

**GS Advanced Program 2023****Generic Booklet**Test Name/Code/No. : **691046**

Name

Email ID.

Roll No.

Mobile No.

Date

**Allotted Time : 60 Minutes****Instructions to Candidates -**


- There are 7 Questions in this Question paper.
- All Questions are Compulsory.
- For all updates, please visit the noticeboard -  
<https://noticeboard.forumias.com/gsap-2023/>

**Important -**

- Answers must be attempted in the QCA Booklet only.
- To upload the Answer Copies please visit to "My Course" section on -  
<https://academy.forumias.com/>
- Only those copies will be evaluated which will be submitted before the next class.

Q. No.	Grade/Score
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Overall Grade/Score	

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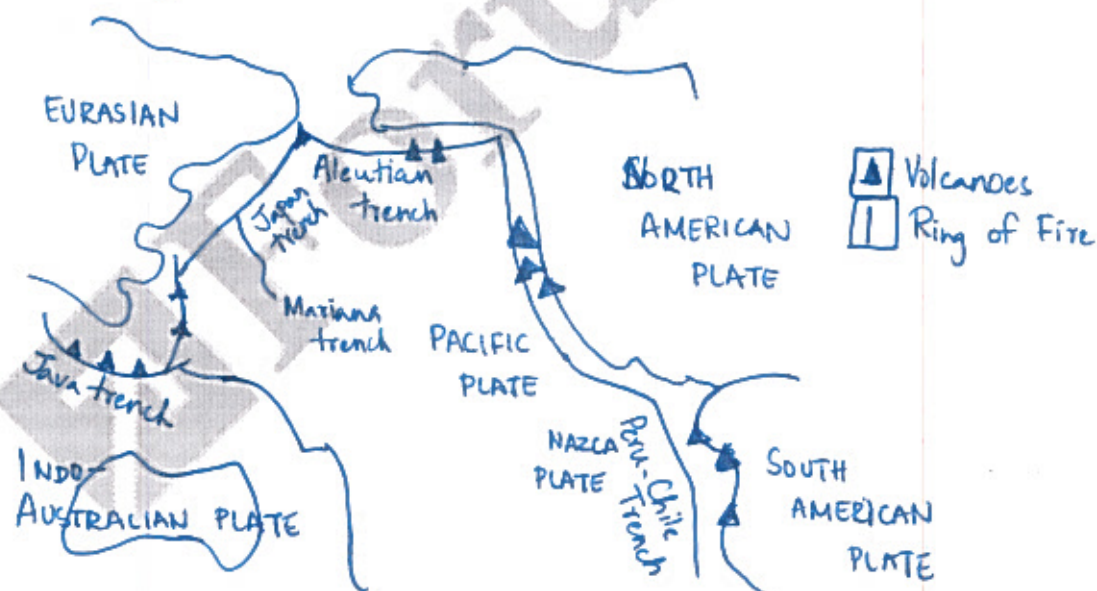
 **Forum IAS**

## Start Writing Here

Q.1) Discuss the geophysical characteristics of Circum-Pacific zone

The Circum Pacific zone, also known as the Ring of Fire, is the belt along which large number of Earthquakes and Volcanoes occur.

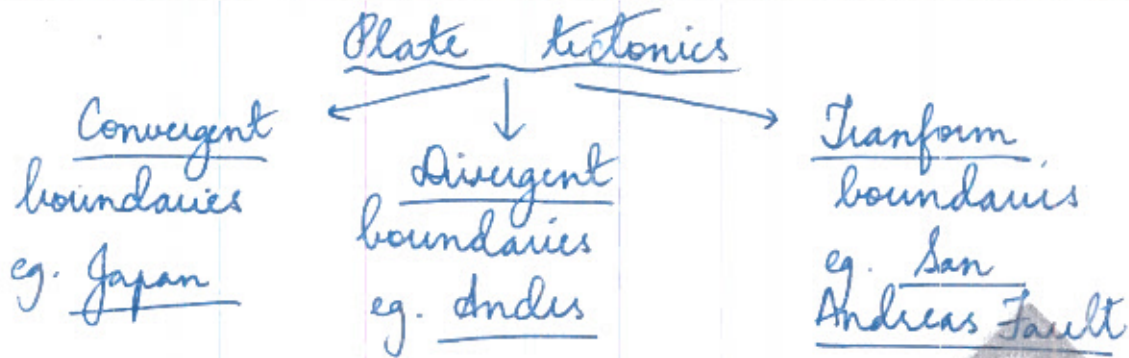
It is found along the west coast of South and North America, from Aleutian Islands to Japan, then from Indonesia to Tonga to New Zealand.



