

Earth's Hidden Engine

Trace the materials and motion beneath Earth's surface.

SC.7.E.6.1 "Describe the layers of the solid Earth, including the lithosphere, the hot convecting mantle, and the dense metallic liquid and solid cores."

NAME _____

DATE _____

1 READ AND MARK _____ Read it twice

YOUR JOB Underline each layer name. Number the four layers from 1 to 4, outermost to innermost, and circle words that tell whether a layer is rigid, solid, or liquid.

Beneath the Surface

- ① Earth looks solid beneath our feet, but its interior has zones with different materials and behaviors. The outer rigid zone is the lithosphere. It includes Earth's crust and the uppermost, firm part of the mantle. The lithosphere is broken into moving plates that carry continents and ocean floors. Below it, hotter mantle rock can slowly flow even though it remains mostly solid. Heat from deeper inside Earth helps cause this motion, which can move the plates above.
- ② Most of the mantle lies between the lithosphere and the core. It is hot rock, not a sea of melted rock. Over very long times, heat makes mantle material rise, spread, cool, and sink. This looping movement is convection. Convection transfers heat and helps drive plate motion. Farther down, the outer core is a dense liquid made mostly of iron and nickel. Motion in this metallic liquid helps produce Earth's magnetic field, which extends far into space.
- ③ At Earth's center is the inner core, made mostly of iron and nickel. It is extremely hot, yet it is solid because the enormous pressure squeezes its atoms tightly together. The inner core is surrounded by the liquid outer core. Both cores are denser than the rocky mantle because they contain much more metal. Scientists use earthquake waves to infer these layers, since waves change speed or direction when they enter materials with different properties. The layers work together as heat moves outward from deep inside Earth.

2 ANSWER WITH EVIDENCE Use the passage

1 What two parts of Earth make up the lithosphere?

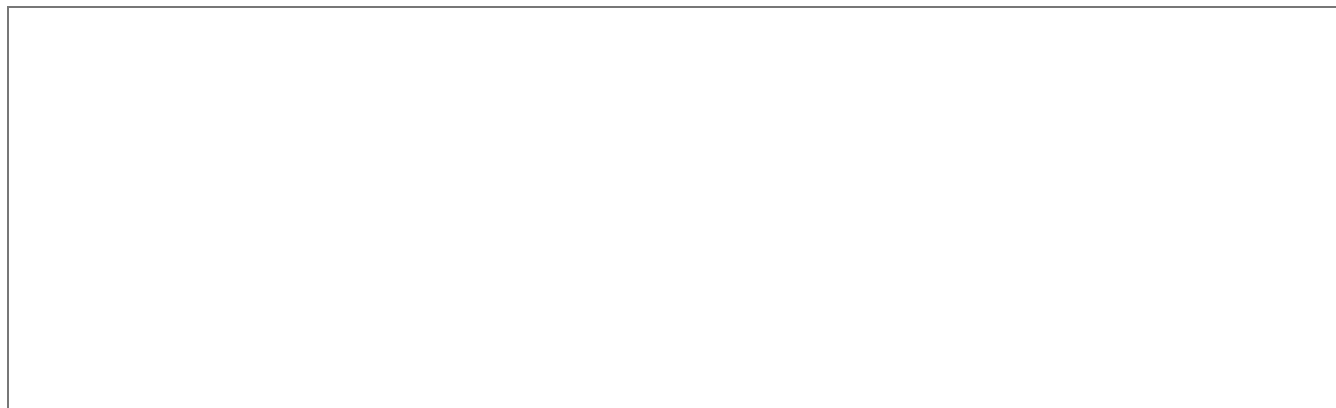
2 Describe the convection cycle in the mantle. How does this movement affect the lithosphere?

3 Compare the outer core and inner core. Include what each is mostly made of and whether it is liquid or solid.

4 List the four layers named in the passage from outermost to innermost. Give one property of the innermost layer.

3 YOUR TURN Your own words

Draw a cutaway sketch of Earth that shows the lithosphere, mantle, outer core, and inner core in the correct order. Add arrows showing mantle convection and write a caption explaining why the inner core is solid even though it is extremely hot.



PART 1 • READ AND MARK

Underline each layer name. Number the four layers from 1 to 4, outermost to innermost, and circle words that tell whether a layer is rigid, solid, or liquid. Accept any marking that follows this job and points at the right text.

PART 2 • ANSWERS

#	QUESTION	ANSWER
1	What two parts of Earth make up the lithosphere?	Earth's crust and the uppermost, firm part of the mantle.
2	Describe the convection cycle in the mantle. How does this movement affect the lithosphere?	Mantle material rises, spreads, cools, and sinks in a loop. This convection transfers heat and helps move the plates of the lithosphere.
3	Compare the outer core and inner core. Include what each is mostly made of and whether it is liquid or solid.	Both are made mostly of iron and nickel. The outer core is a dense liquid, while the inner core is solid.
4	List the four layers named in the passage from outermost to innermost. Give one property of the innermost layer.	Lithosphere, mantle, outer core, inner core. The inner core is extremely hot but solid because of enormous pressure.

PART 3 • YOUR TURN (SAMPLE ANSWER)

The cutaway labels the layers from outside inward as lithosphere, mantle, liquid outer core, and solid inner core. Arrows in the mantle show material rising, spreading, cooling, and sinking. Caption: "The inner core stays solid because enormous pressure squeezes its atoms tightly together, even at extreme temperature."

Accept equivalent descriptions of the lithosphere as crust plus the rigid uppermost mantle. In the sketch, require all four layers in correct order, mantle convection arrows, and an accurate pressure-based explanation for the solid inner core.