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Earth and its Interior
Rocks
Plate Movements

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Formation of the Earth

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Interior of Earth

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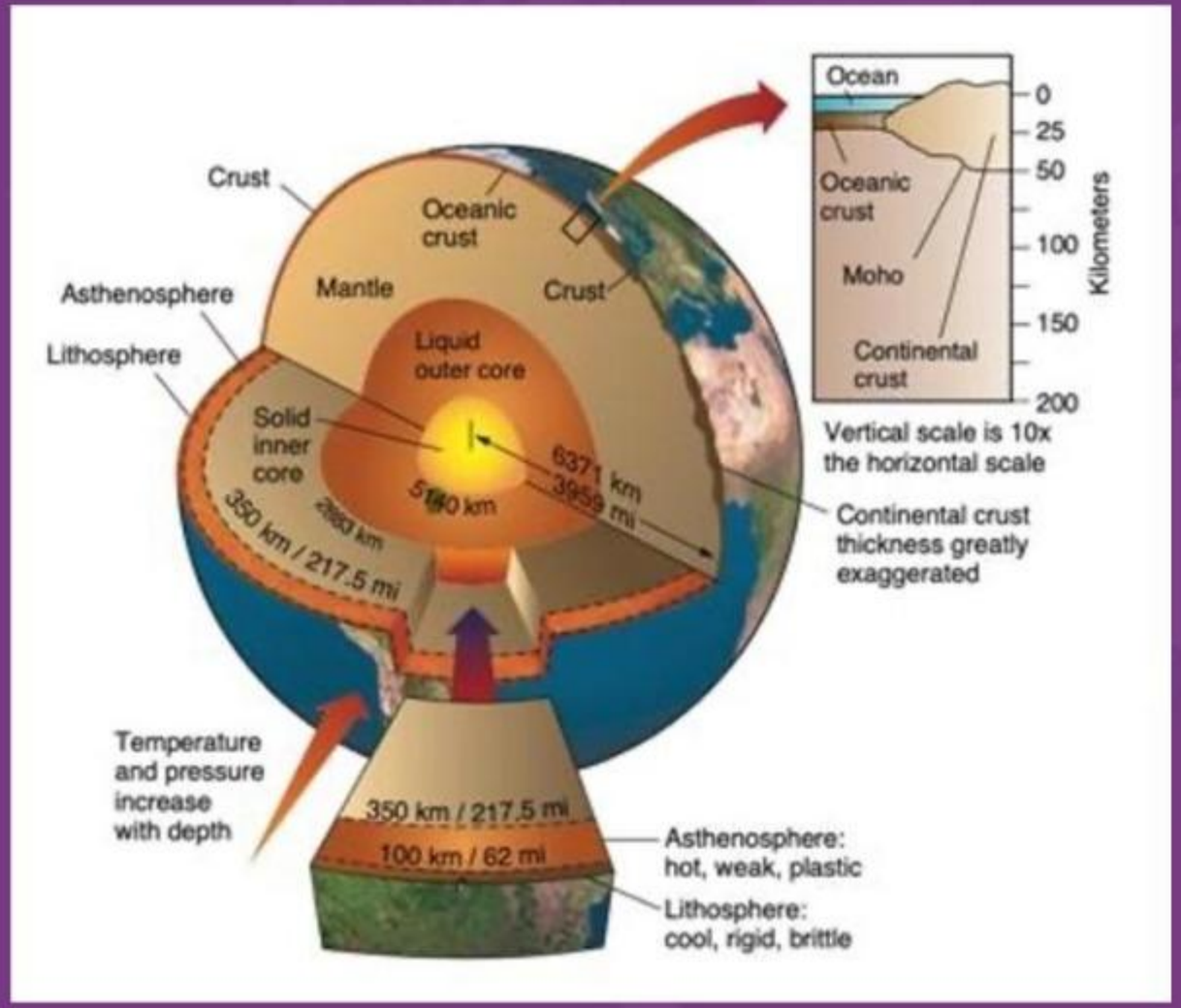
Structure of the Earth



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The Crust

- It is the outermost solid part of the earth. It is brittle in nature.
- The thickness of the crust varies under the oceanic and continental areas. Oceanic crust is thinner as compared to the continental crust.
- The mean thickness of oceanic crust is 5 km whereas that of the continental is around 30 km.

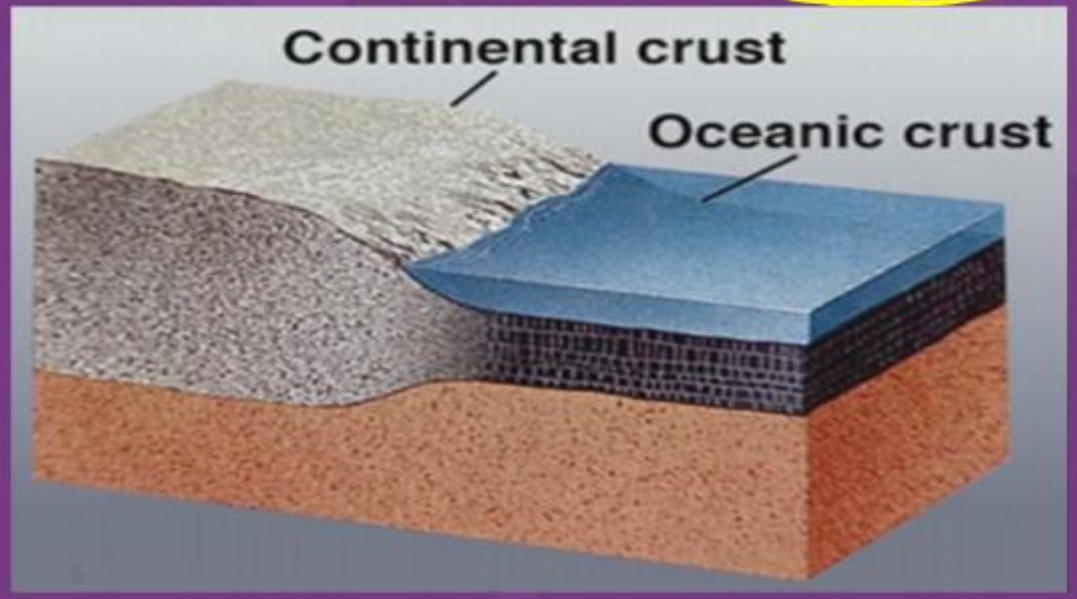
→ cracks & ruptures easily.

Oceanic crust is always heavier than continental crust.

→ Due to higher density of oceanic crust.

Density → Mass / Volume.

- The continental crust is thicker in the areas of major mountain systems. It is as much as 70 km thick in the Himalayan region.
- The continental crust, composed chiefly of Granite has a density of 2.7 g/cm^3.
- The type of rock found in the oceanic crust is basalt. The mean density of material in oceanic crust is 3 g/cm^3.



