

### Earth's Interior

#### INTRODUCTION

Geophysicists believe that the Earth is divided into numerous shells, each with different physical and chemical properties. Because we can't collect samples from the center of the Earth, we base our models on indirect evidence, such as data from seismic events.

To construct a model of the Earth's interior, we use a variety of geophysical observations. Arrival times of seismic waves at different seismometers on the Earth's surface are used to infer the physical properties of rocks and how they vary with depth. Shadow zones of seismic waves show that the Earth has two distinct layers, a mantle and a core.

#### OBJECTIVES

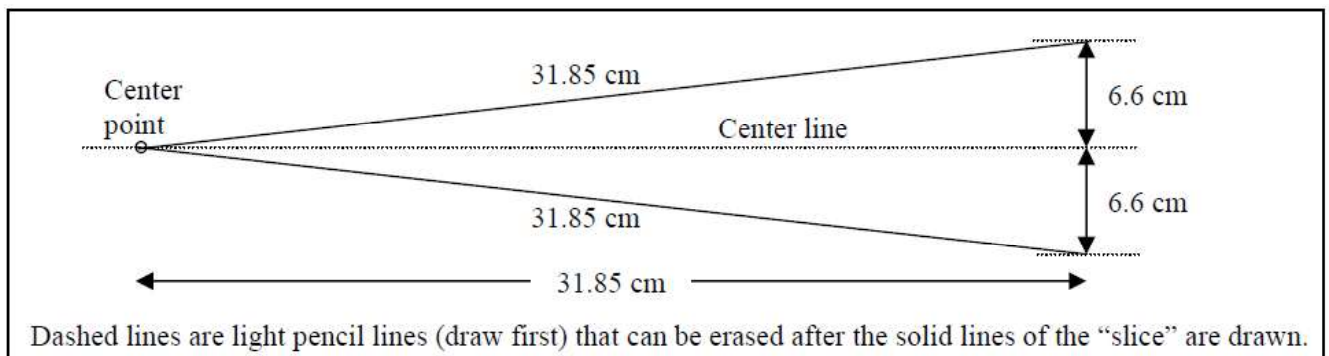
Students will gain an understanding and appreciation for the scale of the Earth's inner layers by constructing a scale model of a "Pizza Slice" of the Earth's interior. The students will see the relationship of the Earth's large-scale structure to the phenomenon of Plate Tectonics.

#### MATERIALS:

One big sheet of white paper  
 meter stick  
 string (35cm long)  
 pencil  
 colored pencils

#### PROCEDURE

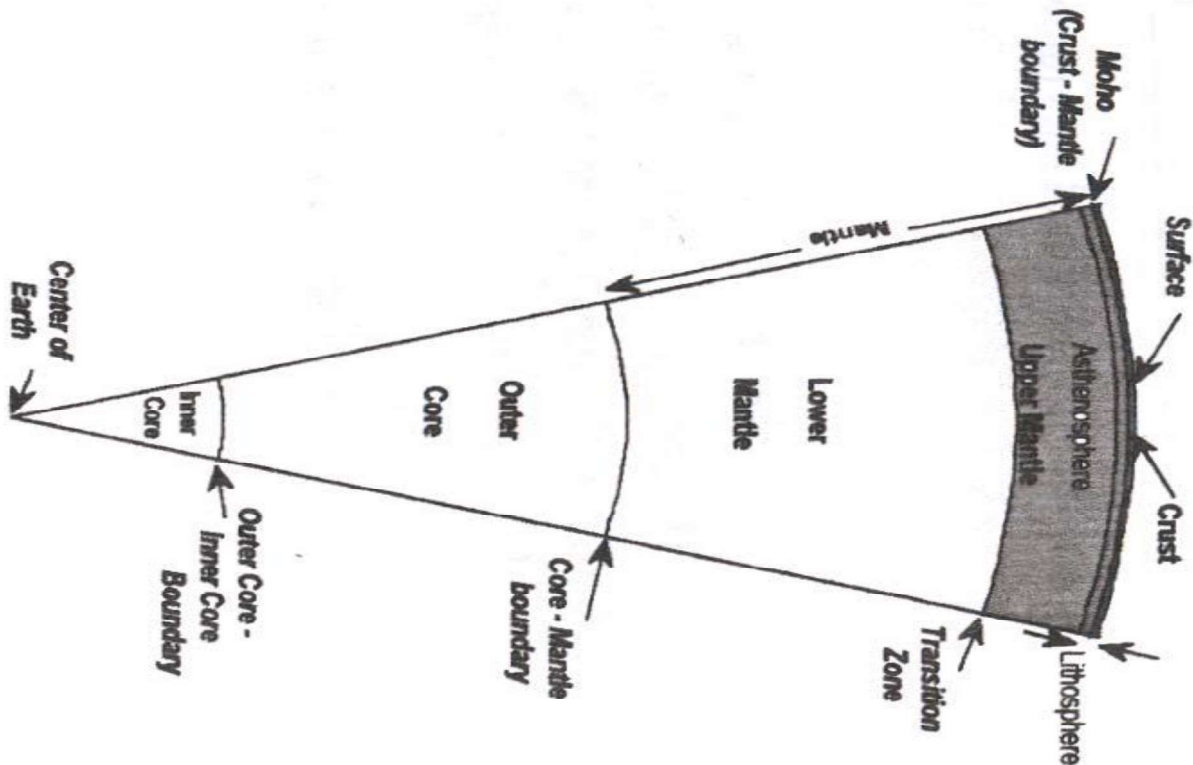
1. Draw a light center line 31.85 cm in length. (So it does show later.)  
 This distance represents the radius of the Earth.
2. Draw two "width lines" 6.6 cm to each side of the center line at the end of the center line.



