Educator Information and Directions

This packet is a complement to our video lesson ***Layers of the Earth***.
The following pages include these items:

- Review Vocabulary
- Guided Notes
- Layers of the Moon Reading Passage and Comprehension Questions
- Modeling the Earth Hands-On Activity
- Drilling Through the Earth Simulation Lab

We recommend printing this packet prior to your student watching the video so that they can follow along with the guided notes, which they can then use when answering practice questions. Alternatively, the Guided Notes can be used as a written assessment.

Lesson Objectives

- Identify and describe the four main layers of the Earth
- Explain the factors that make exploring the Earth's inner layers challenging

The ungraded extension activities provide opportunities for students to deepen their learning. They also promote the following:

- Critical thinking
- Sensory exploration
- Real-world applications
- Inference skills
- Vocabulary mastery

Extension Activities

The Earth's Many Layers
Although the Earth has four main layers, these layers can be further divided down into sub-layers, such as the asthenosphere, mesosphere, and lithosphere. Help your student go online and research these layers, using information from reputable sources, such as NASA and NOAA. Encourage them to use their findings to create their own diagram of Earth's layers.
50 Gold/$coops

Layers of Other Planets
After your student completes the "Layers of the Moon" reading passage and comprehension questions, encourage them to pick another planet in our solar system to investigate. What layers make up that planet? Are they similar to or different from the layers that make up Earth? What do they think might be responsible for these similarities or differences? Challenge your student to add a third circle to the Venn diagram on the fifth page of this lesson to compare and contrast the layers of the Earth, Moon, and their chosen planet.
50 Gold/$coops

Suggested Gold/$coops
Using the reward function on the first tab of your parent account, you may wish to award Gold/$coops for extension activities and/or accomplishments completed outside the website.
We recommend the following amount for each successfully completed lab and activity: **50 Gold/$coops**

Layers of the Earth Vocabulary Review

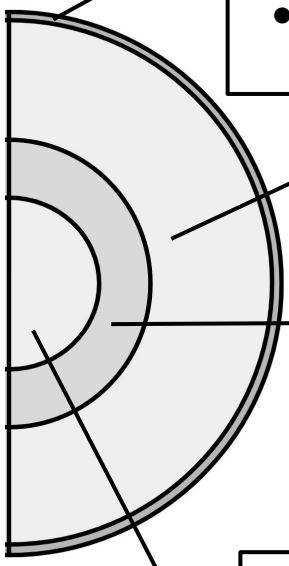
Please review these key terms from the lesson. Draw a line matching the word to the correct definition, or record the term's number next to the correct definition. The first one has been done for you.

Vocabulary Term	Definition
1. Crust	the part of the Earth's crust beneath landmasses, anywhere from 25 to 50 miles thick
2. Continental crust	the layer made of molten, liquid iron and nickel, due to extremely high temperatures
3. Oceanic crust	the part of the Earth's crust beneath the ocean, as thin as 3 miles
4. Mantle	the dense ball of iron at the center of our planet, stays in a solid state due to intense pressure
5. Outer core	the thickest layer made of dense and heavy solid rock that slowly flows due to currents of intense heat
6. Inner core	the first and thinnest layer of the Earth, made of a mixture of solid rocks and minerals ***1***

Layers of the Earth
Guided Notes

Instructions
Download and print or digitally prepare this PDF to complete while watching the *Layers of the Earth* teaching video. Fill in each of the blanks with the appropriate word or phrase. *It's OK to pause the video while recording your answers.*

Overview
In this lesson, you are going to learn about the four main layers of the Earth and what makes them so challenging to explore.



The Crust
- Made of different rocks and minerals
- Continental crust can be ___ - ___ miles thick
- Oceanic crust is as thin as ____ miles

The Mantle
- _____ miles thick
- Made of dense, heavy rocks
- Solid, but flows like a _____
- Temperature from 1,000 °F to 7,000 °F

The Outer Core
- 1,400 miles thick
- Made mostly of _____ and nickel
- Temperature up to _____ °F

⏸ How do high temperatures impact the metals in the outer core?

The Inner Core
- 750 miles wide
- Made of _____
- Temperature up to 10,000 °F
- Kept solid by high amounts of _____

⏸ What makes exploring the planet's inner layers so challenging?

