs  
(C) Magma                    (D) Lava domes
10. Examples of volcanic mountains in the Ring of Fire are:  
(A) Fujiyama, Japan  
(B) Mt. St. Helens, USA  
(C) Stromboli, Italy  
(D) Pinatubo and Mayon, Philippines

**Answers:**

1. (B)                      2. (D)                      3. (A)  
4. (A)                      5. (D)                      6. (B)  
7. (A)                      8. (C)                      9. (D)  
10. (C)

**Q.1. [G] Arrange the given statements as per given instructions**

Arrange the following in proper chronological order.

1. i. Collapse of buildings  
ii. Shaking of the ground  
iii. Rehabilitation measures  
iv. Strain in the rock strata
2. i. Ejection of molten lava  
ii. Formation of caldera  
iii. Magma cooling and solidification  
iv. Formation of crater lake

**Answers:**

1. iv, ii, i, iii                                      2. i, iii, ii, iv

**Q.2. Give geographical reasons****1. Slow vertical movements are called continent-building movements.**

- Ans:** i. Slow (epeirogenic) movements keep on taking place either towards the centre of the earth or towards the earth's crust.  
ii. Due to such movements, an extensive portion of the crust is either raised up or it subsides.  
iii. When a portion of the crust is raised above sea-level, it leads to the formation of continents.

Hence, slow vertical movements are called continent-building movements.

**\*2. Soft rocks form folds while hard rocks form faults.**

- Ans:** i. Soft rocks, deep within the crust, are flexible and under high pressure.  
ii. Hence, they fold easily due to compressional (converging) forces.  
iii. Hard rocks, near the earth's surface, are rigid and not under high pressure.  
iv. Hence, they form faults easily due to tensional forces.





**\*3. Folds depend on the strength of rocks and intensity of forces.**

- Ans:**
- Soft and elastic rocks are affected more by compressional forces.
  - The rocks react to compressional force depending on their strength and the speed of the force.
  - When compressional forces are applied on ductile or flexible rocks, folding occurs. These rocks are particularly susceptible to folding without breaking.
  - Folding is more likely to occur where compressional forces are applied slowly.

**\*4. L-waves do not have a shadow zone.**

- Ans:**
- Earthquake waves get recorded in seismographs located at far off locations. However, there are some specific areas where the seismic waves of an earthquake are not reported. Such zones are called shadow zones.
  - Generally, seismographs located at any distance within  $105^\circ$  from the epicentre record the arrival of both, P-waves and S-waves. However, the seismographs located beyond  $140^\circ$  from the epicentre; record the arrival of P-waves, but not that of S-waves. Thus, a zone between  $105^\circ$  and  $140^\circ$  from the epicentre is identified as the shadow zone for both the types of waves.
  - The entire zone beyond  $105^\circ$  does not receive S-waves. The shadow zone of P-waves appears as a band around the earth between  $105^\circ$  and  $140^\circ$  away from the epicentre.
  - As L-waves travel in the direction of circumference of the along the earth crust, and not downwards, these waves do not have a shadow zone.

**\*5. People living in the Himalayas are more vulnerable to earthquakes.**

- Ans:**
- The Himalayan region is one of the most seismically active regions or active earthquake zone in the world.
  - The Himalayas lie at the fault line between the Indo-Australian plate and the Eurasian plate.
  - Tectonic movements between these plates make this place vulnerable to earthquakes.
- Hence, people living in the Himalayas are more vulnerable to earthquakes

**GG - Gyan Guru**



The earth's rigid outer part is made up of many tectonic plates. These plates keep drifting very slowly. Until 175 million years ago, the earth had just one supercontinent called 'Pangea'. According to Theory of Continental Drift, tectonic movements are responsible for the existence of the 7 current continents. These movements will change the shape and position of the continents in the future too.

**\*6. Extinct conical volcanoes often form crater lakes.**

- Ans:**
- At times, the eruption of volcano brings about a large quantity of material and relieves lot of pressure.
  - After a volcanic eruption, a large and deep depression called caldera may remain in that area. This can be around 10 m wide and hundreds of metres deep.
  - A smaller caldera is known as crater.
- When the funnel-shaped crater of an extinct volcano is filled with rain water, it forms a crater lake.

**Q.3. Differentiate between**

**\*1. Slow movements and Sudden movements**

**Ans:**

No.	Slow movements	Sudden movements
i.	Slow movements occur over hundreds of years.	Sudden movements occur over short periods of time (few seconds to several hours).
ii.	They cause continent-building, folding and faulting.	They cause earthquakes and volcanoes.

**\*2. Epeirogenic movements and Orogenic movements**

**Ans:**

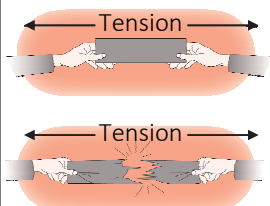
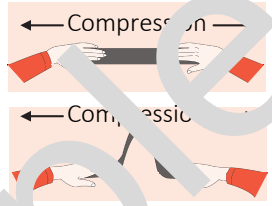
No.	Epeirogenic movements	Orogenic movements
i.	Epeirogenic movements are slow vertical movements in the interior of the earth.	Orogenic movements are slow horizontal movements in the interior of the earth.



ii.	Although these movements occur very slowly; they lead to formation of continents and extensive plateaus.	These movements are also slow, but their speed is more than the epeirogenic movements. They lead to formation of fold mountains, block mountains and rift valleys.
iii.	They influence huge areas.	They influence smaller areas.
iv.	They don't occur due to tensional and compressional forces.	They occur due to tensional and compressional forces.

