

MCQ Question · mcqquestion.com

Geomorphology: Earth’s Structure and Landforms

Free · Share

Geomorphology: Earth’s Structure and Landforms

Two forces have been fighting over every mountain on Earth since the planet cooled. One keeps building them up. The other never stops tearing them back down.

Geomorphology, at a glance

How Earth’s structure and internal-external forces build and erode every landform

01
Three main layers

Crust, mantle, and core.

02
Seven major plates

Constantly drifting on the mantle.

03
105° shadow zone

Proves the outer core is liquid.

04
India crossed the equator

On its 200-million-year drift north.

LithosphereThe crust plus the solid uppermost mantle, 10-200 km thick, where all natural earthquakes happen.

AsthenosphereThe mantle's partially molten upper layer, down to about 400 km, that lets tectonic plates slide.
OrogenyMountain-building through severe folding, concentrated in long narrow belts.
EpeirogenyGentler, broader uplift or warping across large parts of the crust.

What Are Earth's Layers, and How Do We Even Know?

Must Know

What are Earth's layers, and what shapes the land above them?

- **Earth is made of three main layers: the crust, mantle, and core.** The thin crust is where every landform takes shape. The mantle beneath it drives plate tectonics. The core is Earth's innermost layer.
- The crust runs about 5 km deep under the oceans, but 30 km deep under continents, and up to 70 km under the Himalayas.
- The mantle runs from the crust down to about 2,900 km. Its upper part, the asthenosphere, reaches about 400 km down and is the main source of magma.
- **The crust plus the solid uppermost mantle together make the lithosphere.** It is 10-200 km thick, and this is where all natural earthquakes happen.
- The core starts at 2,900 km depth. Its outer part is liquid, but its inner part is solid, and both are made mostly of nickel and iron.

How do scientists actually know what's down there?

- Mining, deep drilling, and volcanic material thrown up during eruptions give scientists direct rock samples from below the surface.
- Gravity anomalies, magnetic surveys, meteorite samples, and seismic waves all reveal what's inside indirectly, without ever touching it.
- **P-waves arrive first and pass through solids, liquids, and gases. S-waves arrive later and pass only through solids.**
- S-waves never reach seismographs more than 105° from the earthquake's epicentre. This gap, the shadow zone, proves the outer core is liquid, since S-waves cannot pass through liquid.

> **Quick check 1.** Q1. True or False: the crust plus the solid uppermost mantle together make up the lithosphere, where all natural earthquakes happen. *(True or False?)* See answer ↓

> **Quick check 2.** Q2. True or False: S-waves can pass through the Earth's liquid outer core, just like P-waves do. *(True or False?)*
>
> See answer ↓

How Did Wegener's Wild Idea Become Plate Tectonics?

Good to Know

What did Wegener actually propose, and why did it take decades to accept?

- **Alfred Wegener's 1912 continental drift theory proposed that continents once formed a single landmass and slowly drifted**

apart. He named it Pangaea, meaning “all earth,” surrounded by one mega-ocean, Panthalassa.

- Pangaea first split into a northern Laurasia and a southern Gondwanaland. Evidence includes matching ancient rock belts on Brazil’s coast and Western Africa, and Gondwana sediments from India matching counterparts across six Southern Hemisphere landmasses.
- Wegener suggested two driving forces: a pole-fleeing force from Earth’s equatorial bulge, and a tidal force from the Sun and Moon’s pull. Most scientists at the time found both far too weak to actually work.
- Harry Hess proposed in 1961 that new crust erupts at mid-ocean ridges and pushes older crust outward. This sea floor spreading finally explained the missing mechanism, and is why oceanic crust is never older than 200 million years.

How did the Indian plate actually get here?

- The lithosphere is broken into seven major plates (Pacific, North American, South American, Eurasian, African, Indo-Australian, Antarctic), plus several minor ones like Nazca, Cocos, and Arabian.
- **India began as an island off Australia’s coast**, separated from Asia by the Tethys Sea, and started moving north about 200 million years ago when Pangaea broke apart.
- Around 60 million years ago, while India was still near the equator and still travelling, huge lava flows built the Deccan Traps.
- India collided with Asia about 40-50 million years ago. This continent-continent collision pushed the Himalayas upward, and they are still rising today.

