

Q: On 18<sup>th</sup> December 2023, volcanoes erupted in Iceland due to 'Earthquakes' discuss how volcanoes are formed.

## Volcanic Eruptions

**definition of volcanoes:** Volcanoes are natural geological features that form when molten rocks, ash and gases erupt onto Earth's surface. They are typically associated with tectonic plate movements where Earth's crust is either colliding or separating.

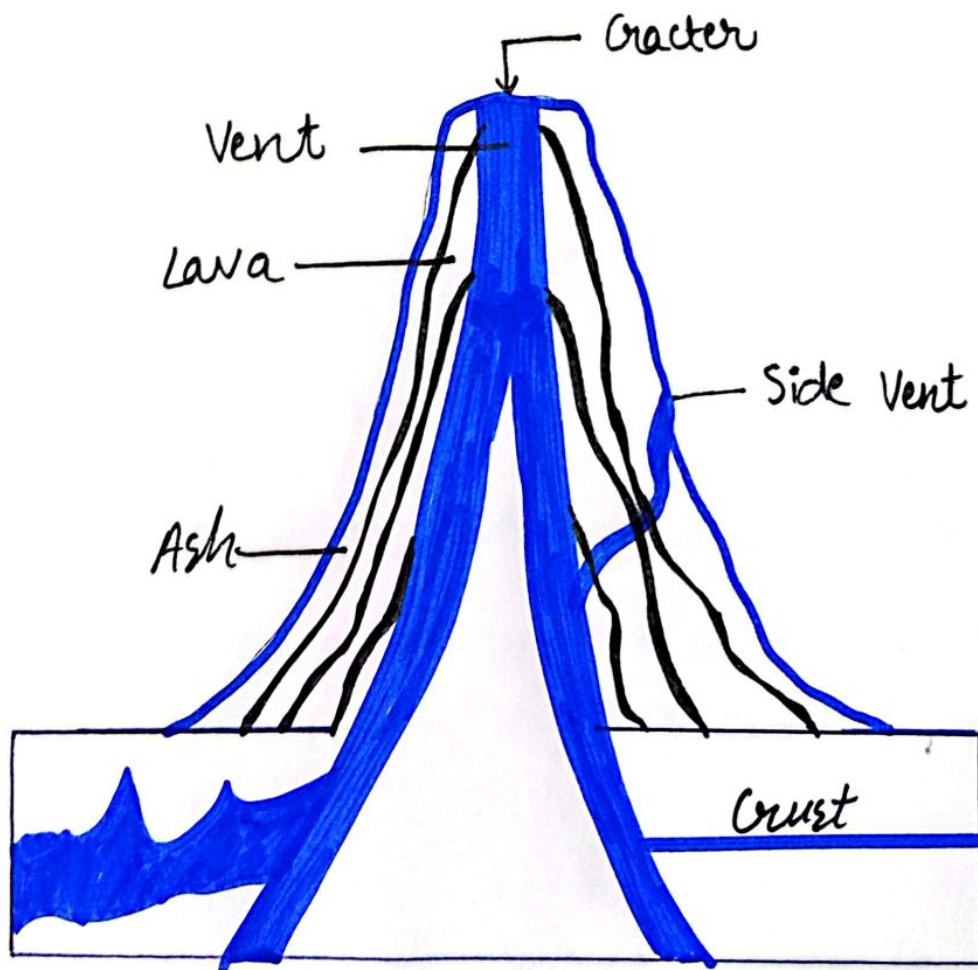


Figure: Volcanic Eruption

# Formation of Volcanoes from Earthquakes

Volcanoes can be formed in various (var) ways that are associated with tectonic plate movements as in Earthquake. Since Earthquakes are formed due to tectonic plate movements thus as a result of earthquakes volcanoes erupted. These below mentioned tectonic plate movements explain how volcanoes are formed due to earthquakes:

## a. Convergent plates Movements

In most cases, volcanoes are erupted on convergent plate boundaries where one tectonic plate moves beneath another in a process called subduction. As subducting plate sinks into Earth's mantle, the intense heat and pressure causes release of volatile substances and melting of molten rock leads to volcanic activity.

## b. Divergent plates Movements

Volcanoes are also erupted due to movement of divergent plates, where tectonic plates move away from each other at divergent plate boundaries. Due to this movement a gap is created and molten rocks and

ash is erupted leading towards volcanic activity.

