

Earthquakes 3-5

Earthquake Science

LESSON PLAN 1

What's Inside?

Children will better understand earthquakes, volcanoes and tsunamis when they learn that we live on the surface of a constantly changing planet.

Key Terms and Concepts

asthenosphere	inner core	molten
continental	layer	oceanic
crust	lithosphere	outer core
geologist	mantle	

Purpose

To help the students learn that the earth is composed of several distinct layers

Objectives

The students will—

- Use *Inside the Earth* to identify, compare and contrast the layers of the earth.
- Research the Internet to find more information about the smaller divisions into which scientists divide the earth's layers. (Linking Across the Curriculum)
- Make a comparison of the layers of the earth to those of a layer cake with the handout *Venn Diagram*; create models of the layers of the earth from cake, icing, candies and nuts.
- Follow directions on *Graphing the Depth* to set up and analyze data on the layers of the earth. (Linking Across the Curriculum)
- Write several science fiction entries in their journals of a trip to the center of the earth. (Linking Across the Curriculum)

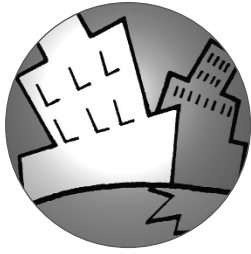
Activities

“The Layers of the Earth”

“Ultimate Layer Cake”



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Earthquakes 3-5

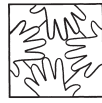
LESSON PLAN 1 What's Inside?

Materials

- *Inside the Earth*, 1 copy per student or group
- Chalkboard and colored chalk or chart paper and colored markers



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"The Layers of the Earth"

SET UP 5 minutes CONDUCT 30 minutes

Science: Earth Science; Social Studies: Geography; Language Arts: Research

TEACHING NOTE You can present *Inside the Earth* as an overhead transparency or as a handout for individual students or small groups.

1. Ask the students to share any knowledge they have about the interior of the earth using the following questions.
 - What are the characteristics of the surface of the earth?
 - What kinds of natural features can be found on the earth's surface?
 - What changes to the earth's natural features have the students noticed in their lifetime? What changes can they describe that have happened over a long period of time?
 - Of what do they think the earth is composed?
 - If they could cut the earth in half from pole to pole, what food listed below would they expect it to resemble? For example:
 - Layer cake
 - A grape
 - Half an apple
 - A multilayered candy bar

Ask the students to explain their choices.

2. In a brief discussion compare the three main layers of the earth—crust, mantle and core—to the layers of an apple.
3. Present or distribute *Inside the Earth*. Ask the students to find the core, mantle and crust on the picture and read about the other divisions into which scientists divide these three layers.

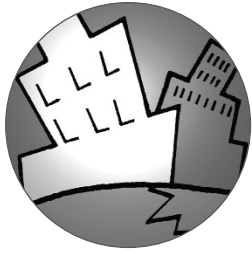


Wrap-Up

Draw five progressively smaller circles, one inside the other, on the chart paper, each circle in a different color. Have the students help you label each layer according to the information on *Inside the Earth*: Crust, Lithosphere, Mantle, Outer Core and Inner Core.



As a whole group, have the students list words from the activity sheet that apply to the five layers. Are there words that overlap across layers? For example: both the mantle and the outer core are molten; the outer and inner core are composed mostly of iron and nickel; and the crust and the inner core are solid.

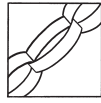


Earthquakes

3-5

LESSON PLAN 1

What's Inside?



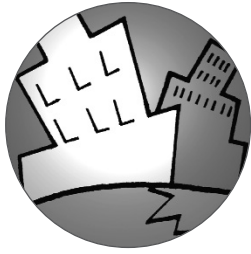
Linking Across the Curriculum

Science: Earth Science; Language Arts: Research

Scientists divide the earth into even smaller sections: oceanic crust, continental crust, asthenosphere and deep mantle. Assign small groups of students to use the Internet to find out more about one of these layers. Have the groups share their findings with the class. Discuss why these smaller divisions were determined. How does this help scientists to understand the many distinctions among these layers?



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Earthquakes 3-5

LESSON PLAN 1 What's Inside?