**3. Tensional forces and Compressional forces**

Ans:

No.	Tensional (Diverging) forces	Compressional (Converging) forces
i.	Tensional forces operate away from each other and cause stress in the rock strata.	Compressional forces operate towards each other and cause pressure on the rock strata.
ii.	They create faults in the earth's crust.	They create folds in the earth's crust.
iii.	They form block mountains and rift valleys.	They form fold mountains.
iv.		

**\*4. Folding and Faulting**

Ans:

No.	Folding	Faulting
i.	Folding is caused by compressional forces.	Faulting is caused by tensional forces.
ii.	It occurs in soft and elastic rock.	It occurs in hard and rigid rocks.
iii.	It occurs in rocks at a great depth inside the earth's surface.	It occurs in rocks at a lesser depth inside the earth's surface.
iv.	It can be classified based on the inclination of its axial plane and limbs.	It can be classified based on the displacement of the rocks.
v.	It forms fold mountains. (E.g. the Himalayas)	It forms block mountains (E.g. the Satpuras) and rift valleys. (E.g. Narmada valley)

vi.	Types of folds: Symmetrical, Asymmetrical, Overturned, Recumbent, Isoclinal	Types of faults: Normal, Reverse, Tear, Thrust
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**\*5. Syncline and Anticline**

Ans:

No.	Syncline	Anticline
i.	In case of syncline, limbs of the fold slope upwards while the central portion is lower.	In case of anticline, limbs of the fold slope downwards while the central portion is raised up.
ii.	Its trough forms a valley.	Its crest forms a mountain.
iii.	<i>[Note: Students are expected to refer Q.6.(1) for diagrams.]</i>	

**\*6. Asymmetrical fold and Symmetrical fold**

Ans:

No.	Asymmetrical fold	Symmetrical fold
i.	Axial plane is inclined.	Axial plane is vertical.
ii.	Limbs are inclined at different angles.	Limbs are inclined at the same angle.
iii.	<i>[Note: Students are expected to refer Q.6.(2-i, iii) for diagrams.]</i>	

**\*7. Normal fault and Reverse fault**

Ans:

No.	Normal fault	Reverse fault
i.	Normal fault results when a portion of land slides down along the fault plane.	Reverse fault results when a portion of the land is thrown upward relative to other side of the land.
ii.	Here, the exposed portion of the fault plane faces the sky.	Here, the exposed portion of the fault plane faces the ground.
iii.	<i>[Note: Students are expected to refer Q.6.(3-i, ii) for diagrams.]</i>	

**8. Horst and Graben**

Ans:

No.	Horst (Block mountain)	Graben (Rift valley)
i.	Horst is formed when the block enclosed by faults rises or the land on either side subsides.	Graben is formed due to subsidence in the central portion of the crust between two adjacent faults.
ii.	E.g. Satpuras, Black Forest Mountain	E.g. Tapi and Narmada valley
iii.	<i>[Note: Students are expected to refer Q.6. (4 and 5) for diagrams.]</i>	



**9. Fold mountain and Block mountain**

Ans:

No.	Fold mountain	Block mountain
i.	Fold mountain is caused by compressional forces.	Block mountain is caused by tensional forces.
ii.	It has less steep slopes.	It has very steep slopes.
iii.	It has a peak. (E.g. the Himalayas)	It has a flat top. (E.g. the Satpuras)

**\*10. Mercalli scale and Richter scale**

Ans:

No.	Mercalli scale	Richter scale
i.	Mercalli scale measures the intensity of an earthquake.	Richter scale measures the energy released during an earthquake.
ii.	It is based on the observation of the effects on earth's surface, humans, objects and structures.	It is based on the logarithm of the amplitude of the wave measured by a seismograph.
iii.	It ranges from I (not felt) to XII (total destruction).	It ranges from <2.0 to 10.0+ (never recorded).

**11. Acidic lava and Basic lava**

Ans:

No.	Acidic lava	Basic lava
i.	Acidic lava contains a higher percentage of silica.	Basic lava contains a lesser percentage of silica.
ii.	It has a high melting point.	It has a low melting point.
iii.	It is less fluid and flows over shorter distances.	It is more fluid and flows over longer distances.

**Q.4. Write short notes on**

**Parts of a fold**

Ans:

- i. Folds develop in the earth's crust.
- ii. Both sides of a fold are called limbs.
- iii. The axial plane divides a fold into two parts. The axis may be vertical, inclined or horizontal.
- iv. In case of anticline, limbs of the fold slope downwards while the central portion is raised up. The opposite is true in case of syncline.

[Note: Students are expected to refer Q.6.(1) for diagram.]

**2. Classification of fold mountains depending on their age**

Ans:

- i. Folding leads to development of fold mountains.
- ii. Old fold mountains are over 200 million years of age. e.g. the Aravalli in India, the Urals in Russia and the Appalachians in USA.
- iii. Young fold mountains are between 10-25 million years of age. e.g. the Himalayas in India, the Rockies in USA and the Andes in South America.

**3. Earthquake**

Ans:

- i. Movements in the earth's crust generate a lot of stress in the rock strata. When this stress accumulates beyond a limit, it tends to get released in the crust in the form of energy.
- ii. Release of energy waves causes the earth's crust to shake, which is called an earthquake.
- iii. The point where the accumulated stress in the rock strata gets released within the earth's crust is called seismic focus. The point directly above seismic focus, on the earth's surface, is called epicentre.
- iv. The intensity of the shock is the maximum at the epicentre and decreases with increasing distance from the epicentre in all directions.
- v. The instrument to record earthquake waves is called a seismograph.