### Geophysical characteristics

(i) Formation → Due to Plate tectonics,





(ii) Volcanoes

around 75% of volcanoes are found in this region. eg. Mt. Colopaxi

(iii) Large number of earthquakes

around 85% earthquakes occur in the Ring of Fire

(iv) Formation of

Oceanic Trenches  
eg. Kuril Trench

Volcanic arcs  
eg. Japan

Volcanic belts  
eg. Andes

(v) Formation of Hotspots eg. Hawaii

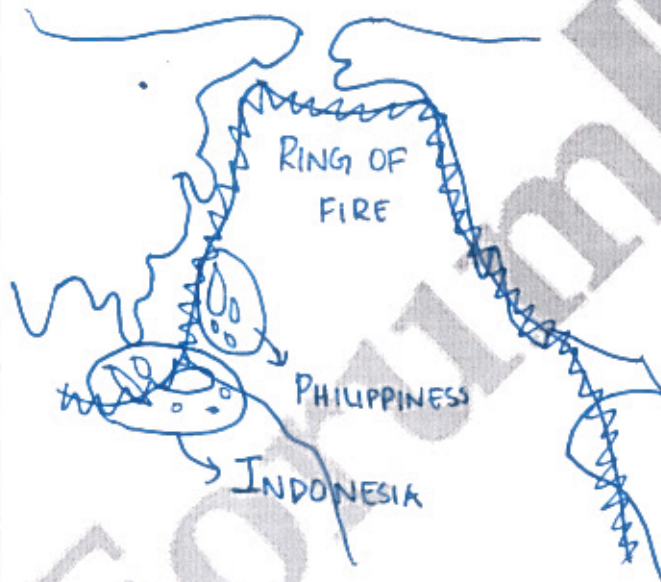
Therefore the Circum Pacific zone helps in understanding the Earth's interior

Overall Grading (✓)

Poor			Average			Good		
1	2	3	4	5	6	7	8	9

Q.2) Explain the formation of thousands of islands in the Indonesian and Philippine archipelago

Indonesia and Philippines are among the largest archipelagos of the world. An archipelago refers to a group of islands.



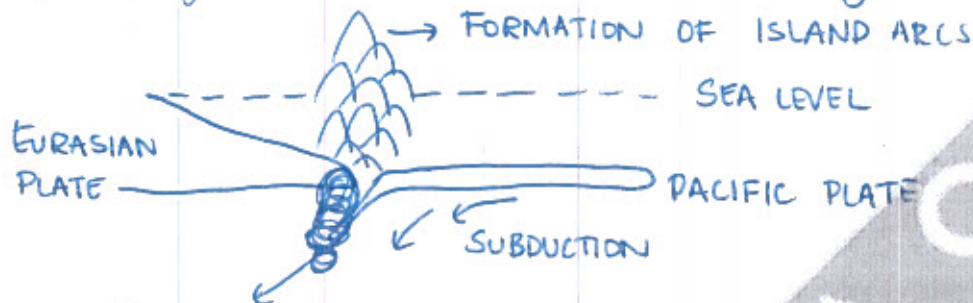
Both these archipelagos are located in the Ring of Fire which witnesses large number of earthquakes and volcanoes.

### Formation

→ Both Indonesia and Philippines are



formed due to Plate tectonics, especially Ocean - ~~Continent~~ <sup>Ocean</sup> Convergence



Rising magma due to melting of Pacific plate

→ When both plates collide, the denser Pacific plate subducts and starts melting → Magma rises up

Volcanic eruptions → Island arcs

Philippines and Indonesia

The formation of Indonesia and Philippines gives information on plate tectonics -

Overall Grading (✓)

Poor			Average			Good		
1	2	3	4	5	6	7	8	9

Q.3) Discuss the convection current hypothesis of Arthur Holmes.