Materials

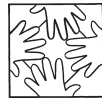
- *Venn Diagram*, 1 copy per group
- 2 large sheet cakes, 1 vanilla and 1 chocolate

For each group:

- Several dishes of white icing
- Food coloring in 2 colors
- A variety of candy decorations, nuts or both
- 1 utensil for spreading icing
- 5 toothpicks
- 1 sheet of paper
- *Graphing the Depth*, 1 copy per student (Linking Across the Curriculum)



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"Ultimate Layer Cake"

SET UP 45 minutes CONDUCT 40 minutes

Science: Earth Science; Mathematics: Modeling

TEACHING NOTE Bake or buy two large sheet cakes, one vanilla and one chocolate. Cut each cake in half lengthwise. Cut uniform pieces of vanilla and chocolate and distribute them evenly to groups of four or five students. (As an alternative to sheet cakes, you could use colored paper, stacked to different thicknesses.)

1. Scientists often use models to explain scientific information. If scientists chose to use a layer cake to describe the layers of the earth, what would be the comparison? Distribute *Venn Diagram* to small groups of students. Based on the information the students gathered about the earth's layers, they will use the diagram to compare and contrast the similarities of a slice of layer cake and the interior of the earth. Working in small groups, ask them to consider:
 - What are the characteristics of a layer cake?
 - What are the characteristics of the earth's interior?
 - What characteristics do they share?
2. Next, have the groups follow the directions on page 2 of *Venn Diagram* to build their cake as close to scale as possible. Students will alternate the vanilla and chocolate slices with layers of icing and candy, nuts or both to represent the earth's distinct layers.
3. Have the students write the name of each corresponding earth layer on a piece of paper and, using toothpicks, label each layer of their cakes.



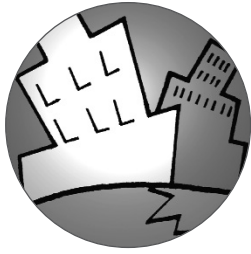
Wrap-Up

Have the students share their creations.



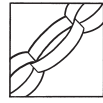
How does each correspond and represent clearly the different layers of the earth? Are their models truly accurate? What are the difficulties they encountered in making a model of a cross section of the earth?

TEACHING NOTE If appropriate, after the children complete the activity, they can eat their layered cake creations.



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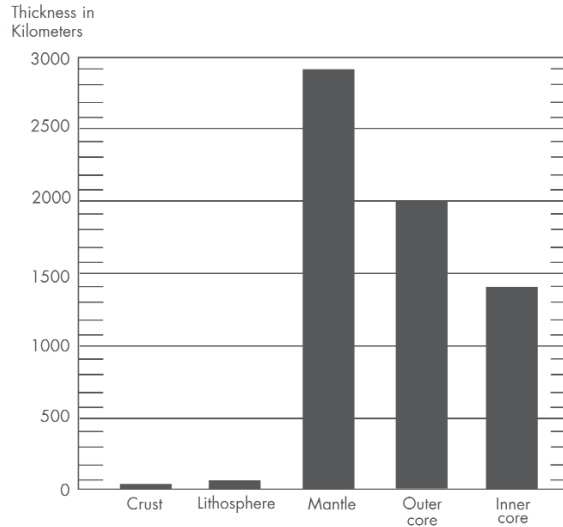


Linking Across the Curriculum

Mathematics: Graphing

Distribute *Graphing the Depth*. Based on the information on the activity sheet and the information students have discussed in class, have them graph the thickness of the earth's layers. Afterward, students will share the answers to the activity sheet.

Answers to *Graphing the Depth*



1. Mantle
2. Crust
3. 6,440 kilometers (4,002 miles)

Language Arts: Writing

Tell students to imagine that they are living in the year 3000. A specially designed ship, made from alloys discovered during man's exploration of space, is about to make a trip to the center of the earth. Your students, now expert geologists, have been invited to help staff the ship and explore the earth's interior. Assign them to write a log covering several days or weeks in which they describe their experiences exploring the layers of the earth. Share these in a display, a bound class book or a class reading.