**4. Causes of earthquakes**

Ans:

- i. **Volcanicity:** Sometimes, shallow earthquakes occur in areas close to the volcanic eruption site. e.g. Earthquake in the Cascades near Mt. St. Helens, USA in 1981 (magnitude: 5.5)
- ii. **Tectonic movements:** Due to the movement of tectonic plates of the crust, floating on the upper mantle, earthquakes occur along their margins (divergent and convergent). e.g. Earthquake in Gujarat, India in 2001. The earthquakes which generally occur in Indonesia, California, Chile, Uttarkashi and Assam can be attributed to tectonic movements.
- iii. **Anthropogenic causes:** Localized earthquakes may occur due to human activities like atomic explosion, drilling, mining, blasting, large-scale construction, etc. e.g. Earthquake due to North Korean nuclear test in 2017.



**5. Volcanoes**

- Ans:**
- Volcano is an opening in the earth's surface through which gases, molten lava and solid material are ejected from the upper mantle to the earth's surface.
  - Volcanoes are caused due to sudden movements.
  - On the basis of the origin of eruption, they are classified as: cone volcanoes and fissure volcanoes.
  - On the basis of periodicity and continuance of eruption activity, they are classified as: active, dormant or extinct (dead).

**6. Major belts of earthquakes and volcanoes**

- Ans:** The three major belts or zones of earthquake and volcanoes on the earth are as follows:
- Circum-Pacific Belt:** It is called the 'Ring of Fire'. It includes the volcanoes of Eastern and Western coastal areas of the Pacific Ocean. Cotopaxi, the highest volcanic mountain of the world, is found in this belt.
  - Mid-Atlantic Belt:** It covers the Mid-Atlantic Ridge. The most active volcanic area is Iceland which is found on Mid-Atlantic ridge.
  - Mid-Continental Belt:** It includes the volcanoes of Alpine mountains, Mediterranean Sea and the Eastern African fault zone. Stromboli and Etna, Italy are famous volcanoes.

**Q.5. Read the following extract and answer the questions given below**

**Kathmandu, 25 April (PTI)**

A powerful earthquake, measuring 7.9 on Richter scale struck Nepal today, nearly 1500 people were killed and over 10000 people were injured in the disaster.

The quake and a series of serious aftershocks delivered a severe blow to Nepal. The tremors were also felt across vast stretches of east and northeast India. It was also felt in China, Bhutan and as far as Pakistan and Bangladesh. The earthquake with epicentre at Lamjung, around 80 kilometres northwest of Kathmandu, had its impact in several cities in Bihar, West Bengal and Uttar Pradesh.

The initial report said the tremor measured 7.9-magnitude. It said the quake hit at 11:40 am local time at a shallow depth of 11 km. "There were 17 major aftershocks measuring over 5 in the next two and half hours," said an officer of the National Seismological Centre. Another aftershock measuring

6.6 hit within 80 minutes of the quake. This is the largest earthquake in Nepal after 80 years. India has sent rescue teams immediately.

**1. What was the magnitude of the earthquake?**

**Ans:** The magnitude of the earthquake was 7.9 on Richter scale.

**2. Where was the epicentre of the earthquake?**

**Ans:** The epicentre of the earthquake was Lamjung, which is around 80 kilometres northwest of Kathmandu.

**3. Which are the other affected areas?**

**Ans:** Other affected areas include several cities in Bihar, West Bengal and Uttar Pradesh.

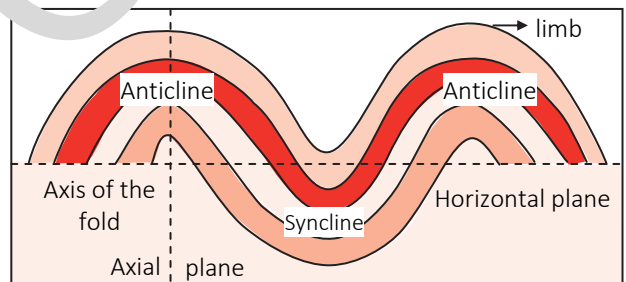
**4. According to you, what could be the reason behind the earthquake?**

**Ans:** It was probably due to tectonic movements. It could also have been due to anthropogenic causes like large scale drilling.