In the 1950s, Arthur Holmes discussed that convection currents had a role to play in the mantle portion.

### Convection currents

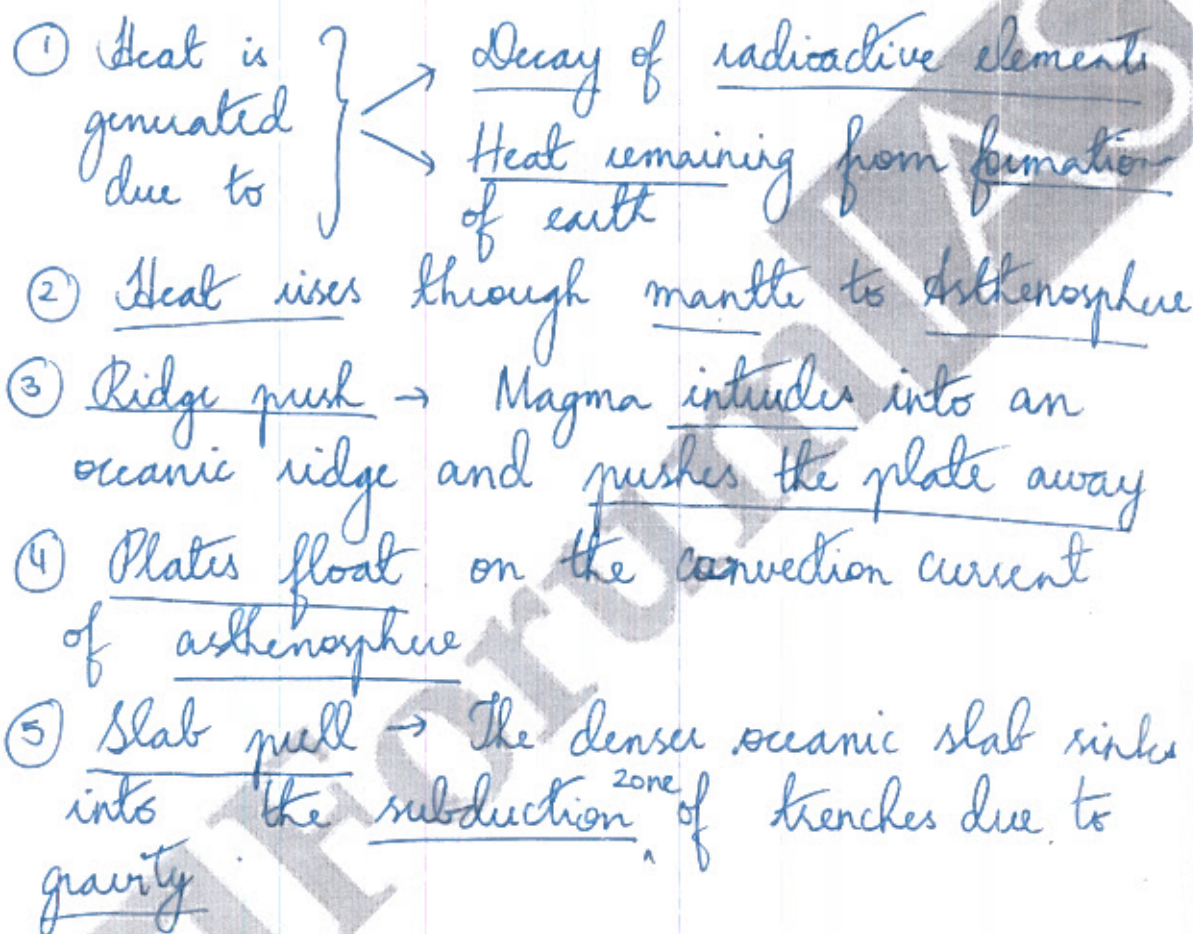
Convection currents are flowing fluids caused due to temperature and density differences within the material.



Below lithosphere, convection currents are formed in the mantle due to unequal distribution of heat.

The rising limbs of the convection current cell create huge energy and pressure on the crust and breaks it. The divergent limbs pull the two broken parts apart in opposite directions.





