

Earth's Interior Structure

A guided tour to learn about:

characteristics of the crust, mantle and core

> tectonic plates and the asthenosphere

graph & diagram interpretation

Dear Teacher,

This webquest provides a structured format for taking advantage of the numerous online resources for learning about the interior layers of the Earth.

Whether you're short on time to teach about the layers of the Earth or looking for an introductory or review activity this webquest will cover the basics about the crust, mantle and core.

Webquest includes the following:

- Labeling a diagram of the Earth layers
- Learning about lithospheric (tectonic) plates and the asthenosphere
- Interpreting graphs and maps on crust depth, earthquakes and tectonic plates
- Answering questions about a brief video

The webquest ends with review questions and includes a complete answer key for you.

All of the links that the students will visit during this webquest are below.

Students can access all these links, in order, on my blog found at this link.

- <u>http://www.iupui.edu/~g115/assets/mod04/earth_composition.jpg</u>
- <u>http://geology.com/nsta/earth-internal-structure.shtml</u>
- <u>http://earthquake.usgs.gov/data/crust/crust.php</u>
- <u>http://www.windows2universe.org/earth/interior/earths_crust.html</u>
- <u>http://www.regentsearth.com/Illustrated%20ESRT/Page%205%20(Tectonic%20Plates)/ESRT%20Page%</u> 205%20Index.htm
- <u>http://www.britannica.com/science/asthenosphere</u>
- <u>https://www.nationalgeographic.org/encyclopedia/mantle/</u>
- <u>http://education.nationalgeographic.com/encyclopedia/mantle/</u>
- http://www.iupui.edu/~g115/assets/mod04/earth_composition.jpg
- <u>http://education.nationalgeographic.com/encyclopedia/core/</u>
- Video: Layers of the Earth—How were they found? What are they? <u>https://www.youtube.com/watch?v=UD7GHzIRI-s</u>

Alternate video link: <u>http://www.iris.edu/hq/programs/education_and_outreach/animations/38</u>

<u>http://ds.iris.edu/seismon/</u>

If you like this activity you may also like my other **<u>Earth Science webquests</u>**:

- ✓ The Rock Cycle (free!)
- ✓ Plate Tectonics

- \checkmark Volcanoes! In the Ring of Fire
- ✓ Volcanoes in the United State

Please email me if you have any questions about this product at <u>GenerationScience3@gmail.com</u>. Thanks!!

Earth's Interior Structure - A webquest

Name _____

Due Date _____

Directions: Each section begins with specific website links for you to follow in order to find the information you need to answer each question.

The three main layers of the Earth are called the crust, mantle and core. The mantle and core are both divided into sublayers.

Go To: Earth's Layers Diagram

1. Complete the table below by writing the letter that corresponds with each layer in the diagram. Choose a color for each layer and LIGHTLY color it in – add the color to the table. Use diagonal lines for the lithosphere.

Letter	Layer	Color
	Continental crust	
	Oceanic crust	
	Lithosphere	
	Asthenosphere	
	Lower mantle (mesosphere)	
	Outer core	
	Inner core	

Crust

Go to: Earth's Internal Structure

2. Use information from the link above to complete the chart.

	Thickness (km)	Made of Rock or Metals?	Most common substance in this layer
Continental crust			
Oceanic Crust			

3. Fill in the blank: Continental crust is _____ dense than oceanic crust.

4. If the Earth were a piece of fruit what part would the crust be? ______



Go to: <u>A Global Crustal Model</u>

You should see a USGS graph that shows the thickness of the Earth's crust. Carefully study the graph to answer the following questions:

5. Find the kilometer (km) scale on the right side of the graph; what color shows crust that is 30 km thick? _____

6. On what two continents do you find crust that is thicker than 60 km?

7. Which has thicker crust, oceanic crust or continental crust? Use evidence from the graph to explain your answer in complete sentences.

Lithosphere

8. Use information from the links below to complete the charts.

Go to: Earth's Crust, Lithosphere and Asthenosphere

	Thickness (km)	Of what 2 Earth layers is it made?	The lithosphere is divided into what?
lithosphere			

9. The lithosphere floats on top of what layer? ______

Go to: <u>Tectonic Plate Map</u>

Study the map, and use the map key, to answer the following:

10. On which plate do you live? _____

Boundary type	List 2 tectonic plates that share this type of boundary – do not use the same two plates together more than once.
Divergent	11.
convergent	12.
transform	13.

Layers of the Mantle

The mantle is divided into the upper mantle and lower mantle. Additionally, the upper mantle is divided into 2 parts: a thin portion of the lithosphere and the asthenosphere.