**Q.6. Draw neat and labelled diagrams for**

**1. Parts of a fold**

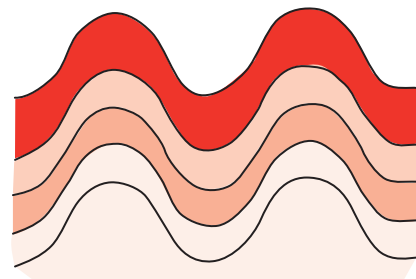
**Ans:**



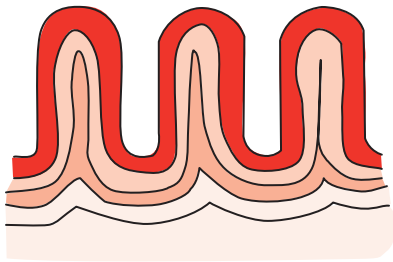
**Parts of fold**

**\*2. Types of folds**

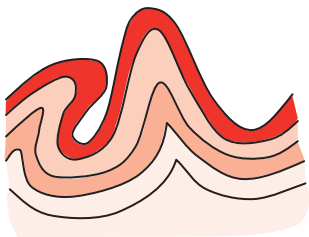
**Ans: Prior to folding**



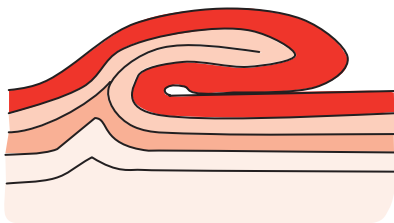
**i. Symmetrical**



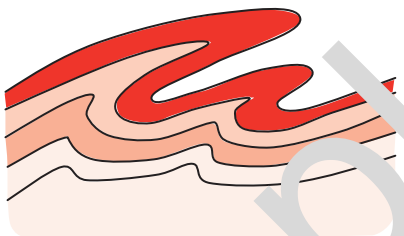
ii. Isoclinal



iii. Asymmetrical



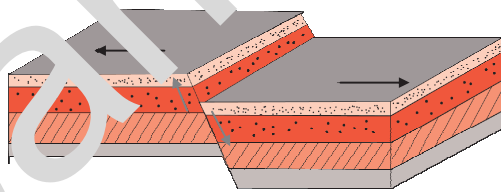
iv. Recumbent



v. Overturne

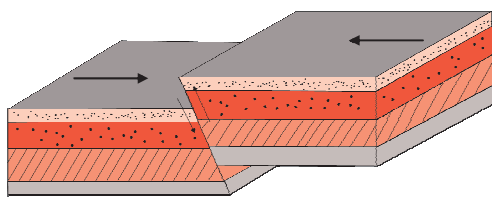
\*3. Types of faults

Ans: i.



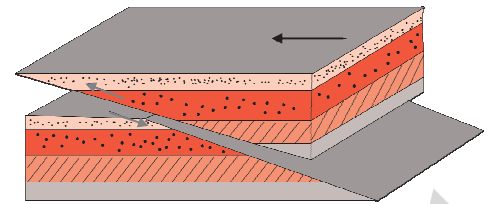
Normal fault

ii.



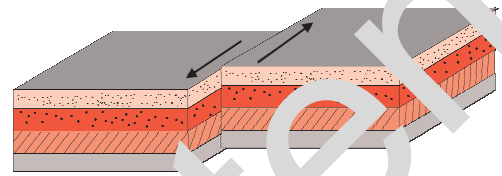
Reverse fault

iii.



Thrust fault

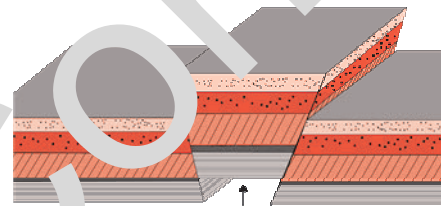
iv.



Block fault

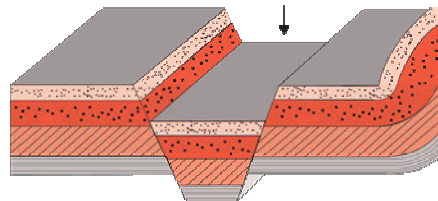
4. Block mountain

Ans:



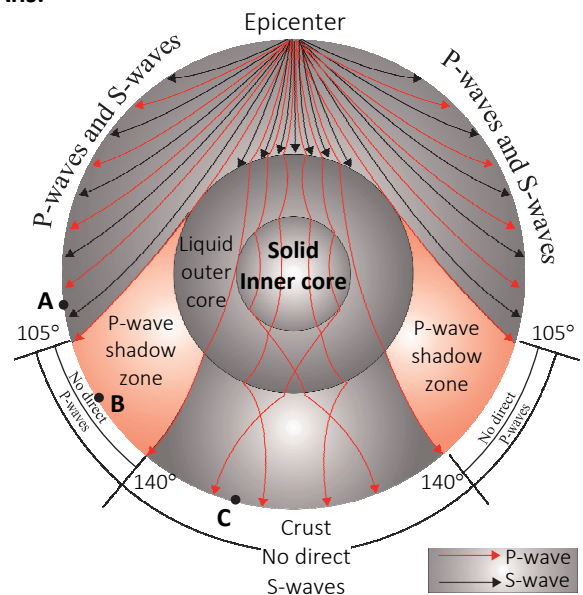
5. Rift valley

Ans:



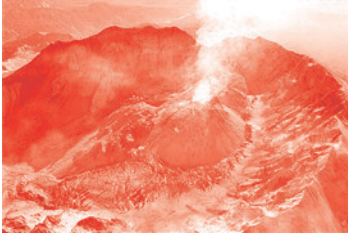
\*6. Shadow zone

Ans:



**\*7. Volcanic landforms**

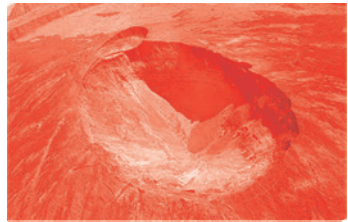
Ans: i. Lava domes



ii. Lava plateaus



iii. Calder



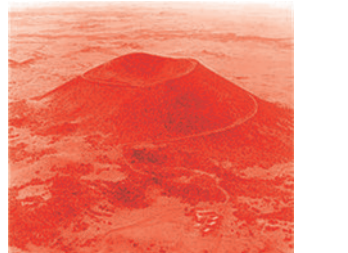
iv. Crater lake



v. Volcanic plateau



vi. Cinder cone

**vii. Composite cone****Q.7. Answer in detail****1. State some evidence of earth movements.**

- Ans:
- After the Great Tsunami of 2004, the coast around Sumatra Island rose by a few centimetres.
  - The Himalayas were formed millennia ago due to tectonic movements which continue even today.
  - In 1963, some sailors witnessed the formation of an island due to volcanic eruption near Ireland.
  - In 2004, islands such as the Megapode Island were reported to have been lost after the tsunami.
  - On the south east coast of Mumbai, near Mazagaon Dockyard, there is evidence of forest-covered land getting drowned.