3. Draw the straight angle lines from the center point to the width line.  
 The straight angle lines should also measure 31.85 cm.
4. Draw the surface arc line using the string with a loop and a pencil (with the length from the center point to the pencil in the loop being 31.85 cm).
5. The center line and width lines can now be erased.
6. Complete the scale model of the slice of the Earth by drawing arcs at the appropriate places using the information in the chart below. Use the string to make your arcs for each layer.

	Actual Value	Scale Value (1:20 million scale)
Radius of Earth	6371 km	31.85 cm
Depth* to base of the crust (average)	35 km	0.175 cm
Depth* to base of lithosphere (average)	100 km	0.5 cm
Depth* to the base of upper mantle	670 km	3.35 cm
Depth* to core-mantle boundary	2885 km	14.425 cm
Depth* to outer core-inner core boundary	5155 km	25.8 cm

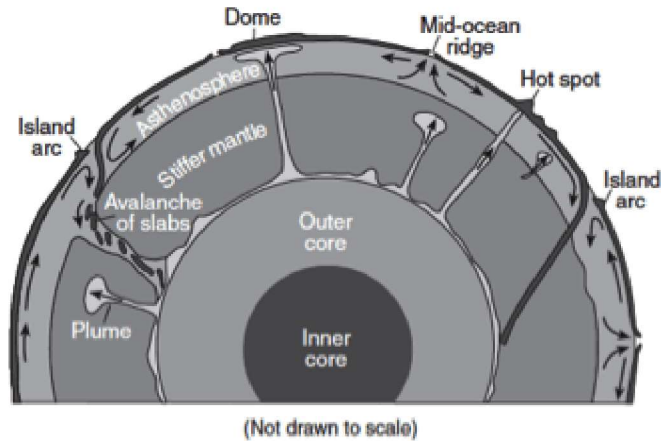
- Label the boundaries and layers of the Earth as shown in the diagram. (Use diagram below as a guide)
- Color the different layers on your diagram using the following colors.
  - Inner Core – white
  - Outer Core – yellow
  - Lower Mantle – orange
  - Upper Mantle – red
  - Crust/Lithosphere – brown
- Use the resources given to write information about each layer on your poster.



\*Measure downward from the surface

## LABORATORY QUESTIONS

1. What are the two types crust and how are they different from each other?
2. What is the Mohorovicic Discontinuity? Label this on your pizza slice. What do you notice about the composition of the layers above and below this boundary?
3. Is our knowledge of the inner Earth an observation or an inference? Explain.
4. What evidence leads to this inference?
5. What happens to the density and temperature of rock within Earth's interior as depth increases?
6. Which part of Earth's interior is inferred to have convection currents that cause tectonic plates to move?
- 7.