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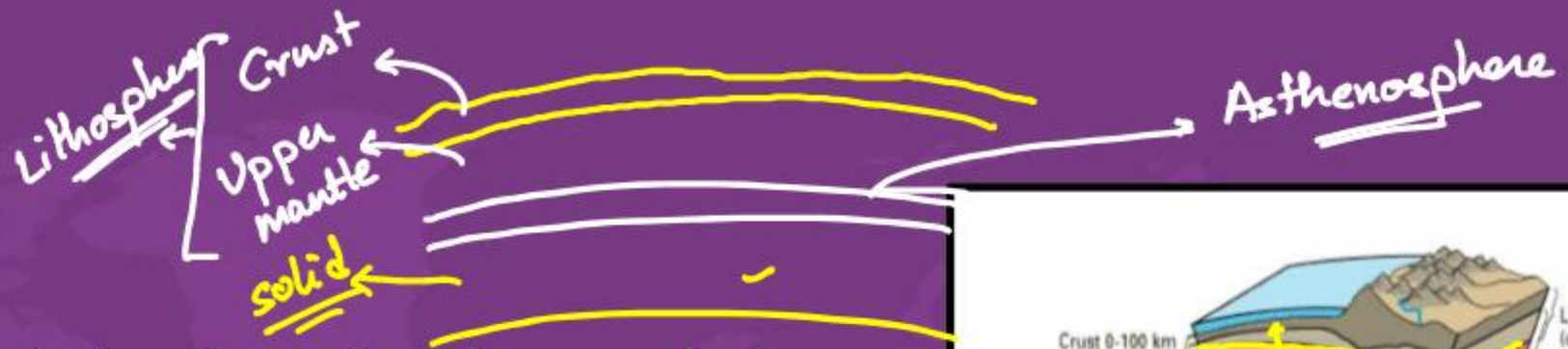
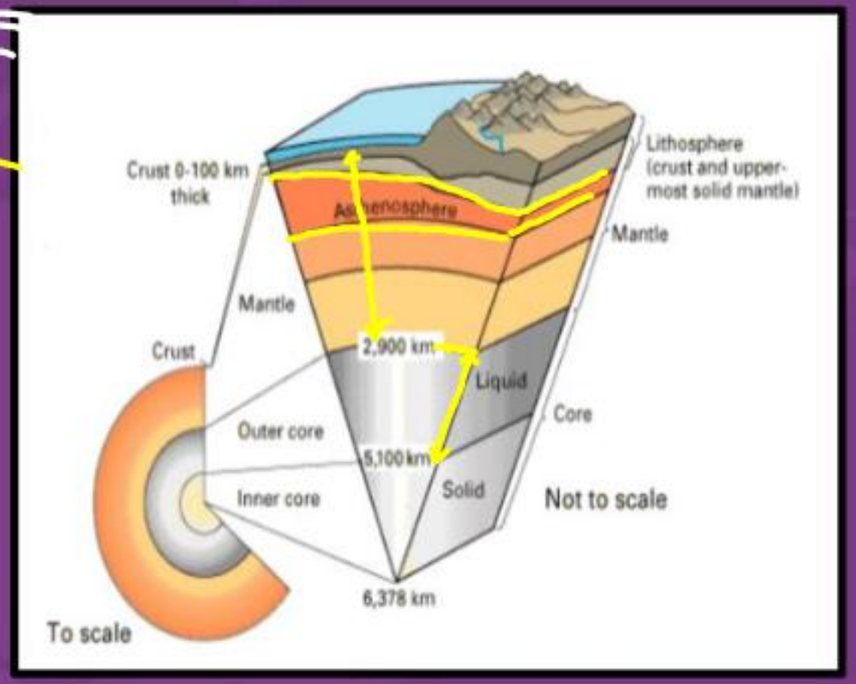
The Mantle



- The portion of the interior beyond the crust is called the mantle.
- The mantle represents about 68 % of Earth's mass.
- It has a density around (3.4 g/cm^3) higher than the crust portion.



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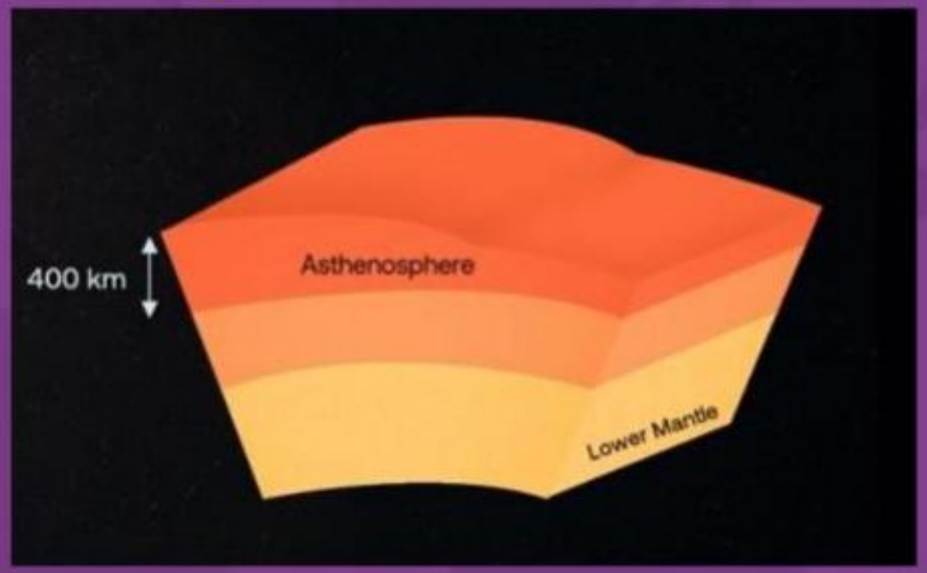
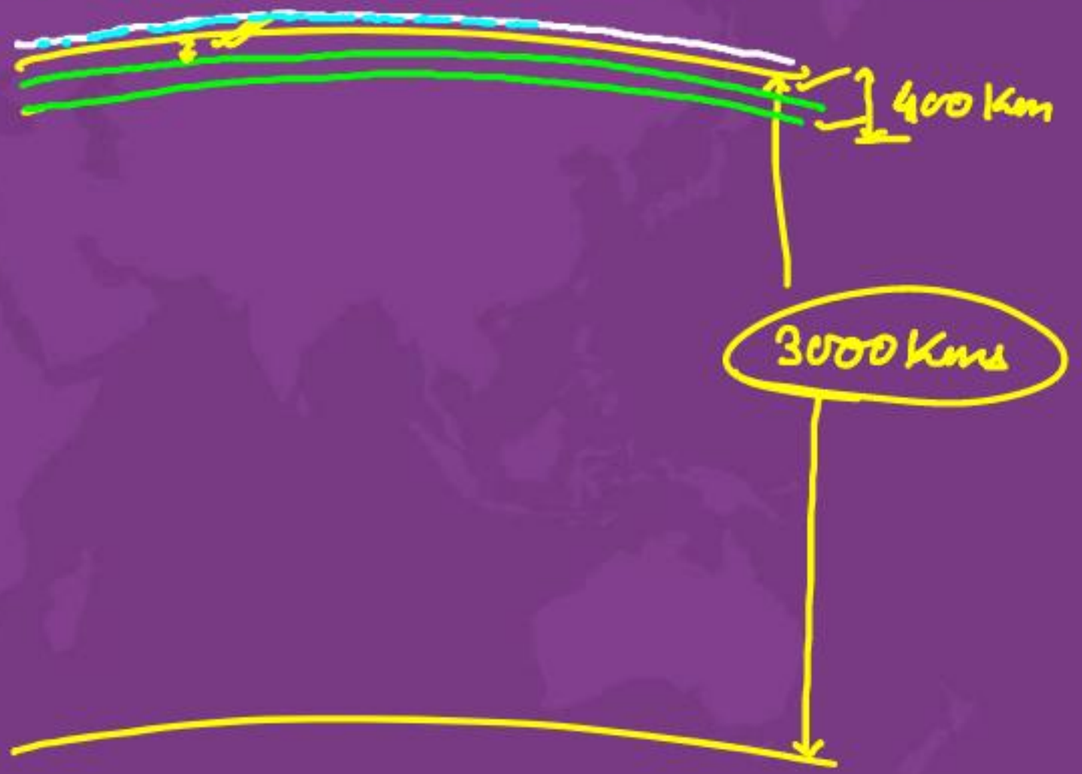
Thickness of lithosphere
↳ 100 - 150 Km

