

Earth's Layers Classwork

Name: _____

6th Grade PSI

1. Earth is a terrestrial planet.
 - a. What other planets are considered “terrestrial?”

 - b. What makes a planet “terrestrial?”

2. What causes changes to the layers below the Earth's surface?

3. What substances make up the Inner and Outer cores?

6th Grade PSI

Use the reading below as well as your slides and notes to answer the questions that follow.



Inside the Earth

The Earth's interior is composed of four layers, three solid and one liquid—not magma but molten metal, nearly as hot as the surface of the sun.

The deepest layer is a solid iron ball, about 1,500 miles (2,400 kilometers) in diameter. Although this inner core is white hot, the pressure is so high the iron cannot melt.

The iron isn't pure—scientists believe it contains sulfur and nickel, plus smaller amounts of other elements. Estimates of its temperature vary, but it is probably somewhere between 9,000 and 13,000 degrees Fahrenheit (5,000 and 7,000 degrees Celsius).

Above the inner core is the outer core, a shell of liquid iron. This layer is cooler but still very hot, perhaps 7,200 to 9,000 degrees Fahrenheit (4,000 to 5,000 degrees Celsius). It too is composed mostly of iron, plus substantial amounts of sulfur and nickel. It creates the Earth's magnetic field and is about 1,400 miles (2,300 kilometers) thick.

River of Rock

The next layer is the mantle. Many people think of this as lava, but it's actually rock. The rock is so hot, however, that it flows under pressure, like road tar. This creates very slow-moving currents as hot rock rises from the depths and cooler rock descends.

The mantle is about 1,800 miles (2,900 kilometers) thick and appears to be divided into two layers: the upper mantle and the lower mantle. The boundary between the two lies about 465 miles (750 kilometers) beneath the Earth's surface.

The crust is the outermost layer of the Earth. It is the familiar landscape on which we live: rocks, soil, and seabed. It ranges from about five miles (eight kilometers) thick beneath the oceans to an average of 25 miles (40 kilometers) thick beneath the continents.

Currents within the mantle have broken the crust into blocks, called plates, which slowly move around, colliding to build mountains or rifting apart to form new seafloor.

Continents are composed of relatively light blocks that float high on the mantle, like gigantic, slow-moving icebergs. Seafloor is made of a denser rock called basalt, which presses deeper into the mantle, producing basins that can fill with water.

Except in the crust, the interior of the Earth cannot be studied by drilling holes to take samples. Instead, scientists map the interior by watching how seismic waves from earthquakes are bent, reflected, sped up, or delayed by the various layers.

1. The Earth is divided into 4 major layers. Name them:
2. How is the Earth's crust similar to a pizza crust?
3. Which layer do you think is made of the oldest material? Why do you think that?
4. Name one unique fact about each layer of the Earth:

Three Types of Rocks Homework

Name: _____

6th Grade PSI

1. What causes all rocks to form?
2. What are the three types of rocks?
3. Define the **rock cycle**.
4. What is the difference between **intrusive** and **extrusive** igneous rock?

The Rock Cycle Classwork

Name: _____

6th Grade PSI

Use the activity in the SMART Notebook file to answer the questions below:

1. Weathering

Acid Rain Information – www.epa.gov/acidrain

a) **(HW)** According to the information on the website above, how is acid rain formed?

b) Biological Weathering:

c) Physical Weathering: Rocks undergo natural physical changes

d) Chemical Weathering: Rocks change their composition because of a chemical reaction (they change to something new)

Activity: Fill in the table below as we complete the activity as a class

Biological Weathering	Chemical Weathering	Physical Weathering

2. Sedimentation

a) What happens to rock fragments that reach the sea?

b) What causes the rock fragments to compress?

Activity: Rebuild the dinosaur fossil

We will be focusing on the preservation of fossils later in this unit!

3. Metamorphic Formation

a) Heat helps change sedimentary rock into metamorphic rock. Where does this heat come from?

b) Describe what happens to the rock as the heat and pressure affect it:

Activity:

How are metamorphic rocks formed?

Describe what happens to the picture as the slider goes towards the right:

4. Intrusive Igneous Rock

a) Intrusive Igneous Rock:

b) Why do you think that the magma cools as it gets close to the surface?

Activity:

List the igneous rocks below:

- _____
- _____
- _____

Marble



Basalt



Limestone



Chalk



Obsidian



Granite



5. Extrusive Igneous Rock

a) How does the magma make its way to the surface of the Earth?

b) How does extrusive igneous rock form?

c) How could you describe the crystals in extrusive igneous rocks?