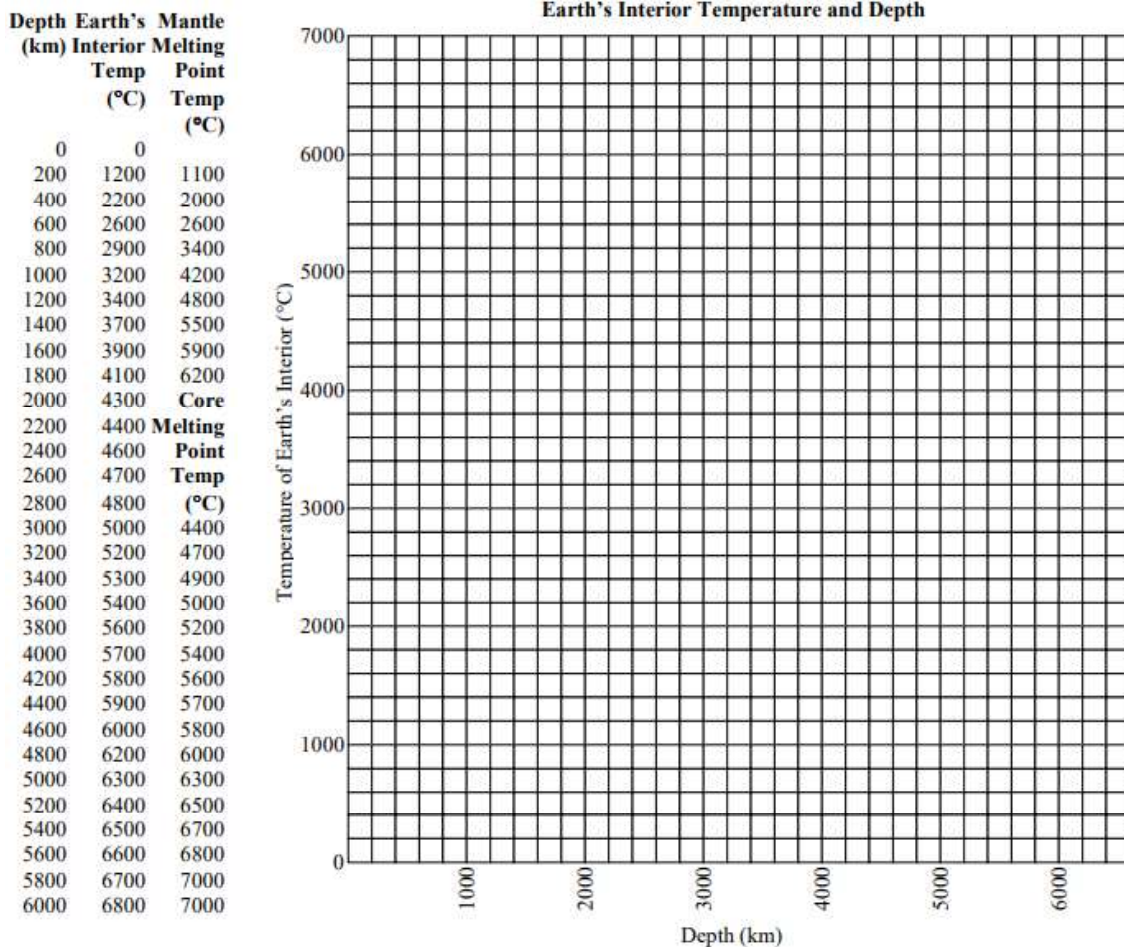
At which depth below Earth's surface is the boundary between Earth's outer core and stiffer mantle located?

1. 700 km
2. 2000 km
3. 2900 km
4. 5100km

**OPTIONAL:**

**Earth's Interior Temperature**

1. Construct a line graph with one color showing the relationship between the “**Temperature of the Earth's Interior**” and **depth**.
2. On the same graph with a second color construct a second line graph showing the “**Melting Point of the Earth's Mantle**” and **depth**.
3. On the same graph with a third color construct a third line graph showing the “**Melting Point of the Earth's Core**” and **depth**.
4. Label each line graph with the appropriate title shown above in bold.
5. Using five additional colors shade (the entire grid into 5 vertical zones) and label the different portions of the Earth's interior using the following guide; Lithosphere – 0 to 120 km, Asthenosphere – 120 to 600 km, Mantle – 600 to 2900 km, Outer Core – 2900 to 5200 km, and the Inner Core – 5200 to 6400 km.



**LABORATORY QUESTIONS**

1. Is the temperature of the rock within the asthenosphere higher or lower than the mantle's melting point? What does this say about the asthenosphere compared to the rest of the mantle?
  
2. Is the temperature of the outer core higher or lower than its melting point? What does this say about the outer core?
  
3. Is the temperature of the inner core higher or lower than its melting point? What does this say about the inner core?