Thus the Convection Current hypothesis has given the foundation for explaining continental drift, sea floor spreading and plate tectonics.

Poor			Average			Good		
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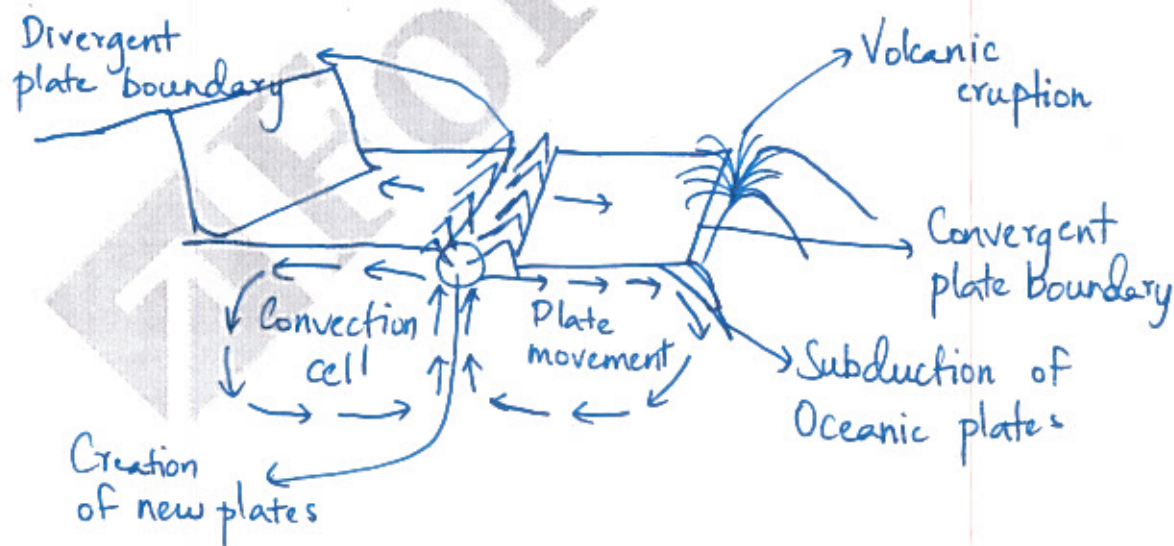


Q.4)

What is sea floor spreading hypothesis? How does the evidence gathered through paleomagnetism justify sea floor spreading hypothesis

Harry Hess came up with the Sea Floor spreading hypothesis in 1960s. Hess argued that convection currents breaks the crust at Mid-Oceanic ridges through constant eruption and new lava wedges into it, pushing the oceanic crust on either side.

Space left between 2 oceanic plates is occupied by magma  $\Rightarrow$  formation of new oceanic crusts.



Since creation of oceanic crust does not lead to shrinking of the others, Hess believed that at trenches, ocean floor

gets melted by the mantle.

Paleomagnetism - Evidence for sea floor spreading

- (i) Majority of Ocean floor → Basaltic rocks → due to volcanic activity. Basalt contains magnetic minerals which align themselves in magnetic field's direction.
- (ii) When Paleomagnetic rocks on either side of ridges were studied, it was found that alternate magnetic rock strips were flipped, with 1 having normal polarity and the other having reversed polarity.
- (iii) Thus, paleomagnetic rocks on sides of mid-oceanic ridges provide evidence for sea-floor spreading.

Sea floor spreading hypothesis along with convection currents and paleomagnetism provide explanation for understanding Plate tectonics theory.

Overall Grading (✓)