The upper portion of the mantle is called Asthenosphere. The word 'astheno' means weak. It is considered to be extending up to 400 km. It is the main source of magma that finds its way to the surface during volcanic eruptions.





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The Core

6370 Km

3400 Kms.

- The core-mantle boundary is positioned at the depth of 2,900 km.
- The core makes up about 31% of the Earth.
- The inner core is in the solid state whereas the outer core is in the liquid state.

→ Due to very high amount of pressure.

- The core is made up of very heavy material mostly constituted by nickel and iron. Hence it is also called the "nife" layer.

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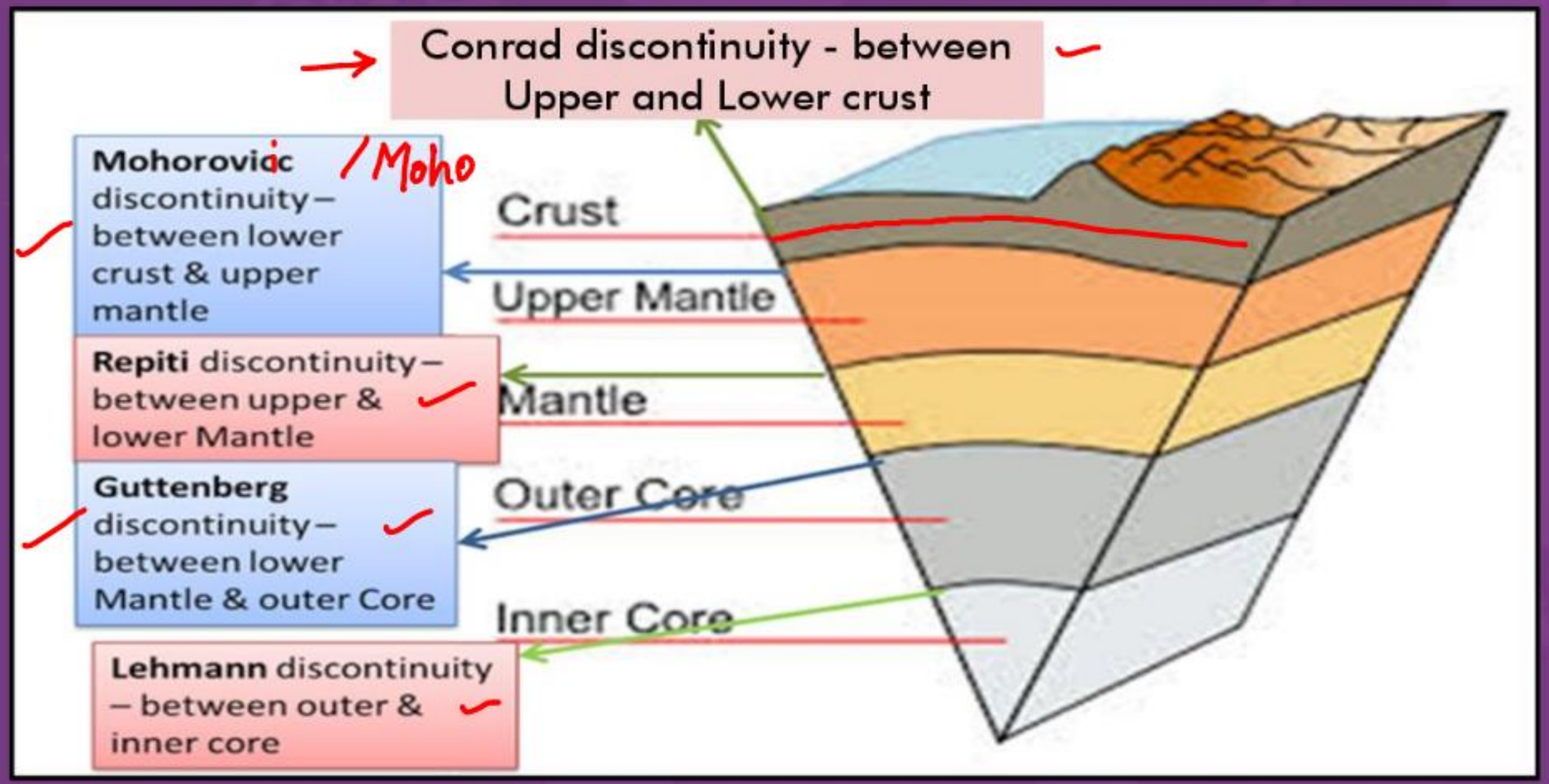
SIAL → Silica & Aluminium
SIMA → Silica & Mg

prelims

Discontinuities inside the Earth



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Prelims

Minerals in the interior the Earth

- Earth as a whole

SIAL

SIMA

Iron (Fe) > Oxygen (O) > Silicon (Si) > Magnesium (Mg) > Sulphur (S) > Nickel (Ni) > Calcium (Ca) > Aluminum (Al)

- Earth's crust

Oxygen (O) > Silicon (Si) > Aluminum (Al) > Iron (Fe) > Calcium (Ca) > Magnesium (Mg) > Sodium (Na) > Potassium (K)

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→ Crust & Mantle

Discontinuity	Location
1. Conrad Discontinuity.	between the upper and lower crust
2. Mohorovicic discontinuity	between the outer core and the inner core
3. Repetti Discontinuity	between the upper mantle and the lower mantle
4. Guttenberg Discontinuity.	between the Earth's crust and the mantle.

