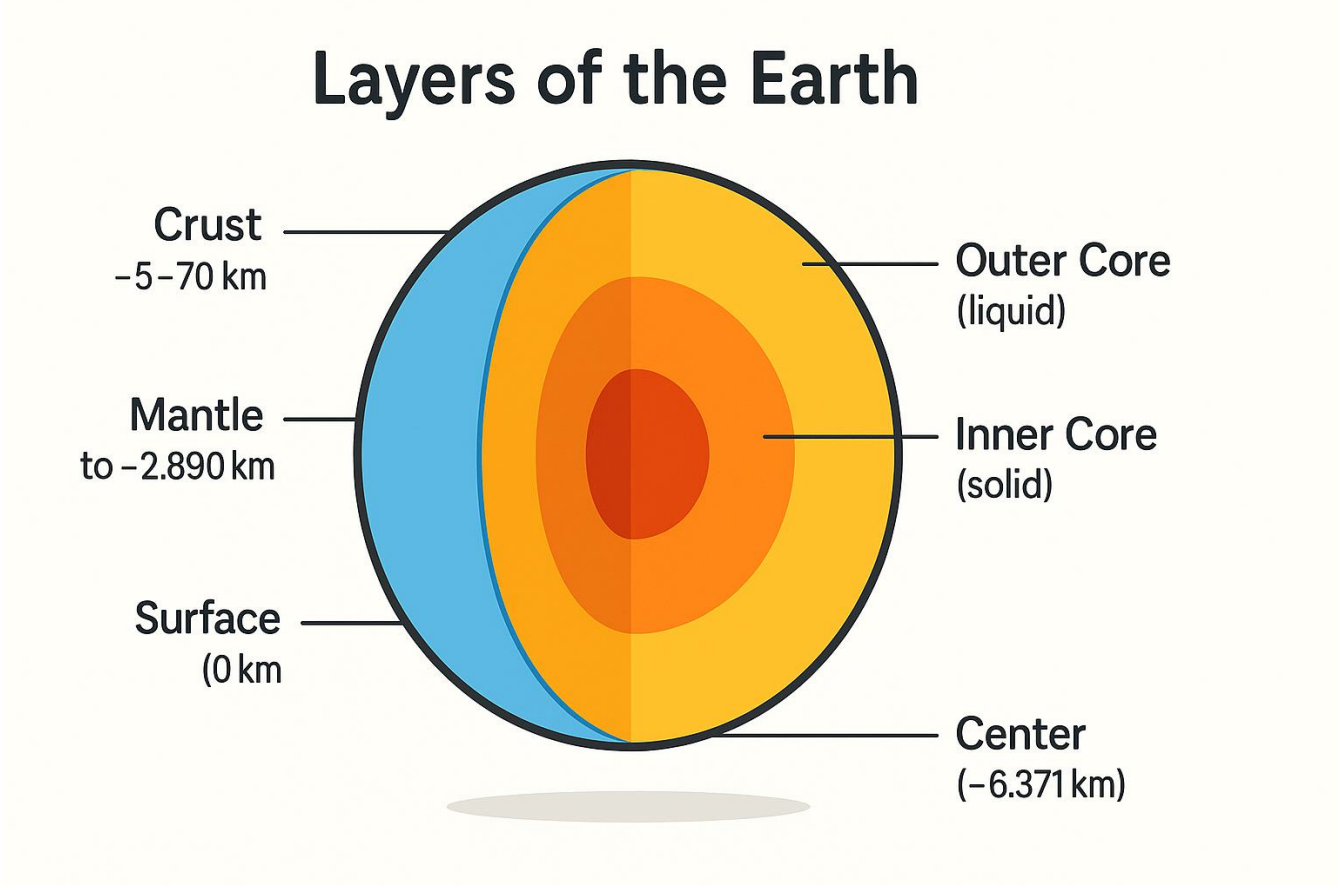
Layers of earth

Layers of the Earth

Big Picture

Our planet is built like a giant onion! From the outside to the inside, the main layers are the **crust**, the **mantle**, the **outer core** (liquid), and the **inner core** (solid). Scientists study how earthquake waves travel to discover what each layer is like.



Earth has four main layers. The crust is thin; the mantle is the thickest; the outer core is liquid metal; the inner core is solid metal.

