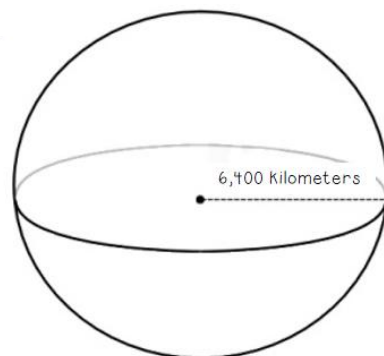


Question: Is Earth made entirely of homogeneous, solid rock?

Background: Sometimes the simplest answer is the right one. Perhaps you, like other scientists, have wondered: What is inside our Earth? The simplest solution to that puzzle is that Earth is made entirely of the very same rock that we see at its surface. To test this theory, scientists study seismic waves, which travel through Earth, as a tool to discover what might be hiding beneath our feet. Earthquakes produce two types of seismic waves – Primary (P) waves and Secondary (S) waves. P waves and S waves behave differently as they travel through different materials. This can help scientists determine the characteristics of Earth’s interior.



Earth’s center is roughly 6,400 km from its surface.

Objectives: You will test this hypothesis by graphing real seismic data as it moves through Earth to its very center. We know that seismic waves travel ~1 km/s through solid rock. If Earth is homogeneous -- or made entirely of solid rock -- seismic waves should travel at a consistent speed through Earth’s interior to its core. If we observe changes in the speed seismic waves travel through Earth’s interior, we know that Earth must NOT be made entirely of homogenous, solid rock.

Create a double line graph showing the relationship between P-wave speed/S-wave speed and depth within the Earth (see Data Tables). Then answer the questions on the back.

KEY

- P-wave
- S-wave

Graphing Seismic Waves
Data Tables

Wave Type	Depth (km)	Speed (km/s)
P	0	6
P	50	9
P	200	8
P	500	9
P	1000	11
P	2000	13
P	2900	14
P	2950	8
P	4000	9
P	5200	10
P	5250	11
P	5500	11
P	6000	11
P	6400	11

Wave Type	Depth (km)	Speed (km/s)
S	0	3.5
S	50	5
S	200	4
S	500	5
S	1000	6
S	2000	7
S	2900	7.5
S	2950	0
S	4000	0
S	5200	0
S	5250	3.5
S	5500	4
S	6000	4
S	6400	4

1. Examine the graph you just made: “**Changes in P-Wave and S-Wave Speed as Depth Increases**”

What changes, patterns, or trends do you see?

2. On your graph, draw two arrows that point to changes, patterns, or differences you see.
3. What It Means: On your graph, for each of your captions, write a comment that explains what each change, pattern, or difference you see means.

What does it tell you about what’s happening?

4. Using your graph, compare and contrast the data for P and S waves.

5. **P-waves** are fast-moving longitudinal waves. They can travel through both solids and liquids. Their speed and direction changes when they encounter a medium of different density than the one they just passed through.

A. Observe: At what three depths in Earth’s interior do P-waves abruptly change speed?

B. Infer: What do these changes in speed suggest about the composition of Earth’s interior at these points?

6. **S-waves** are slow-moving waves. They can travel only through solids.

A. Observe: At what point do S-waves stop traveling through Earth’s interior?

B. Infer: What does this suggest about the composition of Earth’s interior above 3,000 km?

C. Infer: What does this suggest about the composition of Earth’s interior starting at 3,000 km?

Changes in the Speed of P and S-Waves As Depth Increases