Consider the following pairs:

Which of the pairs given above is/are correctly matched?

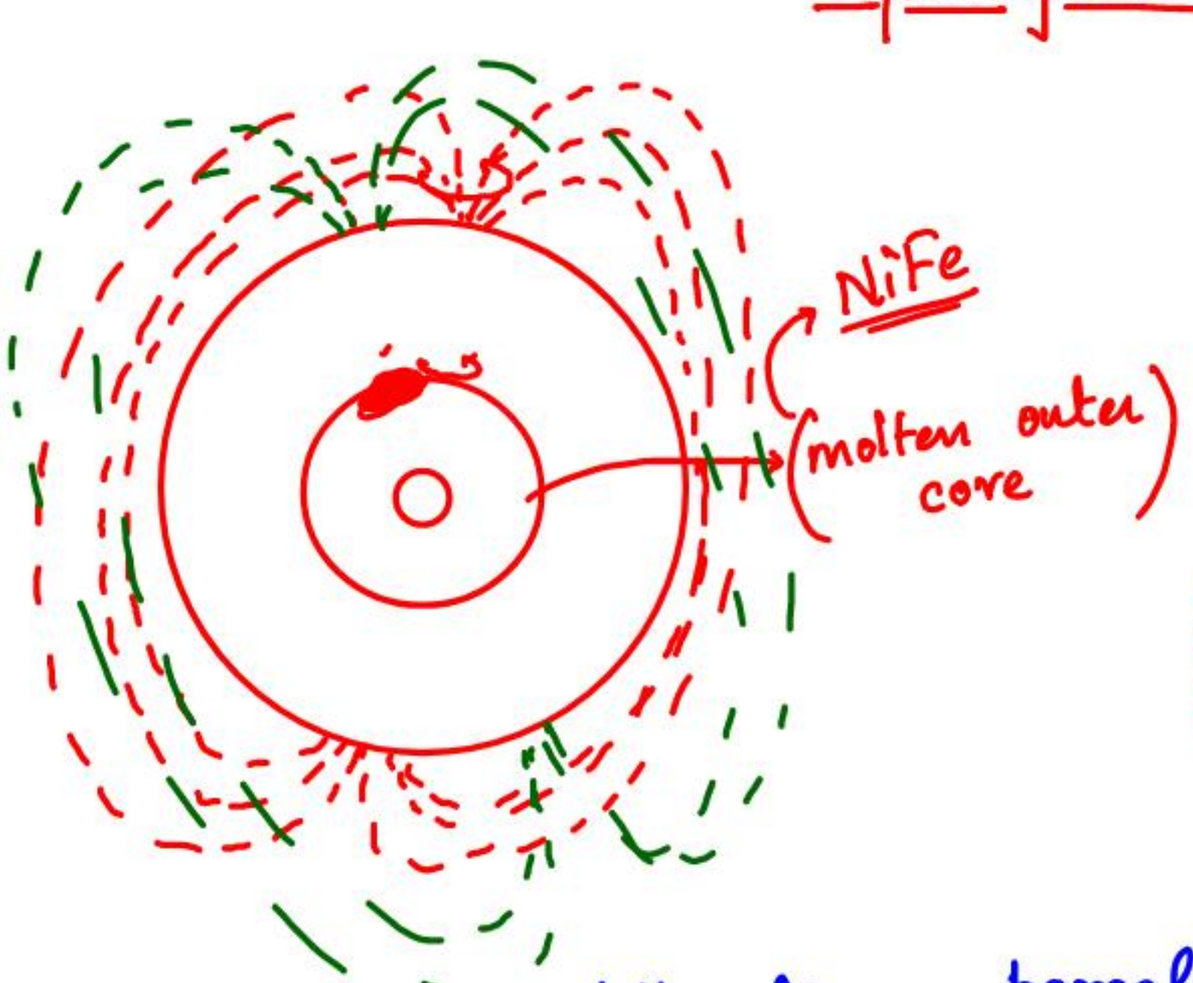
a) 1 & 3 only

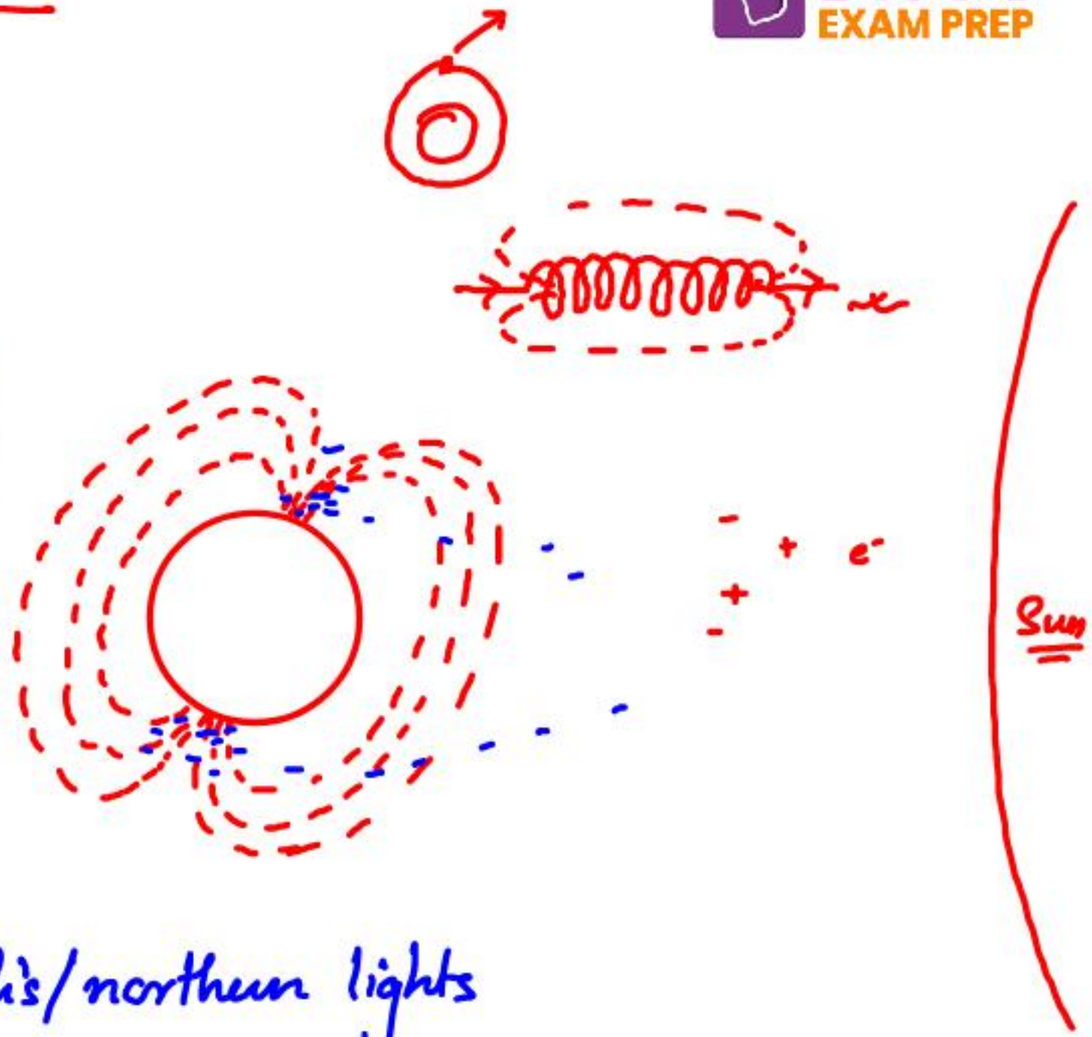
b) 2 & 4 only

c) 1, 2 & 3 only

d) 1, 3 & 4 only

Geomagnetism





Auroras
- N.H → Aurora borealis / northern lights
- S.H. → Aurora australis / southern lights

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Rocks

Prelims.

→ Basics of rocks (their types)

Mains

→ Basic properties of rock systems.

→ Rock cycles.

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What are Rocks?

- Rocks are mineral aggregates with a combination of properties of all the mineral traces.
- Any unique combination of chemical composition, mineralogy, grain size, texture, or other distinguishing characteristics can describe rock types.

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Types of Rocks

Based upon the process of formation

There are three types of rocks: (Primary rock systems)

- Igneous Rocks → solidification of molten materials.
- Sedimentary Rocks → solidification of deposited materials.
- Metamorphic Rocks → Existing rocks when exposed to high temp./high pressure, they change to metamorphic rock systems.

Limestone → Marble.

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Igneous Rocks

- Igneous rock is formed through the cooling and solidification of magma or lava.
- Igneous rock may form with or without crystallization, either below the surface as intrusive (plutonic) rocks or on the surface as extrusive (volcanic) rocks.

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Types of Igneous Rocks

Rate of cooling is slow. ⟵
↳ Grain/Particle size is large.

Following are the two types of igneous rock:

1. Intrusive igneous rock: Diorite, granite, pegmatite