Reading Passage: Layers of the Moon

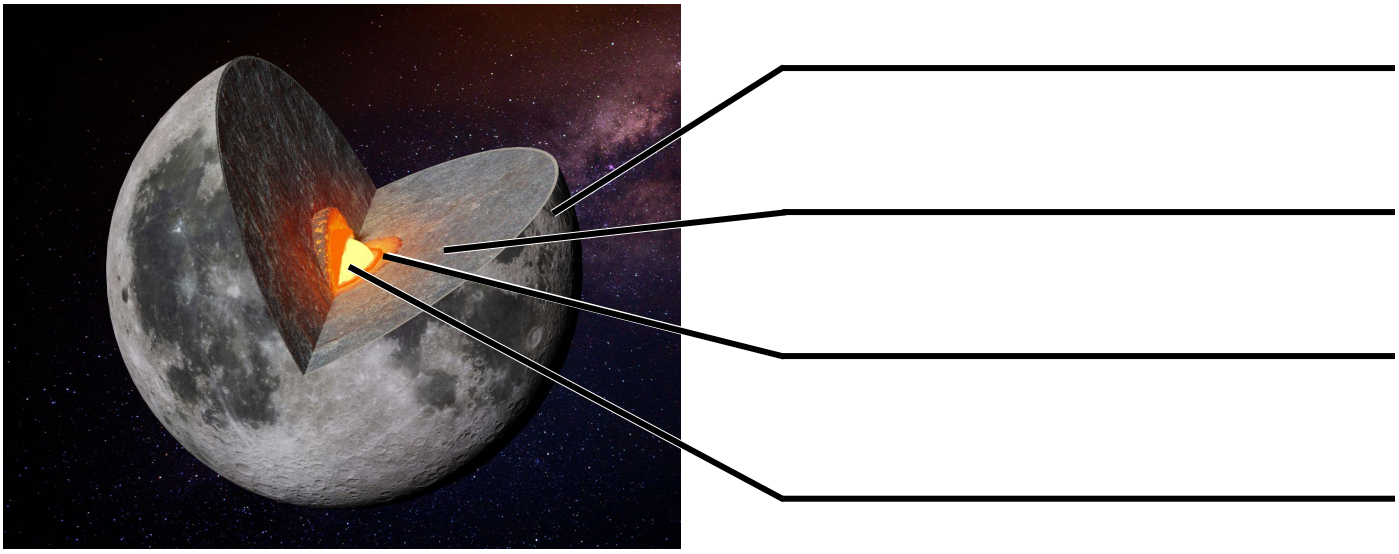
Read the following passage. Use the information to label the diagram and answer the questions on the following page.

The moon is our closest neighbor in space, and it has fascinated humans for centuries. Like the Earth, the Moon has distinct layers.

The Moon's outermost layer is the crust. The crust is the thin, rocky shell that covers the surface of the Moon. Unlike the Earth's crust, which is broken up into segments that move around, the Moon's crust is mostly still. The Moon's crust ranges from about 40 to 90 miles in thickness.

Beneath the crust is the mantle. The mantle is a layer of dense, solid rock that extends about 800 miles below the Moon's surface. It is cooler than Earth's mantle, so the rocks in the mantle don't move around as much.

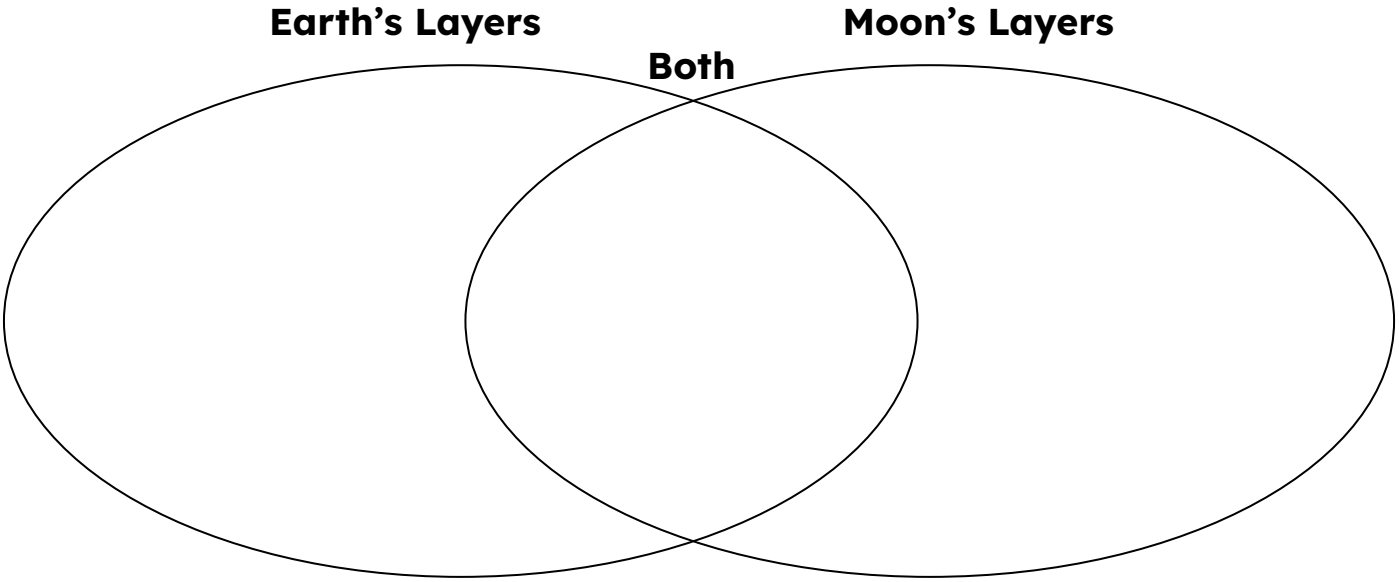
The Moon's outer core is a thin layer of molten metal. This liquid layer surrounds the solid inner core of the Moon. The outer core and inner core of the Moon are both made mostly of iron. Scientists estimate that the inner core of the Moon reaches temperatures of about 2,500 °F.