**For your understanding**

'Tsunami', in Japanese, means 'harbour wave'. They are colossal waves, caused mostly by earthquakes or volcanic eruptions, in water bodies. These waves can reach heights of up to 100 feet. Their impact is limited to coastal areas but their destructive power is enormous.

**2. Explain different types of folds.**

Ans:  **Smart Code** **A** **I** **S** **R** **O**

- Asymmetrical:** The axial plane is inclined. The limbs are inclined at different angles.
- Isoclinal:** The limbs slope in the same direction with same amount. The axial plane may be vertical, inclined or horizontal. Slope of some portion of limbs is near vertical.
- Symmetrical:** The axial plane is vertical. Limbs are inclined at same angle.
- Recumbent:** Axial plane is almost horizontal. One limb lies over the other in horizontal direction.
- Overtured:** One limb lies above the other limb. Limbs slope unequally in the same direction.

[Note: Students are expected to refer Q.6.(2) for diagrams.]



**\*3. Explain different types of faults.**

- Ans:**
- i. Normal fault:** It results when a portion of land slides down along the fault plane and when the exposed portion of the plane faces the sky.
  - ii. Reverse fault:** It results when a portion of the land is thrown upward relative to other side of the land. In such situation, the fault plane faces the ground.
  - iii. Tear fault:** At times, the rock strata on either sides of the fault plane do not have vertical displacement. Instead movement occurs along the plane in horizontal direction.
  - iv. Thrust fault:** When the portion of the land on one side of the fault plane gets detached and moves over land on the other side. The angle of fault plane is generally low (less than  $45^\circ$ ).

*[Note: Students are expected to refer Q.6.(3) for diagrams.]*

**\*4. Explain the concept of shadow zone.**

- Ans:**
- i.** Earthquake waves get recorded in seismographs located at far off locations. But shadow zones are areas on the earth's surface where the seismic waves of an earthquake are not reported.
  - ii.** Each earthquake has different shadow zone. The shadow zone can be drawn based on the location of epicentre.
  - iii.** Generally, seismographs located at any distance within  $10^\circ$  from the epicentre record the arrival of both, P-waves and S-waves. However, the seismographs located beyond  $140^\circ$  from the epicentre; record the arrival of P-waves, but not that of S-waves. Thus a zone between  $105^\circ$  and  $140^\circ$  from the epicentre is identified as the shadow zone for both the types of waves.
  - iv.** The entire zone beyond  $105^\circ$  does not receive S-waves. The shadow zone of S-waves is much larger than that of the P-waves.
  - v.** The shadow zone of P-waves appears as a band around the earth between  $105^\circ$  and  $140^\circ$  away from the epicentre.
  - vi.** The shadow zone of S-waves is larger in extent.
  - vii.** As L-waves travel in the direction of circumference of the along the earth crust,

and not inwards, these waves do not have a shadow zone.

*[Note: Students are expected to refer Q.6.(6) for diagram.]*

**\*5. Write a note on volcanic materials.**

- Ans:**
- i. Solid material:** It consists of dust particles and rock fragments.
    - a. Volcanic dust: Very fine dust particles
    - b. Ash: Small-sized particles
    - c. Cinders: Half-burnt pieces of solid material
    - d. Breccia: Solid angular fragments
    - e. Volcanic bombs: Small fragments falling on the earth formed when lava material solidify when thrown into the air.
  - ii. Liquid material:**
    - a. Magma: Molten rock material below the earth's surface.
    - b. Lava: Molten rock material on the earth's surface.
    - c. Lava is classified into acidic lava and basic lava based on the percentage of silica. Acidic lava contains higher percentage of silica while basic lava contains less percentage of silica.
  - iii. Gaseous material:**
    - a. During an eruption, a dark, cauliflower-shaped cloud is seen over the crater.
    - b. It comprises smoke and inflammable gases, which produce flames.

**\*6. Explain, with examples, different types of landforms produced by volcanic eruption.**

- Ans:**
- i. Lava domes:** Domes are developed when magma comes out and solidifies around its mouth. The shape of the dome depends upon the fluidity of lava. High domes with steep slopes are developed by acidic lava. Low domes with a broad base are developed by basic lava. e.g. Mt. Elden in Arizona.
  - ii. Lava plateaus:** Due to spread of lava in huge quantity from fissure volcano, it covers large areas and plateaus are formed. e.g. Deccan Trap in India.
  - iii. Caldera:** After volcanic eruption, a large and deep depression remains in that area, called caldera. Caldera can be around 10 km wide and hundreds of metres deep. e.g. Mt. Katmai in USA. Smaller caldera is called crater.



- iv. **Crater lake:** When the funnel shaped crater of an extinct volcano is filled with rain water, it forms a crater lake. e.g. Lonar lake in India.
- v. **Volcanic plug:** It is formed when lava solidifies in the volcanic neck. e.g. Devil's Tower in USA.
- vi. **Cinder cone:** During an eruption, solid material is ejected in large quantities, comprising ash, cinder, breccia, etc. It is deposited around the mouth until a conical hill with steep slopes is formed. e.g. Mt. Nuovo in Italy
- vii. **Composite cone:** It is built of alternate layers of lava and cinder. It is symmetrical in shape. e.g. Mt. St. Helens in USA.

[Note: Students are expected to refer Q.6.(7) for diagrams.]