2. Extrusive igneous rock: These rocks erupt onto the surface resulting in small crystals as the cooling takes place quickly. Basalt, tuff, pumice are examples of extrusive igneous rock.

Based upon minerals present →
- Felsic → Rich in Silica → Brighter, less density.
- Mafic → Rich in Fe & Mg → Darker, Denser.
- Ultramafic

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Sedimentary Rocks

Chemical sedimentary rocks

- Chemical reactions are instrumental in formation of deposits
- Deposits solidify to form rocks.

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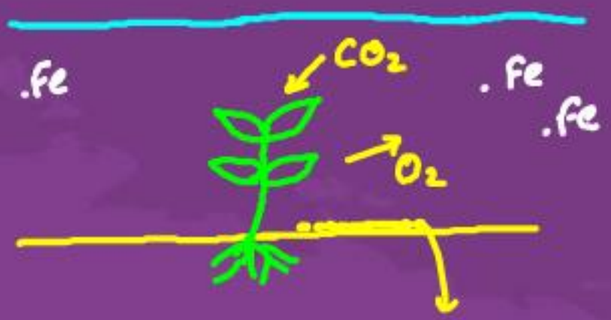
Types of Sedimentary Rocks

1. Clastic sedimentary rocks: These rocks are formed from the mechanical weathering debris. Sandstone, siltstone.
2. Chemical sedimentary rocks: These rocks are formed from the dissolved materials that precipitate from the solution. Iron ore, limestones.
3. Organic sedimentary rocks: These rocks are formed from the accumulation of plant and animal debris. Coal, some dolomites.



$4\,Fe + 3O_2 \rightarrow 2Fe_2O_3$

(solid state)

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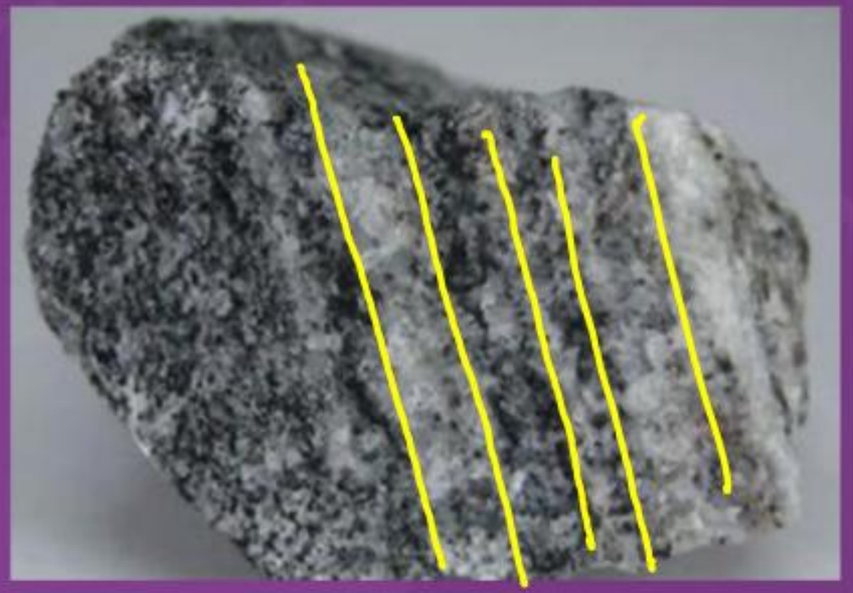
Metamorphic Rocks

- They may be formed simply by being deep beneath the Earth's surface, subjected to high temperatures and the great pressure of the rock layers above it or in mountainous regions.



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Types of Metamorphic Rocks

Following are the two types of metamorphic rock:

1. Foliated metamorphic rocks: These rocks are produced by the exposure to heat and pressure which makes them appear layered. Phyllite, gneiss are examples of foliated metamorphic rocks.
2. Non-foliated metamorphic rocks: These rocks don't have layers. Marble, quartzite are examples of non-foliated metamorphic rocks.

