Chapter 3: Interior of the Earth

Exercises — Exercises

Q1 1(i) Which one of the following earthquake waves is more destructive? (a) P-waves (b) S-waves (c) Surface waves (d) None of the above

(c) Surface waves. They are generated when body waves interact with surface rocks, arrive last on the seismograph and displace rocks, causing structures to collapse, so they are the most damaging waves.

Q2 1(ii) Which one of the following is a direct source of information about the interior of the earth? (a) Earthquake waves (b) Volcanoes (c) Gravitational force (d) Earth magnetism

(b) Volcanoes. During an eruption, molten magma is thrown onto the surface and can be analysed in laboratories, giving direct material from within. Earthquake waves, gravity and magnetism are indirect sources.

Q3 1(iii) Which type of volcanic eruptions have caused Deccan Trap formations? (a) Shield (b) Flood (c) Composite (d) Caldera

(b) Flood. Flood basalt provinces outpour highly fluid lava that flows for long distances and covers thousands of square kilometres. The Deccan Traps, covering most of the Maharashtra plateau, are a large flood basalt province.

Q4 1(iv) Which one of the following describes the lithosphere: (a) upper and lower mantle (b) crust and upper mantle (c) crust and core (d) mantle and core

(b) Crust and upper mantle. The crust together with the uppermost part of the mantle forms the lithosphere, whose thickness ranges from about 10 to 200 km.

Q5 2(i) What are body waves? (Answer in about 30 words.)

Body waves are generated by the release of energy at the focus of an earthquake and move in all directions through the body of the earth. They are of two types, P-waves and S-waves, and they produce surface waves on reaching the surface.

Q6 2(ii) Name the direct sources of information about the interior of the earth. (Answer in about 30 words.)

The direct sources are surface rocks and rocks from mining areas, materials brought up by deep drilling projects such as the Deep Ocean Drilling Project and the Kola drill, and molten magma thrown out during volcanic eruptions.

Q7 2(iii) Why do earthquake waves develop shadow zone? (Answer in about 30 words.)

Waves change velocity and direction, reflecting or refracting, when they meet materials of different density. S-waves cannot pass through the liquid outer core and P-waves are refracted by it, so some areas on the surface receive no waves, forming shadow zones.

Q8 2(iv) Briefly explain the indirect sources of information of the interior of the earth other than those of seismic activity. (Answer in about 30 words.)

Temperature, pressure and density increase with depth, and their rate of change helps estimate values at depths. Meteors, made of material similar to the earth, also help. Gravity anomalies and magnetic surveys reveal how mass and magnetic materials are distributed in the crust.

Q9 3(i) What are the effects of propagation of earthquake waves on the rock mass through which they travel? (Answer in about 150 words.)

Earthquake waves make the rocks through which they pass vibrate, but different waves do so differently. P-waves vibrate parallel to the direction of the wave. They exert pressure on the material in the direction of propagation, creating density differences that stretch and squeeze the material. S-waves vibrate perpendicular to the direction of the wave in the vertical plane, so they create troughs and crests in the material. Surface waves, which are generated when body waves interact with surface rocks, move along the surface and are the most damaging. They cause displacement of rocks, and hence structures collapse. The velocity of waves also changes with density: the denser the material, the higher the velocity. Their direction changes as they reflect or refract on meeting materials of different density. These variations in velocity and direction, recorded on the seismograph, help scientists infer the structure of the earth's interior.

Q10 3(ii) What do you understand by intrusive forms? Briefly describe various intrusive forms. (Answer in about 150 words.)

Lava released in volcanic eruptions cools into igneous rocks. When it cools within the crust instead of at the surface, the resulting forms are called intrusive forms. Batholiths are large granitic domes formed by magma cooling at great depth; they are the cooled portion of magma chambers and appear on the surface only after denudation removes the cover. Lacoliths are dome-shaped intrusive bodies with a level base and a pipe-like conduit from below; the Karnataka plateau has many examples. A lapolith is a saucer-shaped body, concave to the sky. Phacoliths are wavy masses found at the base of synclines or the top of anticlines. Sills and sheets are near-horizontal bodies; thick ones are sills and thinner ones are sheets. Dykes form when lava solidifies in cracks and fissures almost perpendicular to the ground, as wall-like structures. They are common in western Maharashtra and fed the Deccan Trap eruptions.