Activity: Write “Yes” or “No” in the table below

	Igneous	Sedimentary	Metamorphic
Can contain fossils			
Marble is an example			
Can contain minerals			
Made up of layers of particles			
Formed from cooling magma			

Rock Exploration Classwork

Name: _____

6th Grade PSI

Use this paper to record your answers. You must tell what type of rock you think each sample is (Sedimentary, Metamorphic, or Igneous) and explain why your group decided this.

<u>Rock Name</u>	<u>Type of Rock</u> <u>(predicted)</u>	<u>Reasoning</u>
Granite		
Glassy Pumice		
Fossil Limestone		
Ryolite Porphyry		
Slate		
Breccia		
Tuff		
Gabbro		

Obsidian		
Floating Pumice		
Anthracite		
Basalt		

Early Life on Earth / Fossils Classwork

Name: _____

6th Grade PSI

1. What is the importance of **stromatolites**?
2. What makes a chemical “organic?”
3. The first algae appeared about 1.2 billion years ago. What is the importance of this organism?

Early Life on Earth / Fossils Homework

Name: _____

6th Grade PSI

1. What is the estimated age of the Earth?
2. What is a **prokaryote**? How many cells does a typical prokaryote consist of?

3. Fill in the equation for photosynthesis below:

_____ + _____ → _____ + _____

4. What else is needed for photosynthesis to occur that is not a part of the equation above?

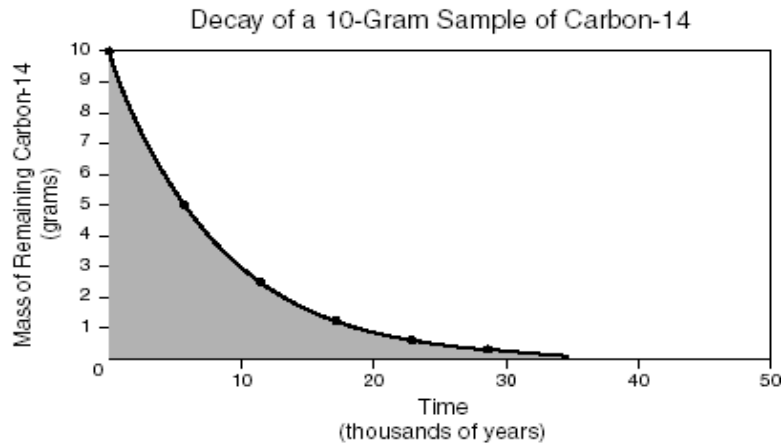
5. Name three living things that perform photosynthesis.

- a.
- b.
- c.

Half-Life Classwork

Name _____

6th Grade PSI



1. According to the graph, what is the approximate half-life of carbon-14?
A. 5.7 years B. 5,700 years
C. 23,000 years D. 1,000,000 years
2. What is a half-life? _____

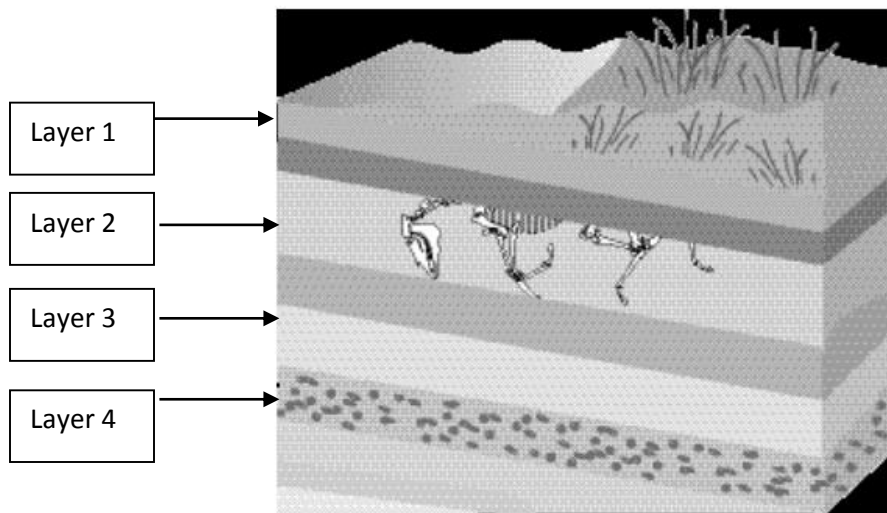
3. If you have 200 grams of radioactive Polonium with a half life of 50 years, how much is left after:
a. 50 years? _____
b. 100 years? _____
c. 150 years? _____
4. Sodium 24 has a half-life of 10 hours. You begin with a sample of 500 grams. It begins to decay. How much Sodium-24 would you have after:
a. 10 hours? _____
b. 30 hours? _____
c. 40 hours? _____
5. The half-life of radium-222 is 38 seconds. If you had a 12 gram sample, how much would be left after:
a. 76 seconds? _____
b. 114 seconds? _____