Quick check 3. Q3. True or False: Alfred Wegener put forth his continental drift theory in 1912, naming the single supercontinent Pangaea. *(True or False?)* See answer ↓

Think it through, before reading on. Chalk and clay are both porous rocks, yet water flows through chalk easily and barely moves through clay. What actually explains the difference?

Show the explanation

Porosity and permeability are different properties. Porosity is how much open space a rock holds; permeability is whether those spaces connect enough to let water flow through. Chalk's pores connect well, so it is both porous and permeable. Clay's pores are tiny and poorly connected, so it holds water but stays nearly impermeable.

Exam Point of View

Test Yourself

Remember the trap. Creep and solifluction are slow mass movements. Mudflow and slump are rapid ones. Exams test this exact split often.

Why Do Rocks Weather Differently, and How Does Soil Form?

Great to Know

What actually shapes a volcano's form, and how do rocks break down?

- Shield volcanoes are built from very fluid basalt lava, which spreads flat instead of piling steep; Hawaii's volcanoes are the classic example. Composite volcanoes erupt cooler, thicker lava with ash, building the classic steep cone.
- **Flood basalt volcanoes pour out huge, thin sheets of runny lava over vast areas**, and India's own Deccan Traps are a giant example. Magma that cools underground, instead of erupting, forms batholiths, laccoliths, sills, and dykes.
- Chemical weathering decomposes rock through reactions like oxidation and carbonation. Physical weathering breaks rock apart without changing its chemistry. Biological weathering comes from plant roots, burrowing animals, and decaying matter.
- **Exfoliation is a result, not a process.** Repeated expansion and contraction flakes curved rock sheets off a surface, leaving it smooth and rounded.

How does soil actually form, and what happens underground?

- Soil formation depends on five factors together: parent material, topography, climate, biological activity, and time.
- Heavy rain washes soil components downward, called eluviation, and deposits them lower down, called illuviation. Removing silica this way is called desilication.
- In dry climates, evaporation pulls groundwater up, leaving salts that harden into a crust called hardpan. In moderate-rainfall tropical areas, calcium carbonate instead forms nodules called kanker.
- Bacteria like Rhizobium, living in the root nodules of legumes, convert nitrogen gas from the air into a form plants can actually use.

Quick check 4. Q4. True or False: composite volcanoes erupt explosively and eject pyroclastic material, unlike the fluid lava of shield volcanoes. *(True or False?)* See answer ↓

Quick check 5. Q5. True or False: mudflow and slump are classified as slow mass movements, while creep and solifluction are rapid. *(True or False?)* See answer ↓

Quick check 6. Q6. True or False: Rhizobium bacteria, living in legume root nodules, convert nitrogen gas into a form plants can use. *(True or False?)* See answer ↓

Quick Q&A

What proves Earth’s outer core is liquid?

The seismic shadow zone: S-waves never reach stations more than 105° from an earthquake's epicentre.

What replaced Wegener's weak driving forces?

Harry Hess's 1961 sea floor spreading theory, based on new crust erupting at mid-ocean ridges.

Is exfoliation a weathering process?

No, it is a result of unloading or thermal expansion, not a process itself.

Which mass movements are rapid?

Mudflow and slump; creep and solifluction are slow.

🔗 Related Topics

- **All World Geography Articles**
- **Gondwanaland and the Gondwana Rock System**
- **The Deccan Traps**
- **The Himalayan Mountain Range**
- **Paleomagnetism and Earth's Magnetic History**

✅ MCQ on Geomorphology

🎲 More World Geography Practice

Practice MCQs

1. Which of the following are the evidences of the phenomenon of continental drift?

I. The belt of ancient rocks from Brazil coast matches with those from Western Africa.

II. The gold deposits of Ghana are derived from the Brazil plateau when the two continents lay side by side.

III. The Gondwana system of sediments from India is known to have its counterparts in six different landmasses of the Southern Hemisphere.