### Apply Your Knowledge

#### 1. Let's recall. (Textbook pg. no 1)

Observe the following pictures in fig. and discuss the questions in the class.

- i. What might be the reasons behind buildings collapsing in photo 1?
- ii. Which event is depicted in photo 2? What impact does it bring about in the surroundings?
- iii. In photo 3, what could be the reason behind the bend in the rock strata?
- iv. What could be the reason behind the difference in altitudes of the land and the steepness of the slope in photo 4?
- v. Classify the events in the photos into sudden and slow movements.
- vi. Example of which of these movements is not likely to be found in the mainland of the Indian sub-continent?

- Ans:**
- i. Earthquake
  - ii. Volcanic eruption  
It causes destruction of life and property.
  - iii. Forces inside the earth's surface.  
Perhaps a part of land subsided due to cracks in the earth's surface.
  - iv. Sudden movements: Photos 1 and 2  
Slow movements: Photos 3 and 4
  - v. Volcanic eruptions

#### 2. Think about it. (Textbook pg. no 3)

How will compressional forces affect brittle rocks?

- Ans:** Compressional forces would break brittle rocks and no folding would occur.

#### 3. Think about it. (Textbook pg. no 4)

'A mountain never remains a mountain'.

Can you relate this idiom with the mountain building process?

- Ans:** As earth movements never cease, mountains are created and eroded continuously over time.

#### 4. Try this. (Textbook pg. no 4)

Observe the diagrams in fig. 1.5. to understand the different types of fold shown in the diagram and match it with its characteristics. Write the name of the fold in the space given below.

- Ans:**
- i. Symmetrical
  - ii. Normal
  - iii. Asymmetrical
  - iv. Recumbent
  - v. Overturned

#### 5. Try this. (Textbook pg. no 5)

Observe the diagrams in fig. 1.6 and read the explanation regarding the characteristics of various faults given below. Identify the faults and match each of them with their characteristics.

- Ans:**
- i. Normal
  - ii. Reverse
  - iii. Thrust
  - iv. Tear

#### Think about it. (Textbook pg. no 6)

- i. When can faults form in fold mountains?
- ii. Can folds form in block mountains? Find the reasons and discuss.

- Ans:**
- i. Cracks may develop in the rocks of fold mountains due to tensional forces.
  - ii. No, as block mountains are formed due to tensional forces and in rocks which are too rigid to fold.

#### 7. Let's recall. (Textbook pg. no 6)

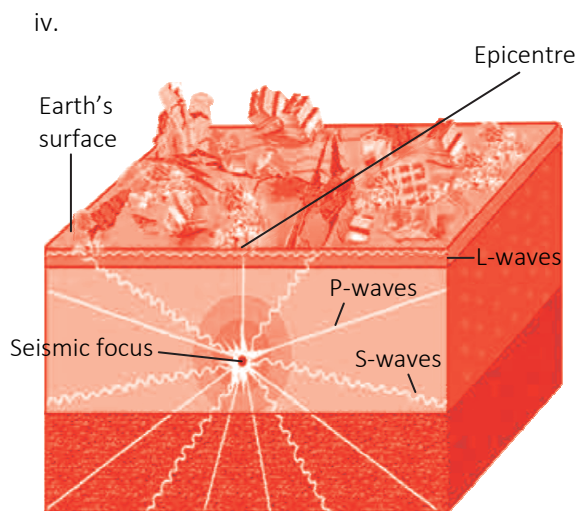
On 19<sup>th</sup> August, 2018, around 300 people died in Indonesia.

Many buildings collapsed. Many roads broke apart. A tsunami was generated.

- i. What was the cause behind these events?
- ii. What actually happened during this natural event?
- iii. Name the energy waves involved in this natural event.
- iv. Observe the diagram in figure and label the boxes.

- Ans:**
- i. Earthquake
  - ii. Due to tectonic movements, an earthquake of magnitude 7.5 occurred with its epicentre in the mountainous Donggala Regency, Indonesia.
  - iii. Tsunami





**8. Think about it.** (Textbook pg. no 6)  
 Look at fig. During an earthquake, do you think the seismic waves reach entire portion of the earth? Is there any region on the Earth's surface where a given earthquake will not be reported?

**11. Give it a try.** (Textbook pg. no 8)  
 How to locate epicentre of a given earthquake?  
 Take the given hypothetical data in the table.  
 The data shows the time of arrival of P-waves and S-waves at 3 seismograph stations.  
 Assume the scale of the map as 1 cm : 18 km.

Recording Station	P-wave arrival time (IST)	S-wave arrival time (IST)
Jalna	11: 06: 06	11: 06: 19
Washim	11: 06: 46	11: 07: 03
Aurangabad	11: 07: 06	11: 07: 24

**Ans:** 1. The time difference between the arrival of P-waves and S-waves for each station –  
 Time lag = Arrival time of S-waves – Arrival time of P-waves  
 Jalna = 11: 06: 19 – 11: 06: 06 = 13 sec  
 Washim = 11: 07: 03 – 11: 06: 46 = 17 sec  
 Aurangabad = 11: 07: 24 – 11: 07: 06 = 18 sec

2. Actual distance on land surface for each station  
 Jalna = 13 × 8 = 104 km  
 Washim = 17 × 8 = 136 km  
 Aurangabad = 18 × 8 = 144 km

3. Jalna =  $\frac{\text{Actual distance}}{\text{Scale of the map}}$   
 =  $\frac{104}{18}$   
 = 5.8 cm  
 Washim =  $\frac{136}{18}$  = 7.6 cm  
 Aurangabad =  $\frac{144}{18}$  = 8 cm

