4. Distribution of the Oceans and Continents

1. Multiple choice question

(i) Who amongst the following was the first to consider the possibility of Europe, Africa and America having been located side by side.

(a) Alfred Wegener
(b) Antonio Pellegrini
(c) Abraham Ortelius
(d) Edmond Hess
Answer: (c) Abraham Ortelius

(ii) Polar fleeing force relates to:

(a) Revolution of the Earth
(b) Gravitation
(c) Rotation of the earth
(d) Tides

Answer: (c) Rotation of the earth

(iii) Which one of the following is not a minor plate?

(a) Nazca
(b) Arabia
(c) Philippines
(d) Antarctica

Answer: (d) Antarctica

(iv) Which one of the following facts was not considered by those while discussing the concept of sea floor spreading?

(a) Volcanic activity along the mid-oceanic ridges.
(b) Stripes of normal and reverse magnetic field observed in rocks of ocean floor.
(c) Distribution of fossils in different continents.
(d) Age of rocks from the ocean floor.

Answer: (c) Distribution of fossils in different continents.

(v) Which one of the following is the type of plate boundary of the Indian plate along the Himalayan mountains?

(a) Ocean-continent convergence

(b) Divergent boundary

(c) Transform boundary

(d) Continent-continent convergence

Answer: (d) Continent-continent convergence

2. Answer the following questions in about 30 wor

(i) What were the forces suggested by Wegener for the movement of the continents?

Answer: Wegener suggested that two forces were responsible for continental drift. These are Polar fleeing force and Tidal force. The Polar fleeing force is related to the rotation of the earth. The Tidal force is due to the attraction of the moon and the sun, which causes tides in the oceans.

(ii) How are the convectional currents in the mantle initiated and maintained?

Answer: Arthur Holmes in 1930s discussed the possibility of convection currents operating in the earth's mantle portion, generated due to radioactive elements causing thermal differences in the mantle portion. The convectional currents in the mantle of the earth are initiated and maintained by temperature differences within the earth. Hot magma from greater depths comes up and comparatively cold lava from above goes down giving birth to convectional currents.

(iii) What is the major difference between the transform boundary and the convergent or divergent boundaries of plates?

Answer: The **transform boundary** is formed when two adjacent plates slip horizontally past one another. **Convergent boundary** is formed when two plates come closer while **divergent boundary** is formed when two plates move away from each other.

(iv) What was the location of the Indian landmass during the formation of the Deccan Traps?

Answer: Deccan traps were formed by volcanic lava during the movement of the Indian plate towards the Eurasian plate. This started somewhere around 60 million years ago and continued for a long period. The Indian subcontinent was still close to the equator at that time.

3. Answer the following questions in about 150 words

(i) What are the evidences in support of the continental drift theory?

Answer: Evidence of Movement of Continents:

(i) **Jig-Saw-Fit:** The shorelines of Africa and South America have a remarkable and unmistakable match.

(ii) **Rocks of same age across the oceans:** The belt of ancient rocks of 2,000 million years from Brazil coast matches with the rocks from western Africa.

(iii) **Tillite:** The Gondwana system of sediments from India is known to have its counter parts in Africa, Falkland Island, Madagascar, Antarctica, and Australia. At the base, the system has thick tillite indicating extensive and prolonged glaciations.

(iv) **Placer Deposits:** The gold bearing veins are in Brazil and it is obvious that the gold deposits of the Ghana are derived from the Brazil plateau when the two continents lay side by side.

(v) **Fossils:** The skeletons of Mesosaurus, a small reptile, are found only in the Southern Cape Province of South Africa and Iraver formations of Brazil. The two localities presently are 4,800 km apart with an ocean in between them.

(ii) Bring about the basic difference between the Drift theory and Plate tectonics.

Answer:

Drift Theory: German meteorologist Alfred Wegener suggested the first comprehensive theory of continental drift in 1912. According to Wegener, all the continents formed a single continental mass and mega ocean named Tethys surrounded the same. He argued that around 200 million years ago, the super continent, Pangaea, began to split into two large continental masses as Laurasia and Gondwanaland. Subsequently, Laurasia and Gondwanaland continued to break into various smaller continents that exist today. The continents assumed a shape somewhat similar to the present shape in the Pleistocene Age about 50-60 million years ago.

Plate Tectonics: In the 20th century, McKenzie, Parker, and Morgan, independently collected the available ideas and came out with a concept termed Plate Tectonics. A tectonic plate is a massive, irregularly shaped slab of solid rock, generally composed of both continental and oceanic lithosphere. Plates move horizontally over the earth’s asthenosphere as rigid units. The theory of plate tectonics proposes that the earth’s lithosphere is divided into major and minor plates. Young Fold Mountain ridges, trenches, and/or faults surround these major plates. Due to

movements of the currents, the rigid plates of the lithosphere, which 'float' on asthenosphere, are in constant motion.

(iii) What were the major post-drift discoveries that rejuvenated the interest of scientists in the study of distribution of oceans and continents?

Answer: Several post-drift studies have revealed many new facts of geological and geographical importance. Some of the major finds are followings:

1. Arthur Holmes in 1930s discussed the possibility of convection currents, which are generating due to radioactive elements causing thermal differences in the mantle portion.
2. The mid-oceanic ridges were found to be most active in terms of volcanic eruptions.
3. There are remarkable similarities in rocks located equidistant on either side of the crest of-ridges with respect to the period of formation, chemical compositions, and magnetic properties.
4. The ocean crust rocks are much younger than the continental rocks.
5. The deep trenches have deep-seated earthquake occurrences.
6. The development of concept of sea floor spreading gave a new twist to the distribution of continents and oceans in form of plate tectonics.