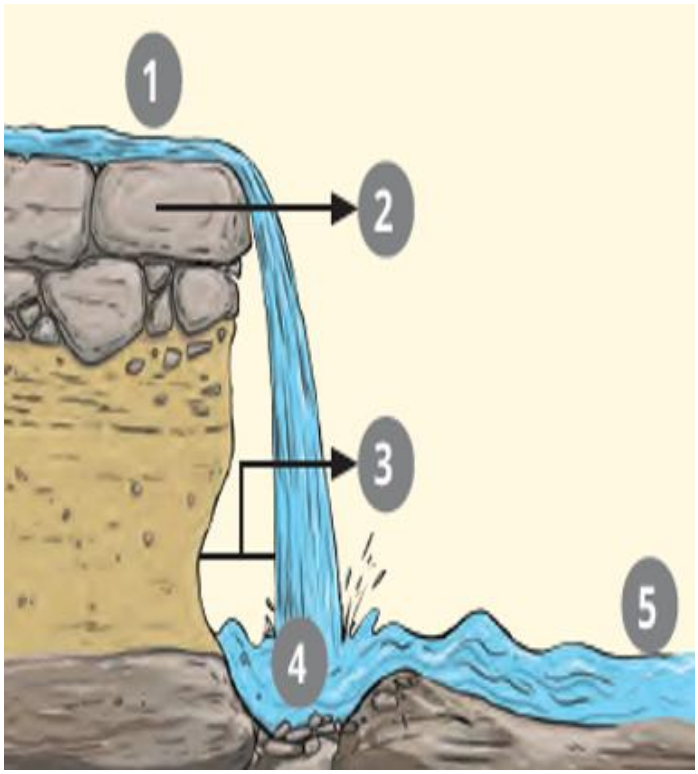
INDIAN SCHOOL AL WADI AL KABIR

Class: IX	Department: Social Science	Sub: Geography
Chapter-2 Question Bank:2	Topic: **Shaping of the Earth's Surface**	Year: 2026 -2027

1	**Explain the structural relationship between the lithosphere and the asthenosphere.** Ans. The lithosphere, which includes the Earth's crust and the upper part of the mantle, is broken into tectonic plates. It rests upon the asthenosphere, a hot, mobile layer of semi-molten rock that allows these plates to move slowly.
2	**Compare the geological processes occurring at convergent and divergent plate boundaries.** Ans. At convergent boundaries, plates move toward each other, leading to the formation of fold mountains or volcanic activity when an oceanic plate sinks. In contrast, at divergent boundaries, plates move apart, allowing magma to rise and create new crust, such as mid-ocean ridges.
3	**How do convection currents in the mantle drive the movement of tectonic plates?** Ans. Heat from the Earth's core causes molten material in the mantle to rise while cooler material sinks. This continuous cycle creates convection currents that push and pull the plates above them in different directions.
4	**Distinguish between chemical and biological weathering with specific examples.** Ans. Chemical weathering involves minerals reacting with water, air, or acids to form new substances. Biological weathering is caused by living organisms, such as when plant roots grow into rock cracks and split them apart.
5	**Why is the area around the Pacific Ocean known as the "Ring of Fire"?** Ans. This region is named the Ring of Fire because most of the world's earthquakes and volcanic eruptions occur along the plate boundaries found in this area.
6	**How does the process of 'lateral erosion' contribute to the formation of meanders?** Ans. As a river flows, it erodes the outer banks of bends and deposits sediment on the inner banks. This dual process of lateral erosion and deposition gradually creates large, winding loops called meanders.
7	**Explain the formation of a "sea stack" as an evolutionary stage of coastal erosion.** Ans. Coastal erosion begins by undercutting cliffs to form caves; when caves on opposite sides of a headland meet, they form an arch. When the arch eventually collapses, it leaves behind an isolated pillar of rock known as a stack.
8	**Analyze the role of 'Karst topography' landforms in human life.** Ans. Karst topography, created by groundwater dissolving soluble rocks like limestone, forms caves and sinkholes. These features are important as they provide fresh water sources, tourism opportunities, and often hold cultural or religious significance.
9	**Explain how deforestation acts as a catalyst for both erosion and landslides**. Ans. Deforestation leaves soil exposed, making it easier for wind and water to strip away fertile topsoil (erosion). Furthermore, the lack of tree roots to hold soil together makes steep slopes unstable, significantly increasing the risk of landslides during heavy rain.
10	**How can a sudden rise in temperature trigger an avalanche?** Ans: A sudden rise in temperature partially melts the snow, reducing friction between snow layers and making the snowpack unstable.