Asthenosphere

Go to: <u>Asthenosphere</u> and

Characteristics of the Lithosphere and Asthenosphere

14. At what depth range below the Earth's surface is the asthenosphere located?

15. List 3 ways that the asthenosphere is different from the lithosphere:

a.	
b	
с.	

Lower Mantle (Mesosphere)

Go to: Mantle and Earth's Layers Diagram

16. Using both links above, list 3 ways that the lower mantle is different from the asthenosphere:

а.	
b.	
c.	
-	

17. To what depth below the surface does the lower mantle extend? _____

Layers of the Core

Go To: <u>Core</u>

18. Use information from the link above to complete the chart and questions.

	Thickness (km)	Made of what metals?	Temperature Range (°C)	Liquid or Solid State?
Outer Core				
Inner Core				

19. Which layer creates the earth's magnetic field?

20. Why is the inner core in a solid state rather than a liquid state given the extremely high temperatures?

Watch the video (<u>https://www.youtube.com/watch?v=UD7GHzIRI-s</u>) and answer the following questions:

21. Scientists in the ______ began using data from ______ to learn about the Earth's interior.

22. What characteristic of seismic waves did scientists use to determine the differences between the layers of the Earth?

23. What are the three characteristics of different layers of the Earth that cause seismic waves to change direction and speed?

a. _____ b. _____ c. ____

Earth's Latest Earthquakes

Go to: Seismic Monitor

Use this interactive map to find information about recent earthquakes in a region of your choice – click on a region link on the right side of the screen.

24. Region chose: ______ Click on a circle of your choice - Write the date and time, magnitude (MAG) and location (Location Map) of a recent earthquake on the line below:

Review Questions

25. It is incorrect to say that the crust is broken up into tectonic plates. Explain why this is false.

26. What is the deepest, hottest layer?

27. Which layer is soft and malleable (bendable)? ______

28. Which layer is completely in a liquid state? _____

29. List the 4 layers that are in a completely solid (rigid) state ______

30. In general, as depth increases, how does temperature and pressure change inside the Earth?

31. If you could travel the following distances, in what layer of the earth would you find yourself?

80 km _____

5,000 km _____

2,000 km _____

6,000 km _____

Answer Key



2.

Continental crust	30-50 km	rock	granite
Oceanic Crust	5-7 km	Rock	basalt

3. Continental crust is **less** dense than oceanic crust.

- 4. Peel
- 5. Green
- 6. Asia and South America

7. Continental is thicker than oceanic which you can tell because the areas in which the oceans occur show depths up to about 15 km, but mostly the depth is about 5 km; however, the continental areas are at least 25 km thick which about 35-40 being the most common.

^{8.}

lithosphere	80 km	Crust and upper part of the	Tectonic plates
ntriosphere		mantle	rectome plates

9. Asthenosphere

10. Plate on which you live – If in the U.S. the answer would be North American Plate; Hawaii is on the Pacific Plate.

There are multiple answers possible – below one possible answer is listed for each boundary:

Boundary type	List 2 tectonic plates that share this type of boundary – do not use the same two plates together more than once.
Divergent	11. Pacific Plate and North American Plate
convergent	12. Pacific Plate and Nazca Plate
transform	13. Antarctic Plate and Scotia Plate

14. 100-700 km

15. a. lithosphere is solid rock while the asthenosphere is partially molten and can be deformed/is malleable

b. lithosphere is relatively cold and the asthenosphere is much hotter

c. there are convection currents in the asthenosphere caused by heat from deep within the Earth

16. a. lower mantle is rigid while the asthenosphere is plastic (or malleable)

b. lower mantle is denser

c. lower mantle is hotter

17. 2885 km

18.

	Thickness (km)	Made of what metals?	Temperature Range (°C)	Liquid or Solid State?
Outer Core	2,300 km	iron-nickel alloy	4,000 - 5,000 °C	liquid
Inner Core	1,200 km	Mostly iron	5,000-7,000 °C	solid

19. Outer core

20. The pressure from the rest of the planet is so great that the iron cannot melt because the atoms are forced close together, thus keeping the atoms into a solid state.

21. Scientists in the **1900's** began using data from **earthquakes** to learn about the Earth's interior.

22. Scientists used the travel times of different seismic waves to worldwide stations to determine the boundaries between layers.

- 23. composition, density and temperature
- 24. Answers will vary based on the student's choice.

25. It is not the crust, but the layer called the lithosphere that is broken up into plates. The lithosphere is all of the crust plus the top section of the upper mantle.

- 26. inner core
- 27. Asthenosphere
- 28. outer core
- 29. crust, lithosphere, lower mantle, inner core

30.

80 km lithosphere	5,000 km <u>outer core</u>
2,000 km lower mantle	6,000 km <mark>inner core</mark>