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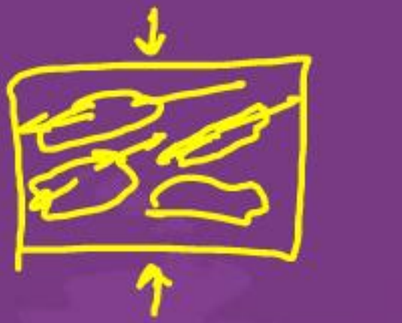
Gneiss, Schists



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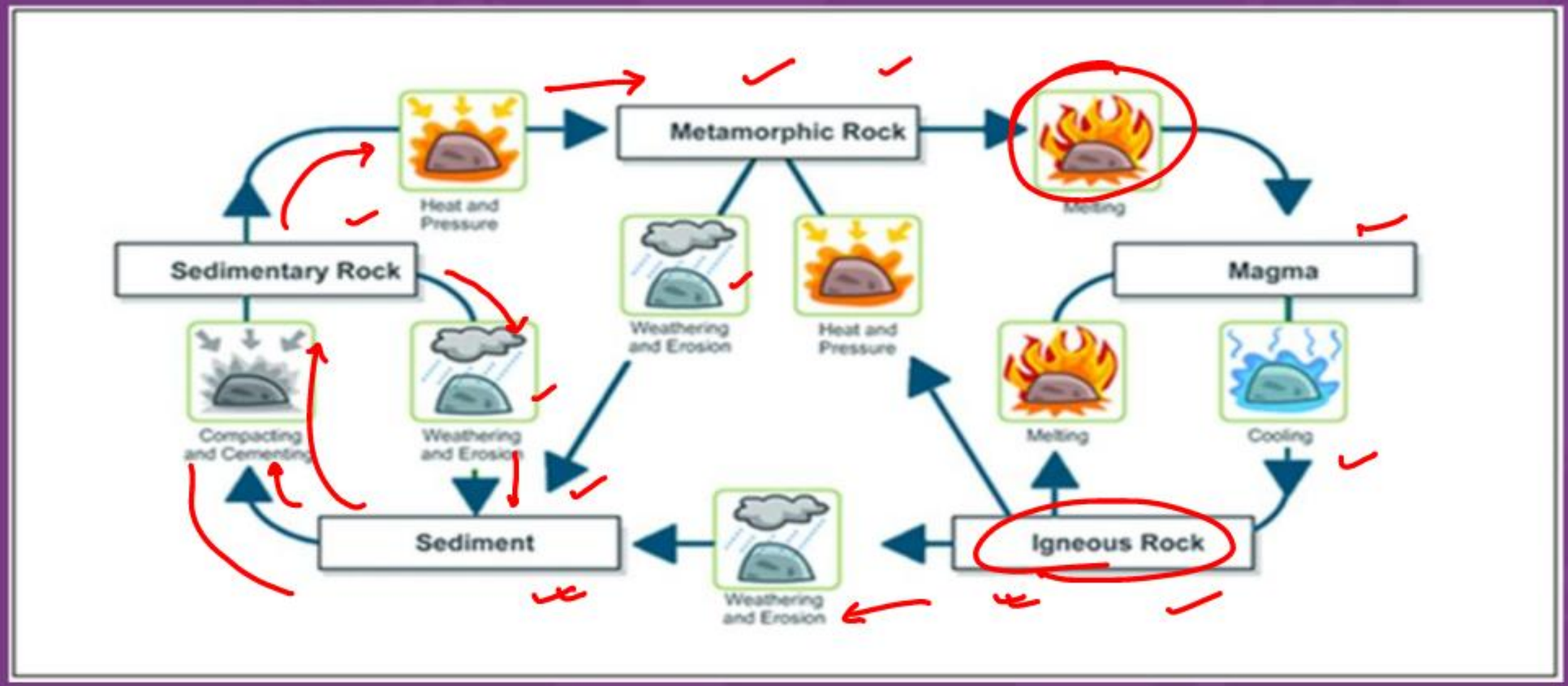
Rocks Cycle



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contractionists

Origin of Continents

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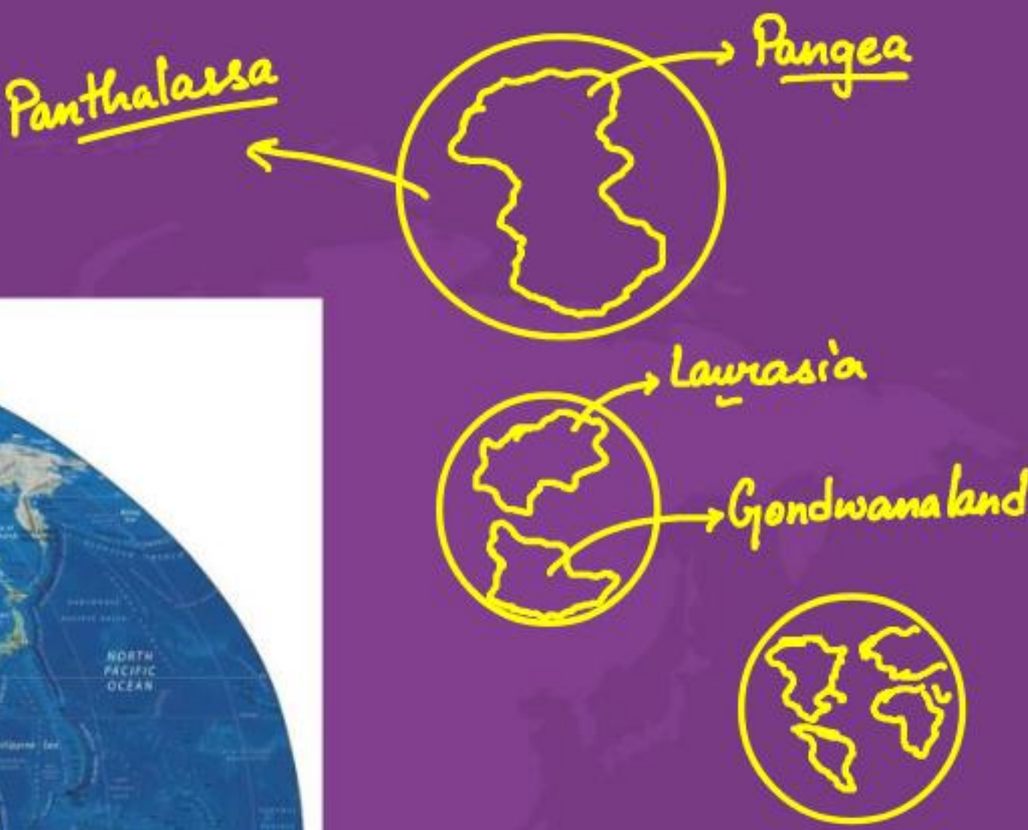
Physical Map of the World



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Alfred Wegner.