11	**Describe the transition of a river from its upper course to its lower course in terms of landform creation.** Ans. In the upper course, steep gradients lead to V-shaped valleys and waterfalls. By the lower course, the river slows significantly and deposits large amounts of sediment to form features like deltas and levees.
12	**Explain the process of gradation and the role of its various agents in reshaping the Earth's surface over time**. Gradation is the continuous process by which natural forces level or smooth the Earth's surface over time. This process involves a combination of wearing down high areas through erosion and filling up low areas through deposition. The primary goal of gradation is to reshape the landscape into a more uniform state. The various agents of gradation play specific roles in this transformation: 1. Running Water: Rivers are powerful agents that shape the land through erosion, transportation, and deposition. In their upper course, they carve steep V-shaped valleys and waterfalls. As they reach the middle course, they begin to meander, creating winding curves and floodplains. Finally, in the lower course, they slow down and deposit massive amounts of sediment to form deltas and levees. 2. Glaciers: Moving ice acts like a massive scraper, carrying rock and debris to carve out U-shaped valleys, cirques, and fjords. When glaciers melt, they deposit this material (called till) to create moraines, which can act as natural dams or form fertile soil. Wind: Most active in arid regions, wind reshapes deserts by picking up loose particles to erode rocks into yardangs and ventifacts. It also transports sand to create various types of dunes, such as crescent-shaped barchans or star dunes, which act as natural barriers against desertification. 3. Waves and Currents: These agents constantly reshape coastlines. They erode land to form dramatic features like cliffs, sea arches, and stacks. Simultaneously, they deposit sediments to create beaches and sandbars, which serve as natural barriers protecting settlements from the sea. 4. Groundwater: In areas with soluble rocks like limestone, groundwater creates Karst topography through chemical weathering. It dissolves rock to form underground caves, sinkholes, and rivers, while depositing minerals to create icicle-like stalactites and stalagmites. Together, these agents are constantly modifying landforms, ensuring that the Earth's surface remains in a state of dynamic change. While internal forces like plate tectonics build up the Earth's features, the agents of gradation work to slowly wear them back down and redistribute material across the planet.
13	**Examine the causes and human impacts of disasters associated with mountainous landforms, specifically focusing on GLOFs and Avalanches.** Ans. Mountainous landforms are subject to dynamic internal and external forces that, while shaping the landscape, also trigger devastating disasters such as Glacial Lake Outburst Floods (GLOFs) and avalanches. Glacial Lake Outburst Floods (GLOFs)- GLOFs occur when large volumes of water are abruptly released from glacial lakes. These lakes are often held back by natural dams composed of ice or loose glacial debris known as moraines. Causes: The primary driver is the rapid melting of glaciers due to rising temperatures, which increases water levels and puts immense pressure on these fragile natural dams.