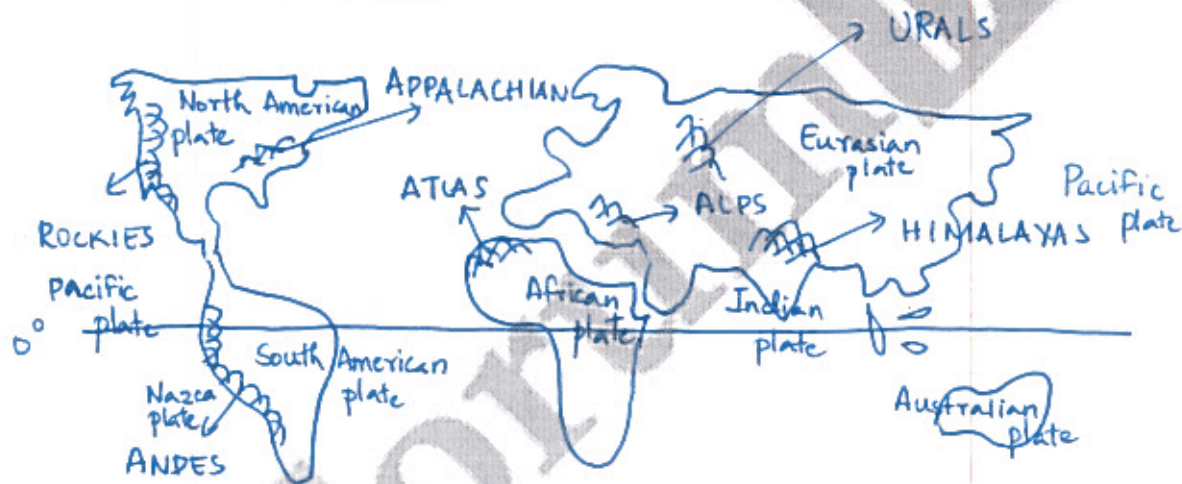
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Q.5)

Why are the world's fold mountain systems located along the margins of continents? Bring out the associations between global distribution of Fold mountains and earthquakes and volcanoes

Fold mountains are mountains formed from the folding of the Earth's crust when 2 tectonic plates collide with each other