**Ans:** Refer Q.7.(4).

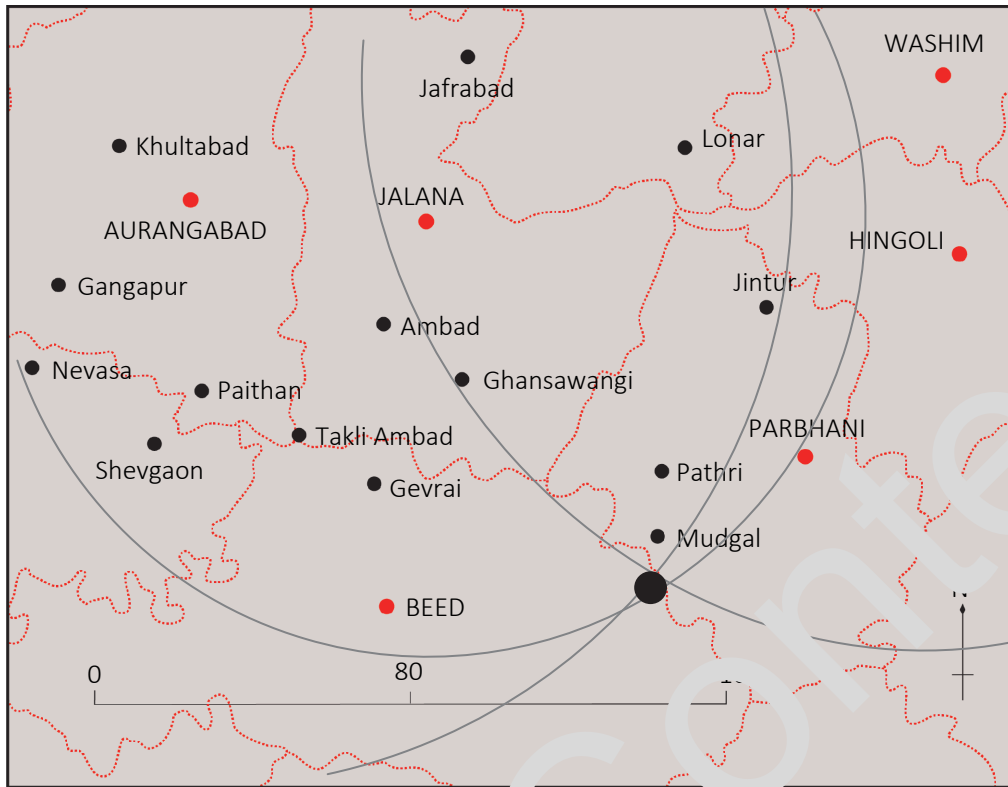
**9. Think about it.** (Textbook pg. no 7)  
 Why has a shadow zone for L-waves not been shown in fig.?

**Ans:** Refer Q.2.(4).

**10. Can you tell?** (Textbook pg. no 7)  
 In fig. A, B, C are three points on the earth's surface. Analyse their locations with respect to epicentre and shadow zones.

**Ans:**

Point	Location	Shadow Zone
A	within 105° from the epicentre	
B	between 105° and 140° from the epicentre	P wave shadow zone
C	beyond 105° from the epicentre	S-wave shadow zone



The place which is around 18 km far from south direction of Mudgal is the epicentre.

**12. Seismic Zones in India (Textbook pg. no 9)**

Zone	Degree of risk	States/UTs
I	Least	
II	Low	
III	Moderate	
IV	High	
V	Very High	

Ans:

Zone	Degree of risk	States/ UTs
I	Least	Nagaland
II	Low	Telangana, Odisha, Chhattisgarh, Eastern Rajasthan
III	Moderate	Eastern Maharashtra, Madhya Pradesh, Tamil Nadu, Kerala, Jharkhand, Western Rajasthan, Andhra Pradesh, Haryana
IV	High	Jammu, Himachal Pradesh, Sikkim, Punjab, Chandigarh, Uttar Pradesh, West Bengal, Delhi, Western Maharashtra, Southern Bihar, Eastern Gujarat, Lakshadweep islands
V	Very High	Kashmir, Northern Bihar, Uttarakhand, Meghalaya, Assam, Mizoram, Tripura, Arunachal Pradesh, Nagaland, Manipur, Western Gujarat, Andaman and Nicobar Islands

**13. Find out! (Textbook pg. no 9)**

Find out examples of active, dormant and extinct volcanoes.

- Ans:
- Active volcanoes:**  
Mt. Fujiyama in Japan, Mt. Stromboli in Mediterranean Sea.
  - Dormant volcanoes:**  
Mt. Vesuvius in Italy, Mt. Katmai in Alaska, Barren Island, India
  - Extinct volcanoes:**  
Mt. Kilimanjaro in Tanzania.



## Chapter Assessment

Time: 1.00 Hr.