	Triggers: The sudden collapse of a dam can be triggered by heavy rainfall, intense snowfall, or geological disturbances such as earthquakes, avalanches, and landslides that strike the lake or weaken its boundaries. This leads to catastrophic flooding as the stored water surges into downstream areas. Avalanches- Avalanches result from a sudden loss of stability in the snowpack on steep mountain slopes. Causes: Heavy snowfall over short periods adds significant weight to the snowpack. If this new snow rests on weak or loosely bonded layers, it becomes highly unstable. Environmental changes, such as a sudden rise in temperature, can cause partial melting, which reduces the friction necessary to hold the snow in place. Additionally, strong winds can create fragile, uneven piles of snow. Human Impacts: Life, Infrastructure, and Connectivity The consequences of these mountainous disasters are severe and multifaceted, as illustrated by the devastating 2021 flood in the Chamoli district of Uttarakhand. Damage to Life: These events lead to a high number of human and livestock fatalities. Infrastructure Destruction: The force of the water or snow causes extensive damage to buildings, bridges, and hydel (hydroelectric) projects, which are vital for the regional economy and energy supply. Loss of Connectivity: A critical impact is the destruction of roads and transport routes, which severs connectivity to remote villages. This isolation makes emergency rescue operations difficult and disrupts the daily lives and livelihoods of mountain communities. Understanding these landform-associated disasters is essential for identifying high-risk regions and implementing mitigation strategies to safeguard human lives and sustainable development in mountainous areas.
14	**Draw and label the diagram of a Waterfall.**  **Fig.2.10. Waterfall** 1 River 2 Hard Rock 3 Gap 4 Plunge Pool 5 River

15 **Differentiate between convergent boundary and divergent boundary.**

Convergent boundary	Divergent boundary
1. where two plates move towards each other.	1. where plates move away from each other.
2. They form fold mountains, leading to volcanic activity and earthquakes.	2. Magma rises from below and forms new crust, creating features, such as mid-ocean ridges.
3. the Himalaya is a good example	3. The Mid-Atlantic Ridge is a good example

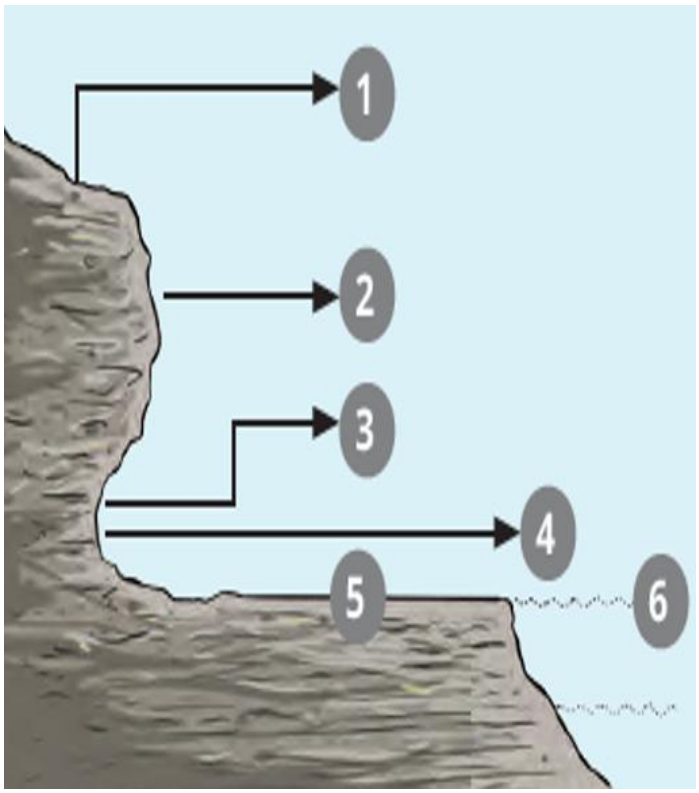
16 **Describe the structural composition of the Earth's interior and explain how the interaction between these layers drives the dynamic changes observed on the Earth's surface.**
Answer: The Earth is composed of three main layers: the **crust**, the **mantle**, and the **core**, each possessing unique physical and chemical properties.

1. **The Crust:** This is the outermost layer where life exists. Its thickness varies significantly depending on the location, ranging from **30–40 km under continents** to just **5–7 km under the oceans**.
2. **The Mantle:** Located below the crust, the mantle is a very thick and hot layer that is mostly solid. The crust and the rigid upper portion of the mantle together form the **lithosphere**. Beneath this lies the **asthenosphere**, a hot, mobile layer of partially molten rock.
3. **The Core:** The innermost part of the Earth is extremely hot and heavy. it is divided into two parts: the **outer core**, which is a fluid layer consisting mainly of iron and nickel, and the **inner core**, which is a solid, hot spinning metal ball and the densest part of the planet.