Along Margins of Continents

→ Due to folding of crust and uprising of sediments along margins of continents

→ Takes place due to

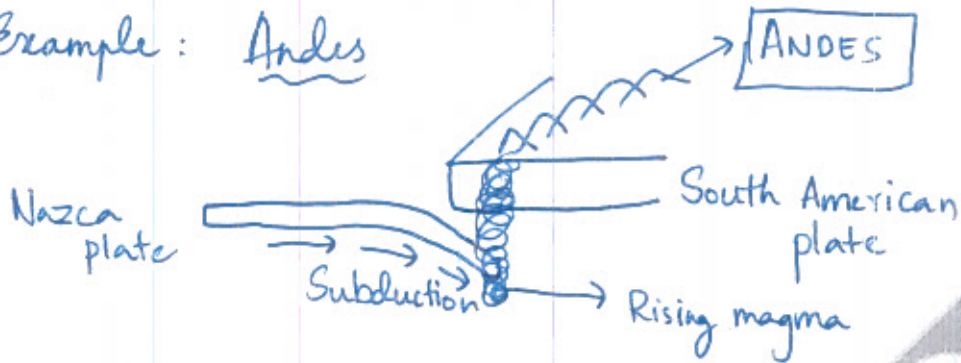
Ocean - Ocean/Continent  
convergence

ANDES

Continent - Continent  
convergence

HIMALAYAS

Example: Andes

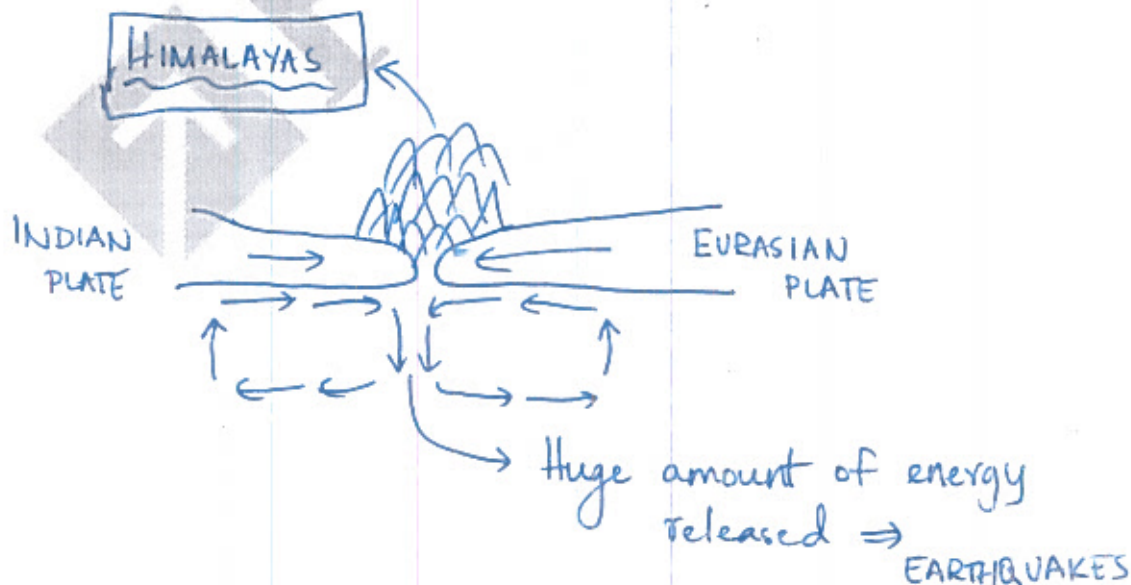


## Fold Mountains and Earthquakes

- Usually associated with Continent-Continent convergence
- Huge amount of energy released when 2 plates collide with each other

### Earthquakes

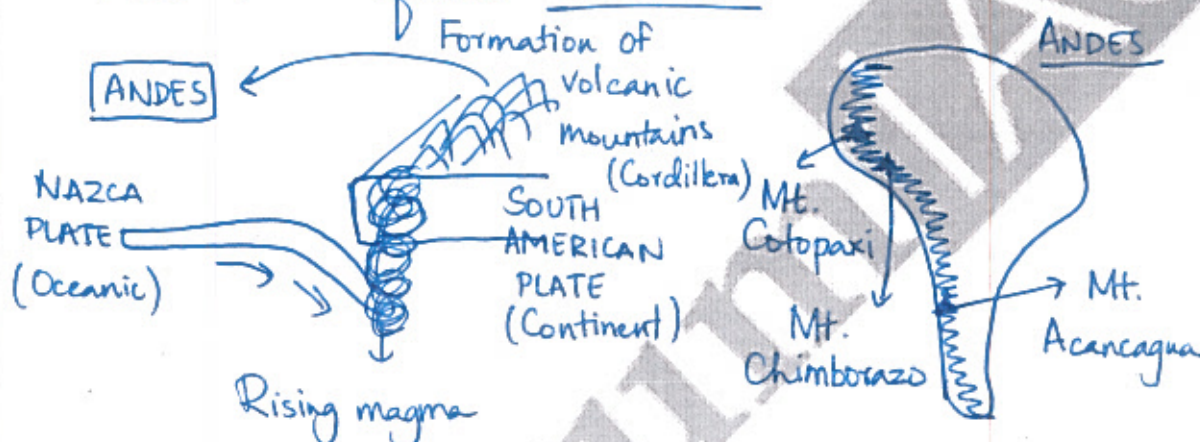
- Especially found along young fold mountains eg. Himalayas





## Fold Mountains and Volcanoes

- Usually found in Ocean-Continent convergence
- Absent in continent-continent convergence
- Oceanic plate is subducted → magma rises to form volcanoes



The association of Fold mountains and Earthquakes and Volcanoes together can be found along the Ring of Fire. Thus their global distribution is due to plate tectonics activities

### Overall Grading (✓)

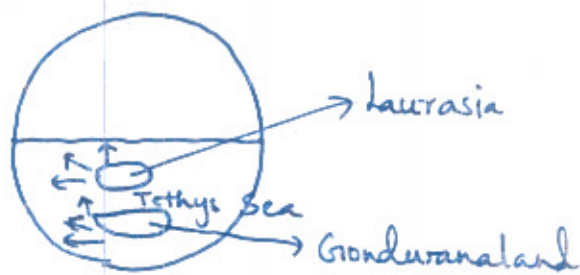
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Q.6) What do you understand by the theory of continental drift? Discuss the prominent pieces of evidence in its support

The Continental drift theory was proposed by Alfred Wegener in early 20<sup>th</sup> Century, to explain great variations of the climate in the past.