Comprehension Questions: Layers of the Moon

Use the reading passage to answer the following questions.

1. Complete this Venn diagram to compare and contrast the layers of the Earth and the Moon. Try to add at least 3 details in each section!



2. Why do you think the Earth's layers and the Moon's layers might share so many similarities?

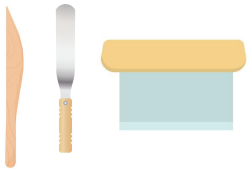
3. Why do you think the Moon's inner core is cooler than the Earth's?

4. Why do you think the Moon's crust is mostly still, unlike the Earth's crust, which is broken up into slowly moving segments?

Modeling Earth's Layers

In this activity, you will create a model of Earth's layers. You will need...

- Four colors of clay (brown, yellow, orange, and red are suggested)
- A dull cutting tool, like a clay knife, frosting smoother, or bench scraper



Instructions

1. Take a small piece of red clay. Roll it into a ball.
2. Wrap a piece of orange clay around this red ball. Add clay so the orange layer is thicker than the red layer. Roll your model back into a ball.
3. Wrap a piece of yellow clay around the model. Add clay so the yellow layer is thicker than the orange layer. Roll your model back into a ball.
4. Flatten a piece of brown clay so it is as thin as you can make it.
5. Wrap the brown clay around the model. Roll your model back into a ball.
6. Ask an adult to help you **carefully** cut the ball in half.
7. Draw and label your model in the box below, then answer the question.

Each of Earth's layers is made of different materials. Which layer of our planet do you think most resembles the clay in your model? Why?

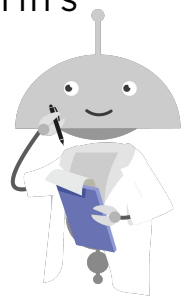
Drilling Through the Earth Simulation Lab

Humans have only ever explored the Earth's crust – until now! In this simulation lab, you'll use what you know about Earth's layers to think about what exploring the depths of the Earth would really take.

1. Imagine your team of Earth scientists is planning to explore the inner core. What do you think will be the biggest challenge during this project?

2. To reach the inner core, your team decides to create a giant, super-powerful drill. What features or tools would you want to be sure to build into the drill to overcome the challenges you predicted?

3. Once your super-powerful drill is finished, it's time to start digging! Where do you think your team should start drilling through Earth's crust? Why do you think that would be the best location?

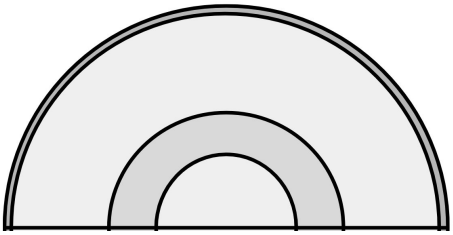


4. The first phase of the project has gone smoothly, and your drill has reached the mantle! What do you think the conditions in the mantle will be like as you continue to explore?

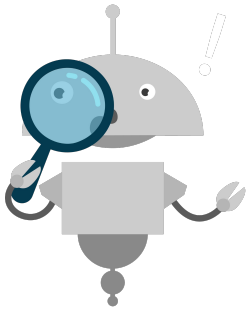
5. It only took your team a few weeks to drill through the crust, but it takes **months** to drill through the mantle. Why do you think it took so long?

6. After exploring the mantle, the drill reaches the outer core. What do you think will make exploring the outer core different than exploring the Earth's other layers?

7. The drill sends back a temperature reading of 10,000 °F. Where do you think it is? Mark its location on the diagram below. Explain how you know.



8. The drill has finally reached the inner core! What do you think the conditions will be like in Earth's deepest layer?



9. Earth's crust, mantle, and inner core are all solid, but your drill is moving much slower in the inner core than in the previous layers. What do you think might be causing this difference?

10. After a long journey, your drill returns to Earth's surface! You built it with heat-resistant materials, so no parts have melted. You also used very hard materials, so it doesn't have any scratches. However, some parts of the drill look like they have collapsed. What do you think caused this?

11. Why do you think scientists haven't launched a mission like this so far?