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Inside the Earth

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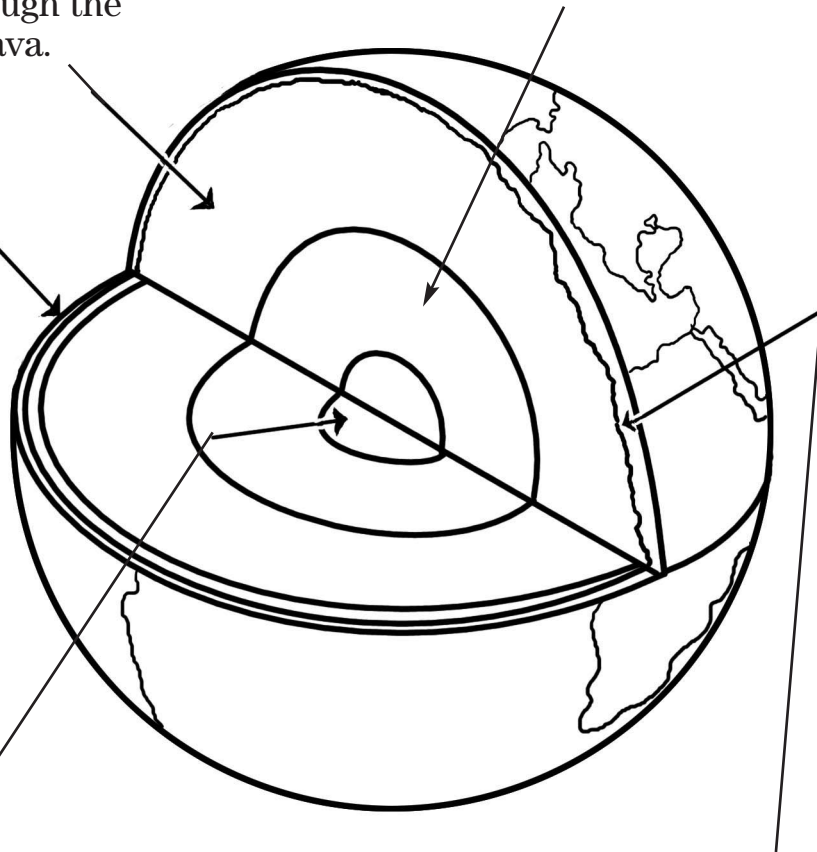
Name _____

Scientists divide the earth into five distinct layers. Identify and list the ways these layers are different and similar.

Mantle: The mantle is actually divided into three layers. All three layers are so hot that they are permanently molten. Magma usually forms in the upper layer of the mantle from rocks rising into it from the lower two layers. In the upper layer, these rocks melt and burst through the surface of the earth's crust as lava.

Outer Core: Scientists believe that the outer core is composed mainly of iron and nickel and is so hot that it is probably always molten.

Crust: The surface of the earth is actually composed of two different types—oceanic and continental. Oceanic crust is quite thick, at 4 miles (6 kilometers) in depth, and young. The rocks in oceanic crust are often no more than 200 million years old. Continental crust can range from 16 miles (25 kilometers) to 56 miles (90 kilometers) in depth. Rocks have been found in continental crust that are at least 3.8 billion years old.



Inner Core: Scientists believe that the inner core is a solid ball of iron and nickel. Temperatures in the inner core may reach as high as 6,700° F (3,700° C). However, the pressures are so high that this part of the earth remains solid rather than molten (melted).

Lithosphere: The lithosphere is actually composed of all the earth's crust and a little bit of its upper mantle. It extends 60 miles (100 km) below the surface of the earth.