Theory

→ At the beginning of Mesozoic era, all continents were united → supercontinent called Pan~~the~~ Pangaea and was surrounded by single ocean called Panthalassa



→ Later, the Pangaea broke into Laurasia and Gondwanaland and further broke into smaller continents, which then drifted into its present positions

→ Wegener believed } SIAL - Outer layer  
                                  } SIMA - Intermediate layer  
                                  } NIFE - Lower layer



Factors causing the drift }  $\begin{cases} \text{Pole-fleeing force} \\ \text{Tidal force} \end{cases}$

## Evidences

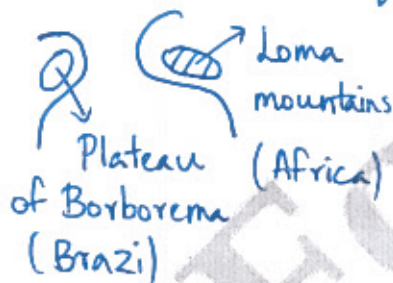
① Matching of Continents in a jigsaw fit

→ The Atlantic coast of South America and Africa have roughly similar shape.



→ Not reliable → Shape changes with rise/fall of sea level relative to land

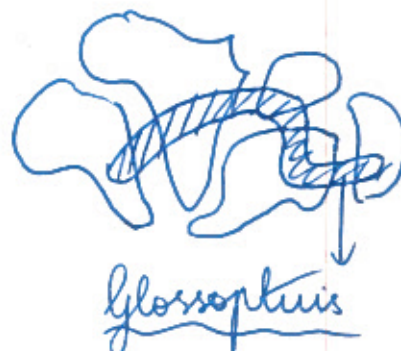
② Structural fit evidence



→ The Age and Composition of rocks along these 2 continents are the same

③ Fossil evidence

Fossils of the fern, Glossopteris have been found on all the southern continents



④ Placer deposits

The Occurrence of rich placer deposits of gold in ghana coast → have been derived from gold bearing rocks in Brazil

⑤ Tillite / Paleoclimatic evidence

glacial evidence is found in Tropical climates - eg. Talder (Odisha) → Most confirmatory evidence.

No explanation on how Pangaea broke apart

Limitations

Considered continents as sialic blocks over simatic oceans

Fails to explain formation and location of continental mountains like Himalayas

→ Pole-fleeing and Tidal force → insufficient to drift continents

The Continental Drift theory rejected the Permanency theory and became the foundation for the development of Plate Tectonics theory

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1	2	3	4	5	6	7	8	9



Q.7)

Explain in detail the theory of Plate tectonics along with suitable illustrations.

Plate Tectonic Theory was propounded by McKenzie, Parker and Morgan in 1967. The theory was developed based on 3 scientific evidences

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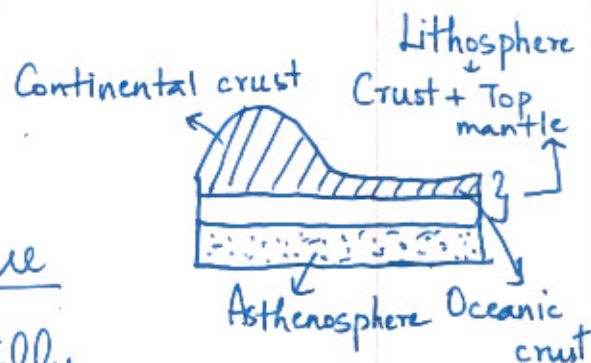
    3 scientific evidences
        /      |      \
    Sea Floor  Palaeomagnetism  Convection
    Spreading
  
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Need

To provide answers on } Formation of Fold mountains  
                                       } Reasons for Earthquakes and Volcanoes

Plate

- It is a massive slab of solid rock comprising of lithosphere
- Plate moves horizontally over Asthenosphere



- Types → Oceanic plate - Pacific plate  
               → Continental plate - Eurasian plate
- There are 7 major plates and several minor plates