Crust = 5 - 70 km thick | Mantle down to = 2,890 km | Outer core = liquid metal | Inner core = solid metal

Crust

The crust is Earth's hard skin where we live. There are two types:

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- **Continental crust**: thicker (about 25-70 km), lighter rocks like granite; makes continents.
- **Oceanic crust**: thinner (about 5-10 km), heavier rocks like basalt; under oceans.

Boundary alert: The border between the crust and mantle is called the *Moho* (short for Mohorovi?i? discontinuity).

Continental crust is thicker but less dense; oceanic crust is thinner and denser.

Mantle

The mantle sits under the crust and is the *thickest* layer. It's made of hot, solid rock that can *slowly* flow over long times. That slow movement (called **convection**) helps move the plates above.

- **Upper mantle** (includes a soft zone called the *asthenosphere*).
- **Lower mantle** (hotter, under higher pressure).

Did you know? Parts of the mantle melt to make *magma*. When magma reaches the surface, we call it *lava*.

Outer Core

This layer is made of liquid metal (mostly iron and nickel). Its swirling motion creates Earth's **magnetic field**, which helps protect us from harmful solar particles.

Boundary alert: The border between the mantle and outer core is the *Gutenberg discontinuity*.

Inner Core

At the very center is a **solid** metal ball (mostly iron). It's extremely hot and under enormous pressure, which keeps it solid even at such high temperatures.

Boundary alert: The border between the outer and inner core is the *Lehmann discontinuity*.

Plates, Quakes, and Volcanoes - How Layers Matter

The rigid **lithosphere** (crust + the very top of the mantle) is broken into large pieces called **tectonic plates**. These plates float on the softer asthenosphere beneath. Where plates meet, we often find mountains, earthquakes, and volcanoes.

Tectonic plates ride on the asthenosphere. Their interactions shape Earth's surface.

Science skill: Earthquake waves (P and S waves) help scientists "x-ray" the planet. S waves won't travel through liquids, so a big S-wave "shadow" tells us the outer core is liquid.

Quick Reference (Approximate)

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- **Crust:** ~5-10 km (oceanic), ~25-70 km (continental)
- **Mantle:** from base of crust down to ~2,890 km
- **Outer Core:** liquid layer below the mantle; boundary at ~2,890 km depth; inner-core boundary at ~5,150 km
- **Inner Core:** solid center; radius ~1,221 km

Numbers vary by location and come from seismic studies. Good enough for Grade 5!

Glossary

Crust
Earth's thin, rocky outer layer where we live.

Mantle
Thick layer of hot rock beneath the crust that slowly flows.

Lithosphere
Rigid outer shell: crust + the very top of the mantle.

Asthenosphere
Softer part of the upper mantle that allows plates to move.

Core
Center of Earth: liquid *outer* core and solid *inner* core.

Moho
Boundary between the crust and mantle.

Convection
Heat-driven, slow motion in the mantle that moves plates.

Seismic waves
Energy from earthquakes used to "see" inside Earth.

Try It at Home (Mini Activities)

1. **Layer Sandwich:** Stack a thin slice of bread (crust), a thick layer of cheese (mantle), jelly (outer core), and a grape (inner core). Identify each part.
2. **Plate Glide:** Place two pieces of cardboard on a towel. Gently push together (convergent), pull apart (divergent), and slide (transform). What happens at the "boundaries"?

Practice - 5 MCQ Questions

1. Which statement is true about Earth's crust?
    - A. Continental crust is thinner and denser than oceanic crust.
    - B. Oceanic crust is thinner and denser than continental crust.
    - C. Both types have the same thickness everywhere.
    - D. There is no difference between them.
2. Which layer is *liquid*?
    - A. Crust
    - B. Mantle
    - C. Outer core
    - D. Inner core

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3. The Moho marks the boundary between the:
    - A. Inner core and outer core
    - B. Crust and mantle
    - C. Mantle and outer core
    - D. Lithosphere and asthenosphere
4. Why don't S-waves travel through the outer core?
    - A. It's too cold.
    - B. It's made of gas.
    - C. It's liquid, and S-waves don't pass through liquids.
    - D. It blocks all waves for unknown reasons.
5. The **lithosphere** is made of:
    - A. Only the crust
    - B. Only the mantle
    - C. Crust + uppermost mantle (rigid)
    - D. Outer core + inner core

▸ **Answer Key** (click to reveal)

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