Venn Diagram

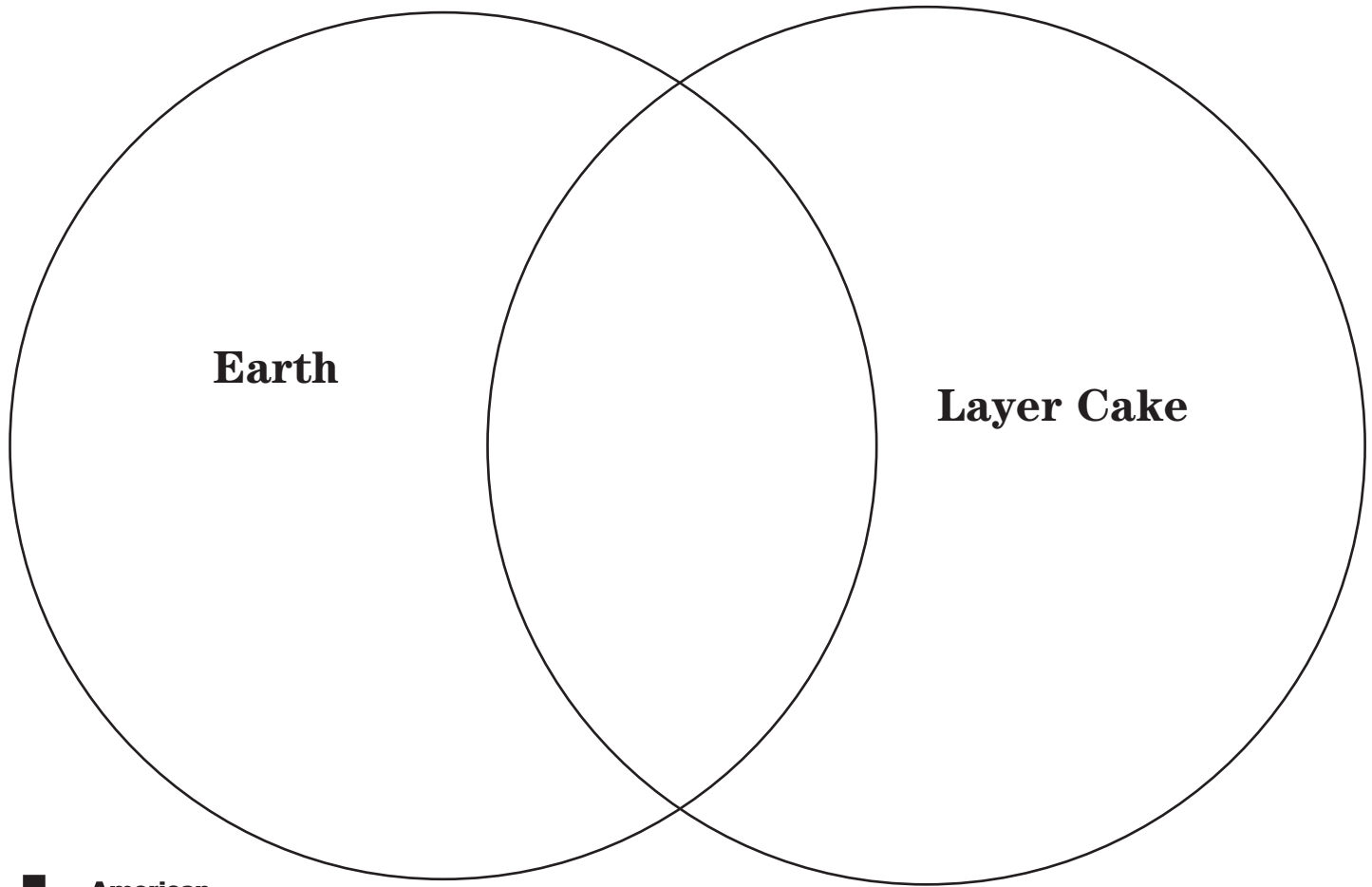
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Name _____

Scientists often build models to show complex information that cannot be explained very easily in words. Follow the steps below to consider and then show how the earth and a layer cake are similar and different.

Directions:

1. What are some words you can use to describe the earth? Write them in the earth circle of the Venn diagram below.
2. What are some words you can use to describe layer cake? Write them in the layer cake circle of the Venn diagram below.
3. What are some words you can use to describe both the earth and the layer cake? Put words that name shared characteristics in the overlapping section of the Venn diagram.





Venn Diagram

Page 2 of 2

Earth Layer Cake

You have learned that the earth is made up of several layers and ingredients. Now it is your turn to become an “earth chef” and make an “earth layer cake.”

Directions:

1. Build your “earth layer cake” using different materials for each layer.
2. Build your cake to scale as closely as possible. That is, use thick materials like the cake to show thick layers and thin materials like the icing or decorations to show thin layers.
3. Your layers must include—
 - Lithosphere
 - Crust
 - Outer core
 - Inner core
 - Mantle
4. Use toothpicks and paper to label each layer.