# Plate boundaries

Divergent / Constructive

Convergent / Destructive

Transform / Conservative

## ① Divergent boundaries

In areas where convection cell has rising limbs

Below ocean - Ridges

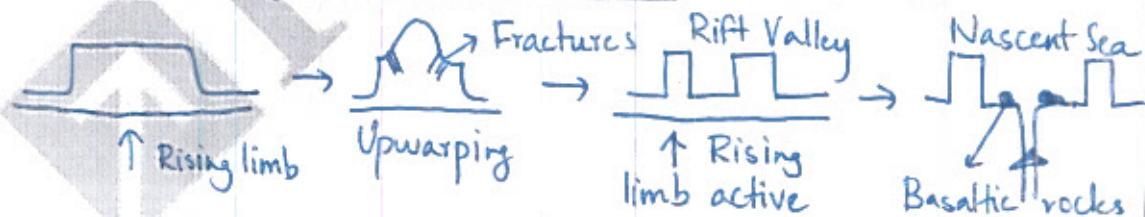
Below continents - Rift valley and Nascent sea

### Mid Oceanic Ridges



### Rift valley & Nascent Sea

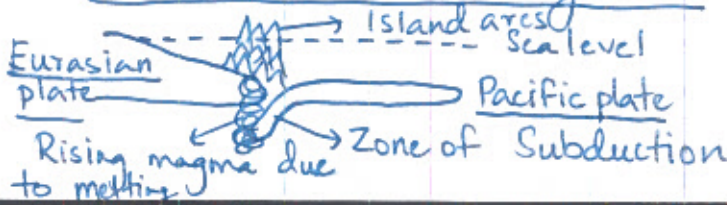
African Rift valley  
Red sea



## ② Convergent boundaries

Plates move towards each other

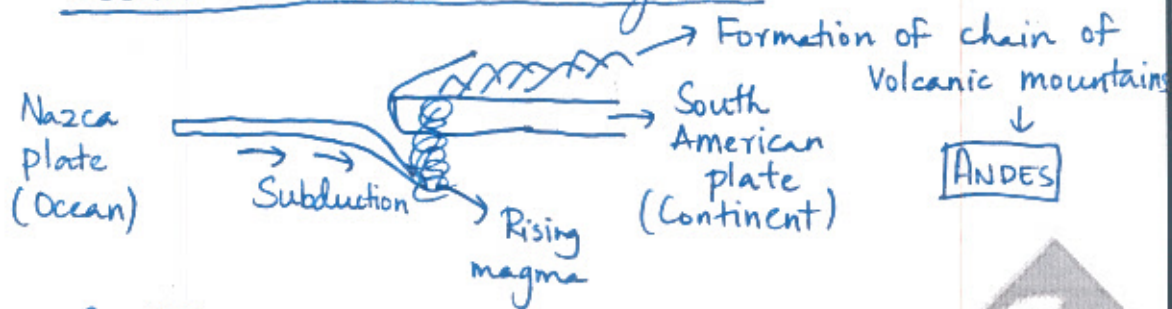
→ Ocean-Ocean Convergence



eg. of Island arcs  
Japan



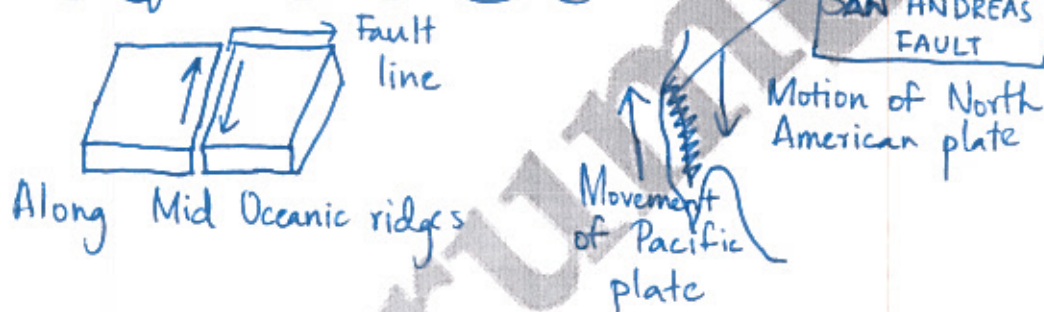
## → Ocean - Continent Convergence



## → Continent - Continent Convergence



## ③ Transform Boundaries



The Plate Tectonic theory provides great explanation on the movement of continents and oceans. It also refutes the idea that continents move over oceanic crust, instead they are moving beside each other.

### Overall Grading (✓)

Poor			Average			Good		
1	2	3	4	5	6	7	8	9

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