Select the correct answer using the code given below. (UPSC CSP 2025, GS Paper I)

A. I and III only

B. I and II only

C. I, II and III

D. II and III only

See answer ↓

2. Beyond how many degrees from an earthquake's epicentre do S-waves stop being recorded entirely, forming part of the shadow zone?

A. 45 degrees

B. 75 degrees

C. 145 degrees

D. 105 degrees

See answer ↓

3. The Richter scale used to measure earthquakes expresses magnitude as a number on which range?

A. 1 to 12

B. 0 to 10

C. 0 to 100

D. 1 to 5

See answer ↓

4. Harry Hess's 1961 hypothesis of new lava at ridge crests pushing oceanic crust apart is known as:

A. Continental drift

B. Sea floor spreading

C. Isostasy

D. Plate tectonics

See answer ↓

5. The 'Asthenosphere', a partially molten layer beneath Earth's rigid lithosphere, is significant because it?

A. Allows tectonic plates to move slowly across its surface

B. Forms Earth's outermost visible layer

C. Contains Earth's only source of fresh water

D. Generates Earth's magnetic field

See answer ↓

6. The point of origin of an earthquake within the lithosphere is known as the focus, or by which other name?

A. Epicentre

B. Hypocentre

C. Seismic centre

D. Fault line

See answer ↓

7. Which of the following types of mass movements are categorized as rapid movements?
1. Creep
2. Mudflow
3. Solifluction
4. Slump Select the answer using the code given below. [CAPF (ACs) 2025]

A. 1 and 2

B. 1 and 3

C. 2 and 4

D. 3 and 4

See answer ↓

8. Which of the following are associated with composite volcanoes?

I. They result in explosive eruptions.

II. They eject pyroclastic materials.

III. Pyroclastic materials and ashes accumulate near the vent, forming layers.

Select the correct answer using the code given below.

A. I and II only

B. II and III only

C. I and III only

D. I, II and III

See answer ↓

Answer Key

1. **C.** The correct answer is **I, II and III**, as per the official key. Statement III is supported by geology. Studies of Gondwana fossils and sediments show similar formations in Africa, South America, Antarctica, Australia and Madagascar. Statements I and II rest on the official key. Memory hook: all three point to one old landmass. ↑ Q1
2. **D.** Beyond 105 degrees from the epicentre, S-waves are not recorded at all, since they cannot cross the Earth's liquid outer core. ↑ Q2
3. **B.** The Richter scale measures the energy released by a quake on a scale of 0 to 10. The Mercalli intensity scale, measuring visible damage, ranges from 1 to 12 instead. ↑ Q3
4. **B.** Hess proposed sea floor spreading in 1961, explaining why oceanic crust is much younger than continental rock. ↑ Q4
5. **A.** The correct answer is that it **allows tectonic plates to move slowly across its surface**. The asthenosphere is hot, semi-solid material that can soften and flow. The rigid lithosphere is thought to float on it. The magnetic field option is wrong because the spinning liquid outer core creates the field. The fresh water option is wrong because no source links the asthenosphere to fresh water. The outermost layer option is wrong because the crust is outermost. Memory hook: A for Asthenosphere, A for slide-Away plates. ↑ Q5
6. **B.** The focus, where energy is released along a fault, is also called the hypocentre. The epicentre is the surface point directly above it. ↑ Q6
7. **C.** Mudflow and slump are rapid mass movements, moving downslope quickly. Creep and solifluction are slow movements, taking place gradually over long periods. ↑ Q7
8. **D.** The correct answer is **I, II and III**. Composite volcanoes have viscous lava that traps gas, so eruptions are often explosive. They are about half lava and half pyroclastic material. They are built of alternating layers of lava, ash, cinders, blocks and bombs. So all three statements are right. Every other option leaves out a true statement. Memory hook: composite means layers on layers. ↑ Q8

Quick-check answers

1. **True.** ↑ 1
2. **False.** ↑ 2
3. **True.** ↑ 3
4. **True.** ↑ 4
5. **False.** ↑ 5
6. **True.** ↑ 6

Curated by Arsalan Zuberi · mcqquestion.com



Scan to read online

https://mcqquestion.com/articles/geomorphology-earths-structure-and-landforms/