Materials for the “earth layer cake”:

- Your completed Venn diagram
- Slices of cake
- 2 colors of icing
- Variety of candy and nut decorations
- Utensil to spread icing
- Toothpicks and a sheet of paper





Graphing the Depth

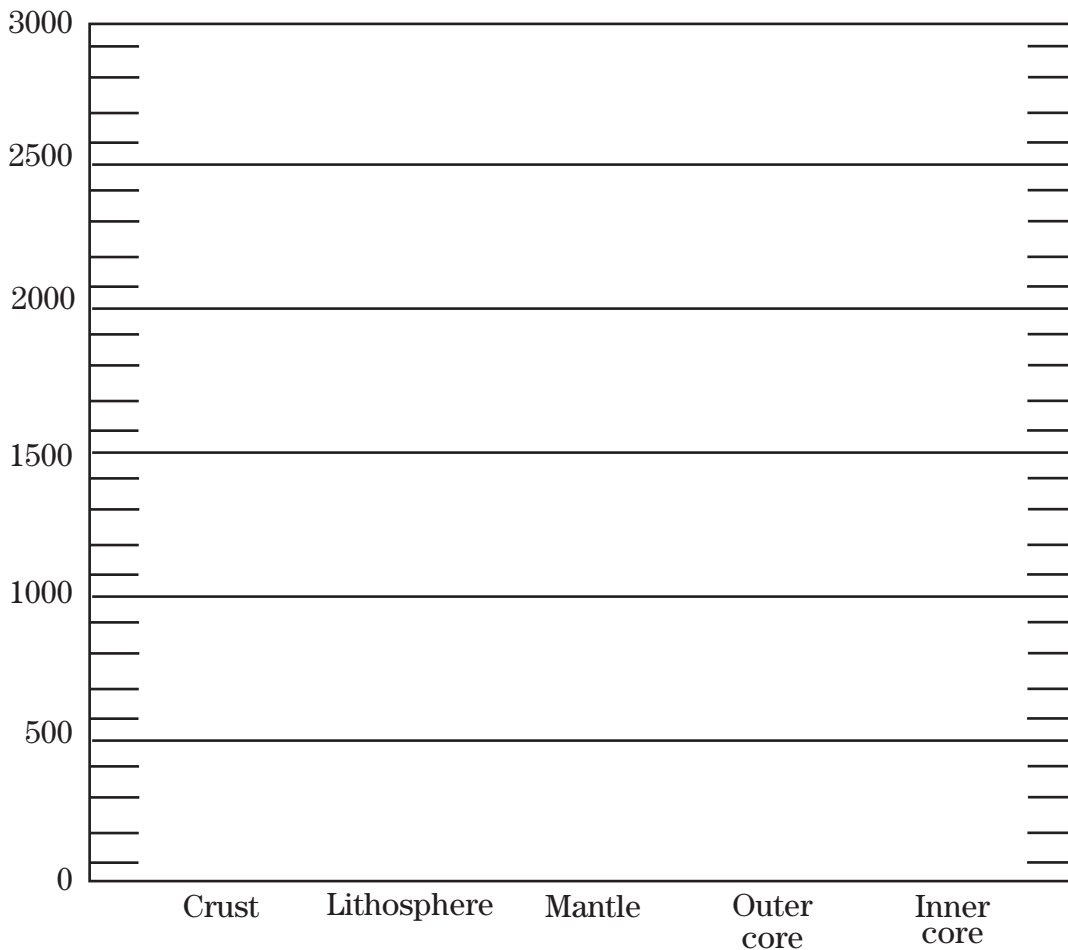
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Name _____

Directions: The layers of the earth vary greatly in thickness. Create a bar graph to illustrate these differences. Use the graph to answer the questions on the next page.

<u>Layer</u>	<u>Thickness in Km (miles)</u>
Crust	40 (25)
Lithosphere	100 (62)
Mantle	2,900 (1,802)
Outer core	2,000 (1,243)
Inner core	1,400 (870)

Thickness in
Kilometers



Adapted from *Earthquakes: A Teacher's Package for K-6* developed by the National Science Teachers Association with the support of the Federal Emergency Management Agency; revised April 1999.



Graphing the Depth

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Now, answer the following questions:

1. Which layer of the earth is the thickest?

2. Which layer of the earth is the thinnest?

3. What is the total thickness of all the earth's layers?