Rock Strata Classwork

Name: _____

6th Grade PSI

1. Fill in the blank: The _____ a fossil is in the ground, the older it is.
2. How is the **half life** of a substance useful for scientists when analyzing the age of a fossil?
3. What is the difference between the **absolute age** and **relative age** of a fossil?
4. How does an **index fossil** help scientists?
5. Use the image below to help answer the questions on the next page:



- a. Which fossil layer is oldest?

- b. Which fossil layer is youngest?

- c. If Layer 1 is found to be 100,000 years old and Layer 3 is found to be 1.2 million years old, what can be assumed about the horse fossil found in Layer 2?

- d. A fossilized rock in Layer 4 is found to be 5.2 million years old. If another fossil is found in this layer, what can we estimate its age to be? Why?

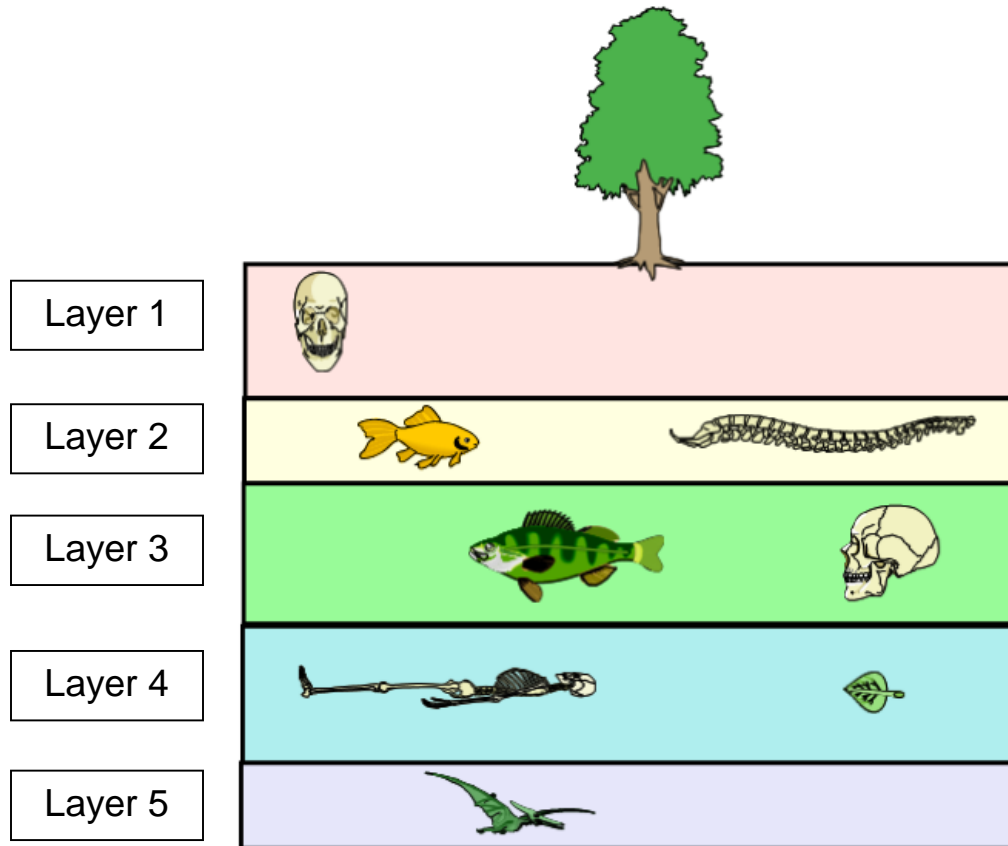
Rock Strata Homework

Name: _____

6th Grade PSI

1. What would a **geologist** study?
2. Define **absolute age**.
3. Define **radiometric dating**.
4. Carbon-14 has a half-life of 5,700 years. What percentage of the original Carbon-14 atoms would remain in a fossilized tree after 5,700 years? What percentage would remain after 11,400 years?
5. Define **relative age**.