Continental Drift Theory

- The Jigsaw fit of continents

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Continental Drift Theory

- Similarity of geological structures across continents
  - Presence of similar mountain ranges across North America and Europe. Example : Appalachians of North America are similar to the Scottish Highlands
  - Similarity in Geological rocks in Western Africa and South America.

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Placer deposits

→ Placer deposits of Gold found in W. Africa had the source rocks in the region of Brazilian highlands.

↳ Indicates the land would have been together.

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Continental Drift Theory

Glacial Striations

Glacial evidences

Tillite / Glacial till

↳ very fine deposits made by glaciers

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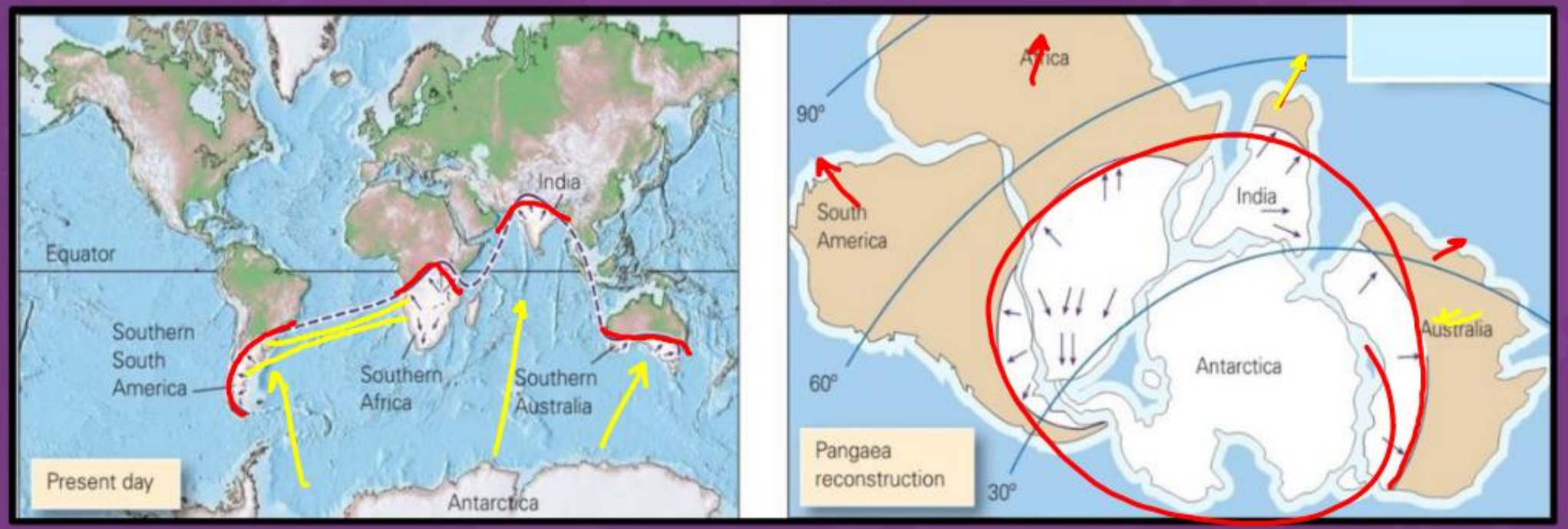
Continental Drift Theory



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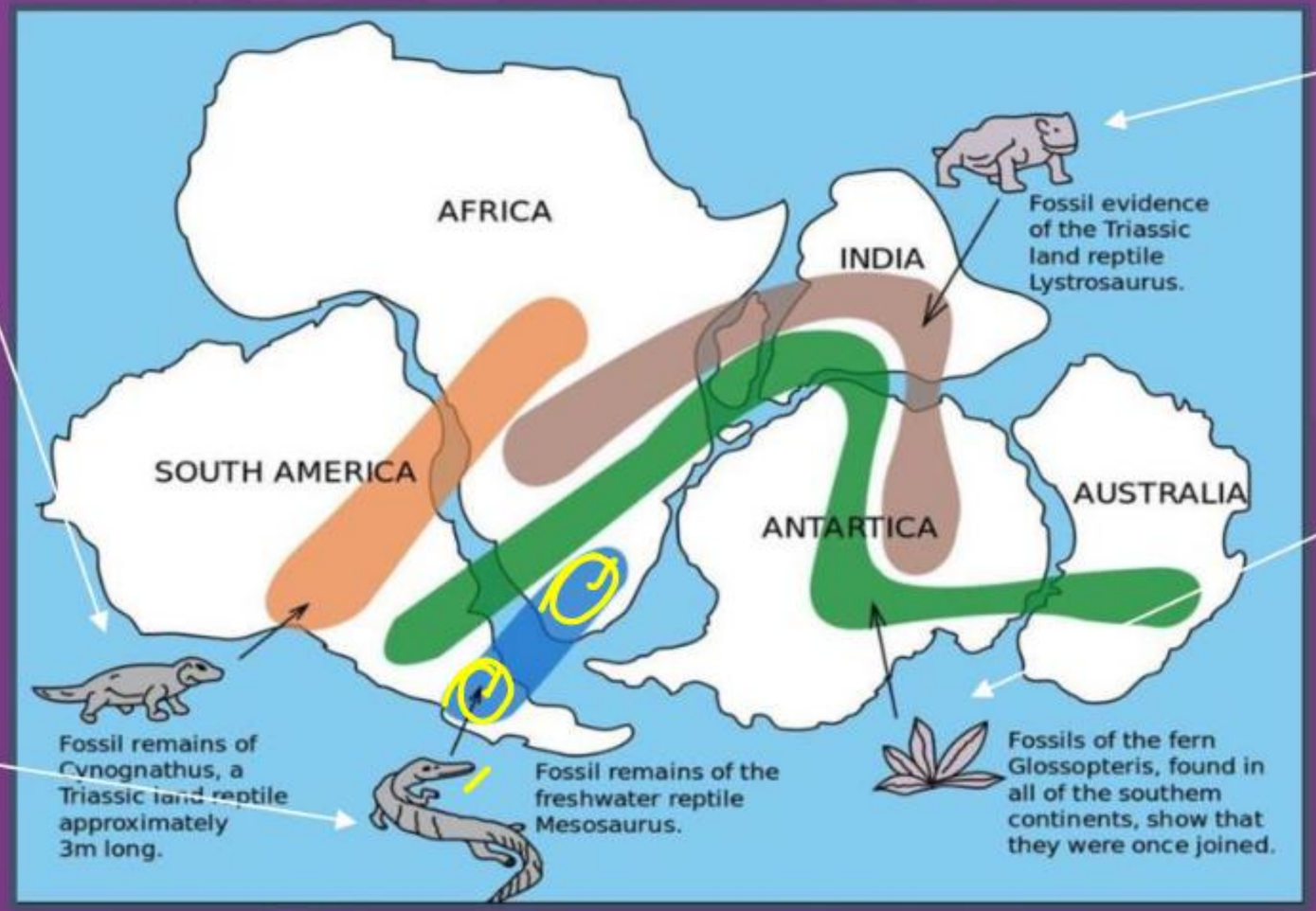
Continental Drift Theory

→ Paleontological evidences.