**Hotspot**  
**Formation of Volcanoes:** Volcanoes called hotspot volcanoes are formed above stationary hot plumes of magma. When tectonic plate comes over this hotspot, volcanoes are erupted.

## Effects of Volcanoes

- a. **Damage to infrastructure:** Ash and dust erupted from volcanoes cause damage to buildings, houses and bridges etc.
- b. **Climate change:** Gases produced by volcanic eruptions produce intense heat in atmosphere. They can also cause fog, acid rain etc.
- c. **Health hazards:** Volcanoes contribute to numerous health hazards because when they slide down the slopes then they acidify water of oceans, destroy soil and air quality.
- d. **Loss of life:** Pyroclastic flows which are high-speed currents of molten rocks and ash, on moving down the slopes, ravage

everything that comes in their way.

- Loss of vegetation: Ash and gases erupted from volcanoes called lava destroy soil quality on moving down the slope and thus causes loss of vegetation.

f. Creation of new landforms: Volcanoes contribute to creation of new land forms like lava plateaus, volcanic mountains that become fertile ground after time and supports agriculture and diverse ecosystems.

Q: Ishaq can do a tailoring job in 6 hours. Abbas does the same job in 4 hours. Irfan does it in 8 hours. Ishaq and Abbas start doing the work. Abbas leaves after 2 hours and Irfan replaces him. How long would it take to complete the work?

Time taken by Ishaq to do the job = 6 hours

Time taken by Irfan to do the job = 8 hours

Time taken by Abbas to do the job = 4 hours

Time for which Ishaq and Abbas work TOGETHER

$$\frac{1}{T} = \frac{1}{6} + \frac{1}{4}$$

After taking LCM:

$$\frac{1}{T} = \frac{5}{12}$$

Reciprocating the equation on both sides:

$$T = \frac{12}{5} = 2.4 \text{ hrs}$$

**Ishaq and Abbas work together for 2.4 hours.**

Work completed by Ishaq and Abbas in 2 hours:

$$= 100 \times$$

Time taken by Ishaq and Abbas to complete the job

Work completed by Ishaq and Abass in 2 hours.

$$\text{Work completed} = \frac{\text{Time taken to complete the job}}{\text{Total time}} \times 100$$

Time for which both partners work together

$$= \frac{2}{2.4} \times 100 = 83.3\%$$

Work completed by Ishaq and Abass in 2 hrs is 83.3%.

$$\text{Remaining work} = 100 - 83.3 = 16.67\%$$

Time for which Ishaq and Irfan work **'TOGETHER'**

$$\frac{1}{T} = \frac{1}{6} + \frac{1}{8}$$

After taking LCM

$$\frac{1}{T} = \frac{7}{24}$$

Reciprocating both sides of equation

$$T = \frac{24}{7} = 3.42 \text{ hrs}$$

Ishaq and Irfan work **together** for **3.42 hrs.**

Finding time taken by Ishaq and Irfan to complete remaining work:

$$\text{Remaining work completed} = \frac{\text{Time taken to complete the job}}{\text{Time for which both work together}} \times 100$$

$$16.67 = \frac{\text{Time taken to complete the job}}{3.42} \times 100$$

Time taken = 0.57 hrs  
to complete  
the job

**Total Time taken to complete the work =**  
Time taken by Ishaq and Abbas to do the job + Time taken by Ishaq & Irfan to do the job  
= 2 hours + 0.57 hours  
= 2.57 hours

Q. A farmer needs to build a boundary wall around his farm. If the area of the farm is  $576\text{m}^2$ , what will be the area of the wall, if it's 2 metres high on 3 sides and 3 metres high on one side?

Area of wall = Area of 3 sides with equal height +  
Area of one side with 3 metres height

Area of 3 sides with equal height =  $3 \times \text{base of wall} \times \text{height of wall}$

base of wall = square root (area of farm)

$$= \text{sqrt}(576\text{m}^2)$$

$$\text{base of wall} = 24\text{m}$$

Area of 3 sides of equal height =  $3 \times 24\text{m} \times 2\text{m}$

$$\text{area of 3 sides of equal height} = 144\text{m}^2$$

Area of one side with 3 metres height =  $\text{base of wall} \times \text{height of wall}$

$$= 24\text{m} \times 3\text{m}$$

$$\text{area of one side with 3m height} = 72\text{m}^2$$

$$\text{Area of wall} = 144\text{m}^2 + 72\text{m}^2$$

$$\text{Area of wall} = 216\text{m}^2$$



Q: Find the angles of perimeter of regular pentagon with each side of 5cm.