Total Marks: 20

**Q.1. (A) Fill in the blanks with appropriate alternatives given below and rewrite the sentences. [3]**

1. Deccan trap in India is an example of \_\_\_\_\_.  
 (A) block mountain (B) rift valley  
 (C) lava plateau (D) caldera
2. Orogenic movements are also known as \_\_\_\_\_ movements.  
 (A) slow (B) sudden  
 (C) horizontal (D) vertical
3. Graben means \_\_\_\_\_.  
 (A) rift valley (B) block mountain  
 (C) fold Mountain (D) volcano

**(B) Identify the incorrect factor. [2]**

1. The different parts of fold are:  
 (A) Limb (B) Anticline  
 (C) Fracture (D) Syncline
2. The waves associated with earthquakes are:  
 (A) M-waves (B) P-waves  
 (C) S-waves (D) L-waves

**Q.2. Give geographical reasons. (Any One) [3]**

1. Extinct conical volcanoes often form crater lakes.
2. Soft rocks form folds while hard rocks form faults.

**Q.3. Write short notes on. (Any One) [4]**

1. Major belts of earthquakes and volcanoes
2. Classification of fold mountains depending on their age

**Q.4. Answer in detail. (Any One) [8]**

1. Write a note on volcanic materials.
2. Explain different types of folds.

### Answers

**Q.1. (A)** 1. (C) 2. (C) 3. (A)

**(B)** 1. (C) 2. (A)

**Q.2.** 1. i. At times, the eruption of volcano brings about a large quantity of material and relieves lot of pressure.

ii. After a volcanic eruption, a large and deep depression called caldera may remain in that area. This can be around 10 m wide and hundreds of metres deep.

iii. A smaller caldera is known as crater.

When the funnel-shaped crater of an extinct volcano is filled with rain water, it forms a crater lake.

2. i. Soft rocks, deep within the crust, are flexible and under high pressure.

ii. Hence, they fold easily due to compressional (converging) forces.

iii. Hard rocks, near the earth's surface, are rigid and not under high pressure.

iv. Hence, they form faults easily due to tensional forces.

**Q.3.** 1. The three major belts or zones of earthquake and volcanoes on the earth are as follows:

**i. Circum-Pacific Belt:** It is called the 'Ring of Fire'. It includes the volcanoes of Eastern and Western coastal areas of the Pacific Ocean. Cotopaxi, the highest volcanic mountain of the world, is found in this belt.

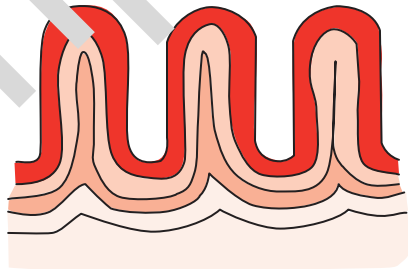


- ii. **Mid-Atlantic Belt:** It covers the Mid-Atlantic Ridge. The most active volcanic area is Iceland which is found on Mid-Atlantic ridge.
  - iii. **Mid-Continental Belt:** It includes the volcanoes of Alpine mountains, Mediterranean Sea and the Easter Africa fault zone. Stromboli and Etna, Italy are famous volcanoes.
- 2.
- i. Folding leads to development of fold mountains.
  - ii. Old fold mountains are over 200 million years of age. e.g. the Aravalli in India, the Urals in Russia and the Appalachians in USA.
  - iii. Young fold mountains are between 10 to 25 million years of age. e.g. the Himalayas in India, the Rockies in USA and the Andes in South America.

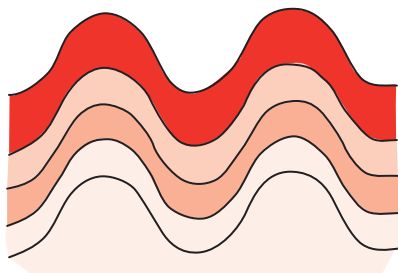
- Q.4.**
- 1.
- i. **Solid material:** It consists of dust particles and rock fragments.
    - a. Volcanic dust: Very fine dust particles
    - b. Ash: Small-sized particles
    - c. Cinders: Half-burnt pieces of solid material
    - d. Breccia: Solid angular fragments
    - e. Volcanic bombs: Small fragments falling on the earth, formed when lava material solidify when thrown into the air.
  - ii. **Liquid material:**
    - a. Magma: Molten rock material below the earth's surface.
    - b. Lava: Molten rock material on the earth's surface.
    - c. It is classified into acidic lava and basic lava based on the percentage of silica. Acidic lava contains higher percentage of silica while basic lava contains less percentage of silica.
  - iii. **Gaseous material:**
    - a. During an eruption, a dark, cauliflower-shaped cloud is seen over the crater.
    - b. It comprises smoke and inflammable gases, which produce flames.
- 2.
- i. **Asymmetrical:** The axial plane is inclined. The limbs are inclined at different angles.



- ii. **Isoclinal:** The limbs slope in the same direction with same amount. The axial plane may be vertical or inclined or horizontal. Slope of some portion of limbs is near vertical.

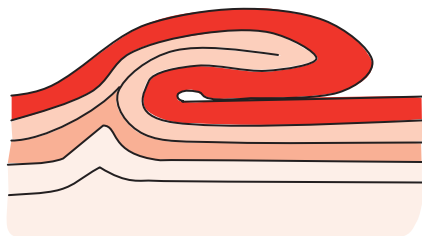


- iii. **Symmetrical:** The axial plane is vertical. Limbs are inclined at same angle.

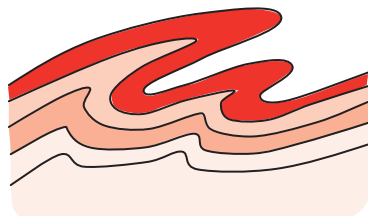




iv. **Recumbent:** Axial plane is almost horizontal. One limb lies over the other in horizontal direction.



v. **Overtured:** One limb lies above the other limb. Limbs slope unequally in the same direction.



Sample Content



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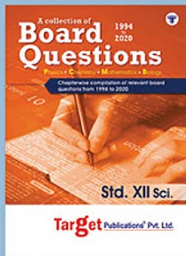
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