The Driving Mechanism of Surface Change: The dynamic nature of the Earth's surface is a direct result of the interaction between these internal layers. Heat generated from the Earth's core causes **convection currents** within the mantle. In this process, molten material rises as it heats up and sinks as it cools, creating a continuous cycle of movement.
Because the lithosphere is broken into various **tectonic plates** that rest upon the semi-molten asthenosphere, these convection currents act as a force that pushes and pulls the plates in different directions. This movement, known as **plate tectonics**, is responsible for major geological phenomena such as the formation of mountains, volcanic eruptions, and earthquakes, constantly transforming the Earth's surface over millions of years.

17 Explain the Plate Tectonic Theory and analyse how the movement of lithospheric plates contributes to the formation of major landforms and the occurrence of earthquakes and volcanic activities. Give suitable examples to support your answer.
Ans. Plate Tectonic Theory states that the Earth's lithosphere is divided into several large and small tectonic plates that move slowly over the semi-molten asthenosphere due to forces operating within the Earth.
The movement of these plates can be of three main types:

1. Convergent movement: When two plates move towards each other, they may collide, causing folding, mountain formation, earthquakes and volcanic activity. For example, the collision of the Indian Plate with the Eurasian Plate resulted in the formation of the Himalayas.
2. Divergent movement: When two plates move away from each other, magma rises from

	beneath the Earth's surface and forms new crust. This process can lead to volcanic activity and the formation of rift valleys and oceanic ridges. 3. Transform movement: When plates slide horizontally past each other, friction and sudden movement can cause earthquakes. Thus, the continuous movement of tectonic plates is an important force responsible for the formation and modification of mountains, volcanoes, rift valleys and other major landforms, as well as the occurrence of earthquakes.
18	**Draw and label the diagram of a Sea cliff and shore platform.**  Fig.2.16. Sea cliff and shore platform 1 Headland 2 Sea cliff 3 Sea cave 4 High-tide level 5 Shore platform 6 Low-tide level
19	**a) Landslides and avalanches can cause severe damage to life, property and infrastructure in mountainous regions. Suggest any three mitigation measures that can reduce their impact.** Ans: • Avoid construction and settlement in highly vulnerable slopes and avalanche-prone areas. • Strengthen slopes through afforestation, retaining walls and proper drainage. • Establish early-warning systems and evacuate people from vulnerable areas when necessary. **b) GLOFs and dust storms are different hazards, but both can cause widespread damage. Explain two suitable mitigation measures for each of these hazards.** Ans: • GLOFs: Monitor glacial lakes and establish early-warning systems; strengthen or safely drain vulnerable glacial lakes where necessary. Dust storms: Develop shelter belts and plantations to reduce wind speed and soil erosion; provide weather warnings and advise people to remain indoors during severe dust storms.

20	**Define the following terms-** 1. Cirques - Bowl-shaped depressions at the head of a glacier 2. Aretes - Sharp ridges between valleys 3. Fjords - A fjord is a long, narrow sea inlet framed by steep cliffs or mountains, which was originally carved out by a glacier and later filled with ocean water 4. Moraines - Landforms created by the deposition of rocks, soil, and debris (called till) carried along and left behind by glaciers. 5. Mantle - The mostly solid layer between the crust and the Earth's outer core. 6. Cliffs are steep rock faces formed as waves undercut the base of the coast. 7. Arches are created when caves on opposite sides of a headland meet 8. Stacks are isolated pillars of rock left standing after the arches collapse. 9. Beach is a landform made up of sand, pebbles, or rocks along the shoreline of a sea, ocean, or lake, created by the deposition of sediments by waves. 10. Delta is a landform formed at the mouth of a river, where it flows into a sea, ocean, or lake, and deposits the sediments it has carried from upstream