- Fossils of Species who could not have travelled across Oceans.

Cynognathus

Lystrosaurus



Glossopteris

Mesosaurus

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Pangea as postulated by Wegener

Types of movement:

- Westward drift of continents
- Movement away from poles.
  - Flight away from poles (Polflucht)

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Continental Drift Theory

- What did Wegener propose?

→ Assumption made by Wegner.

→ Continental masses move/float freely over oceans.

→ (Experience force of buoyancy)

Incorrect Assumption

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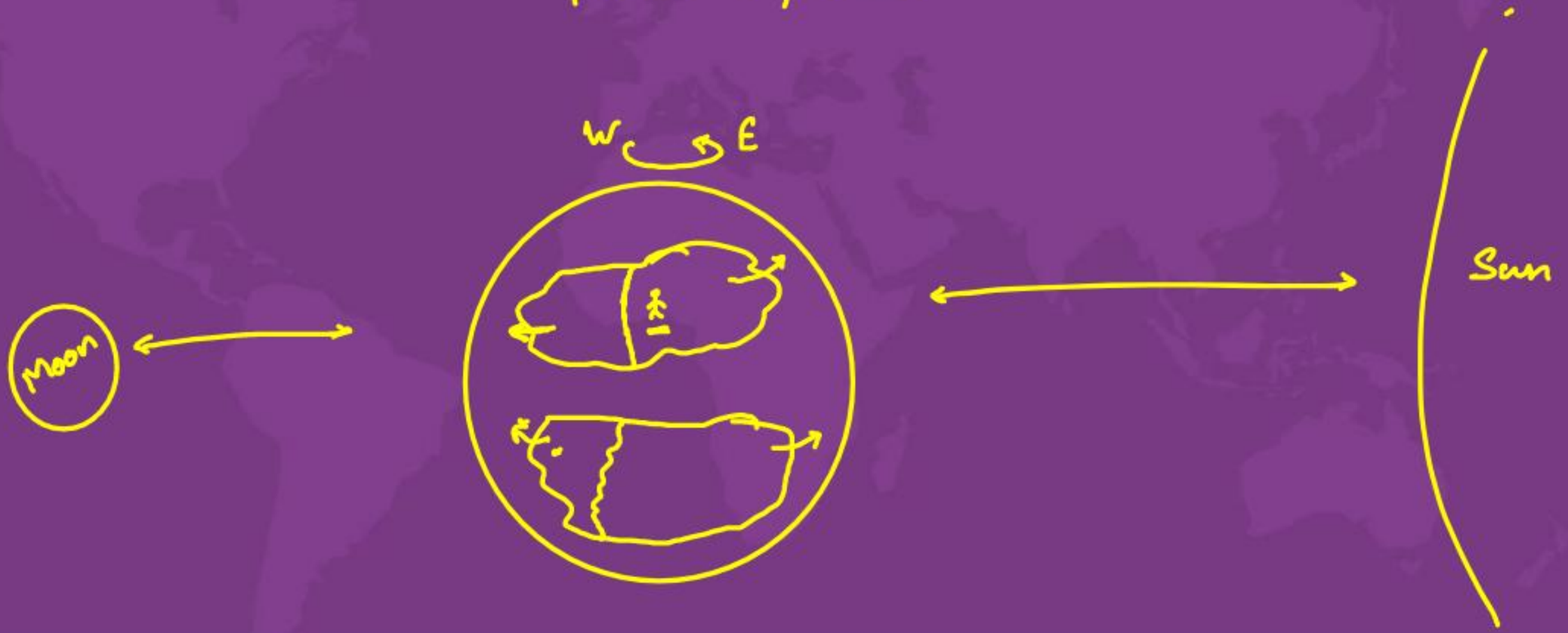
Reasons cited

→ Westward drift of continents

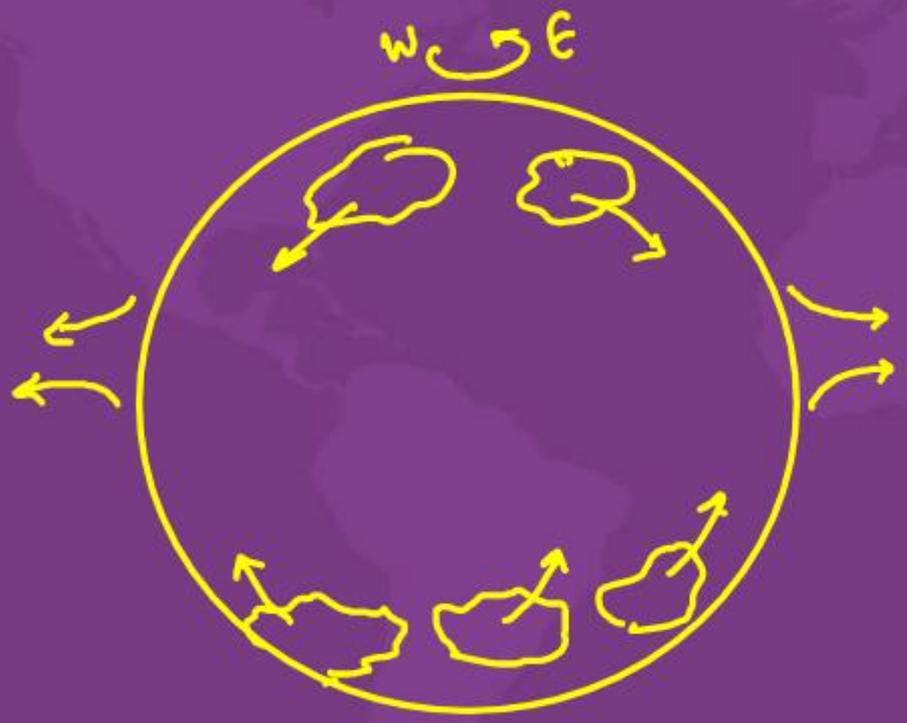
Reason
→ Gravitational pull by Sun & Moon as the planet rotates from West to East; the force of gravitation would hold continents in their place & planet would rotate



→ Movement away from poles.

↳ Due to combination of centrifugal force & force of buoyancy

→ Centrifugal force is maximum around equator.



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Previous Year Questions - Mains

- What do you understand by the theory of continental drift? Discuss the prominent evidences in its support.