Firstly, finding sum of interior angles of a pentagon. Like any other polygon, sum of interior angles of a polygon can be found using formula:

$$S = (n - 2) \times 180^\circ$$

S = sum of interior angles of polygon

n = no. of sides of polygon

Here  
 $n = 5$

$$S = (5 - 2) \times 180^\circ = 540^\circ$$

$$\begin{array}{r} 2 \times 180 \\ \times 3 \\ \hline 540 \end{array}$$

Sum of interior angles of pentagon = S = 540°

Each <sup>interior</sup> angle of pentagon is equal which can be found as:

$$\text{Angle} = \frac{540^\circ}{5} = 108^\circ$$

Angle of perimeter of regular pentagon = 108°.

Q: Find the angles of pentagon having perimeter of 5cm. Also find length of each side of pentagon

→ Firstly finding length of each side of pentagon

$$\text{Perimeter of pentagon} = \text{No. of sides} \times \text{length of each side}$$
$$\text{Let length of each side of pentagon} = x$$
$$5 = 5 \times x$$

Dividing by '5' on both sides

$$\frac{5}{5} = \frac{5x}{5}$$

$$1 = x$$

$$\Rightarrow \boxed{x = 1\text{cm}}$$

length of each side of pentagon =  $x = 1\text{cm}$

→ Finding angles of pentagon

like any polygon, sum of interior angles of pentagon can be found:

$$S = (n-2) \times 180^\circ$$

Here  $n = 5$  no. of sides

$$S = (5-2) \times 180^\circ = 540^\circ$$

$$\text{Each interior angle of pentagon} = \frac{S}{n} = \frac{540^\circ}{5} = 108^\circ$$

Thus, each angle of pentagon =  $108^\circ$

Q: Three bags contain 3 red, 7 black; 8 red, 2 black; 4 red and 6 black balls respectively. 1 of the bags is chosen at random & ball is drawn from it. If the ball drawn is red, find the probability that it is drawn from third bag.

**Solution:**

Let  $A_1$  be an event showing 'first bag is selected'  
Let  $A_2$  be an event showing 'second bag is selected'  
Let  $A_3$  be an event showing 'third bag is selected'

Firstly, finding probability of  $A_3 = P(\dots)$

$$P(A_3) = \frac{\text{Possible no. of ways in which } A_3 \text{ can occur}}{\text{Total no. of possible outcomes}}$$

Total number of outcomes = 3

Possible no. of ways in which  $A_3$  can occur = 1

$$P(A_3) = \frac{1}{3}$$

Similarly  $P(A_1) = \frac{1}{3}$ ,  $P(A_2) = \frac{1}{3}$

Now, finding probability of drawing Red ball from Each bag

Let is  $P(B|A_i)$  Probability of finding red ball from each bag

$$\text{From first bag: } P(B|A_1) = \frac{3}{10}$$

$$\text{From second bag: } P(B|A_2) = \frac{8}{10} = \frac{4}{5}$$

$$\text{From third bag: } P(B|A_3) = \frac{4}{10} = \frac{2}{5}$$

Finding Probability that ball from Third bag is RED let it is represented by  $P(A_3|B)$

Using Bayes' Theorem

$$P(A_3|B) = \frac{P(B|A_3) * P(A_3)}{P(B)} \quad \text{--- (i)}$$

$$P(B) = P(B|A_1) * P(A_1) + P(B|A_2) * P(A_2) + P(B|A_3) * P(A_3)$$

Putting values in above equation

$$= \left( \frac{3}{10} * \frac{1}{3} \right) + \left( \frac{4}{5} * \frac{1}{3} \right) + \left( \frac{2}{5} * \frac{1}{3} \right)$$

Taking  $\left(\frac{1}{3}\right)$  as common

$$= \frac{1}{3} \left( \frac{3}{10} + \frac{4}{5} + \frac{2}{5} \right)$$
$$= \frac{1}{3} \left( \frac{15}{10} \right)$$

$$P(B) = \frac{1}{2}$$

Putting values in eq. (i)

$$P(A_3|B) = \frac{\left(\frac{2}{5}\right) * \left(\frac{1}{3}\right)}{\frac{1}{2}} = \frac{4}{15}$$