6. Use the image below to answer the follow-up questions



- Which fossil is the oldest? How do you know?
- Which fossil is the youngest? How do you know?
- Scientists determine that the skeleton in Layer 4 is 4,000 years old and that the fish in Layer 2 is 2,000 years old. What would be a good prediction for the age of the skull in Layer 3? Why?
- What can be said about the age of the skeleton in Layer 4 compared to the leaf?

Answer Key

Earth's Layers Classwork

1. The other terrestrial planets are Mercury, Venus and Mars. A planet is considered to be “terrestrial” if it is made primarily of rocks and minerals.
2. Pressure beneath Earth’s surface causes the changes to the layers.
3. The Inner and Outer Cores are made up of Nickel and Iron.

Earth's Layers Classwork

1. Crust, Mantle, Outer Core and Inner Core
2. The Earth’s crust is similar to a pizza crust because both are the outer layers and both are very thin compared to the rest of the object.
3. The Core will be made of the oldest material because after the core formed, the substances layered above it began piling on, similar to the formation of a snowball.
4.
 - a) Crust – Outer layer; thinnest layer; Hard and rigid; Composed of plates known as the lithosphere; consists of land and ocean floors
 - b) Mantle – Largest layer; 1,800 miles thick; Made of incredibly hot semisolid rock; Makes up 2/3 of the Earth’s mass
 - c) Outer Core – Only liquid layer of the Earth; Made of mainly nickel and iron
 - d) Inner Core – Extremely hot; Made of nickel and iron; Solid; Under the most pressure of any layer

Three Types of Rocks Homework

1. All rocks form as a result of the intense heat and pressure of the Earth’s layers.
2. The three types of rocks are sedimentary, metamorphic and igneous.
3. The rock cycle is the process through which rocks transform from one type to another.
4. Intrusive igneous rock forms from magma below the surface of the Earth whereas extrusive igneous forms above the surface.

The Rock Cycle Classwork

1. Weathering

- a. Acid rain is formed when gases from volcanoes, decaying vegetation, and man-made sources (such as sulfur dioxide and nitrogen oxide) react in the atmosphere with water, oxygen, and other chemicals.
- b. Biological weathering – Occurs when living things cause rocks to break apart

Activity:

Biological Weathering	Chemical Weathering	Physical Weathering
People walking Tree roots Animals burrowing	Acid rain	Freeze and thaw Onion skin

2. Sedimentation

- a. When rock fragments reach the sea, they are deposited on the seabed and build up in layers. This is called sedimentation.
- b. The pressure of the layers above cause the fragments below to become compressed, forming sedimentary rock.

3. Metamorphic Formation

- a. The heat comes from magma.
- b. The heat and pressure cause the rock particles to compress and align, changing the rock.

Activity:

- Metamorphic rocks are formed when high heat and pressure squashes the particles in the rock and causes them to align.

- When the slider moves to the right, the picture seems to be squashed down. The particles become thinner as they are squashed.

4. Intrusive Igneous Rock

- Intrusive Igneous Rock: Magma that cools and crystallizes underground
- The magma cools as it gets closer to the surface because the higher layers of the Earth are cooler than the lower layers.

Activity:

- Basalt
- Obsidian
- Granite

5. Extrusive Igneous Rock

- Magma reaches the surface of the Earth through volcanoes.
- When the magma cools, extrusive igneous rock is formed.
- The crystals in extrusive igneous rock are large and interlocking.

Activity:

	Igneous	Sedimentary	Metamorphic
Can contain fossils	No	Yes	Yes
Marble is an example	No	No	Yes
Can contain minerals	Yes	Yes	Yes
Made up of layers of particles	No	No	Yes
Formed from cooling magma	Yes	No	No

Rock Exploration Classwork

<u>Rock Name</u>	<u>Type of Rock (predicted)</u>
Granite	Igneous (intrusive)
Glassy Pumice	Igneous
Fossil Limestone	Sedimentary
Rhyolite Porphyry	Igneous
Slate	Metamorphic
Breccia	Sedimentary
Tuff	Igneous
Gabbro	Igneous
Obsidian	Igneous
Floating Pumice	Igneous
Anthracite	Metamorphic
Basalt	Igneous

*If you do not have any of these rocks, feel free to substitute as necessary.

Early Life on Earth / Fossils Classwork

1. Stromatolites are the oldest fossils on record and provide us with evidence of very simple life forms that were around 3.5 billion years ago.
2. Organic chemicals are those that include Carbon.
3. The algae fossils give us an idea of when complex organisms, such as plants, first appeared.

Early Life on Earth / Fossils Homework

1. The Earth is estimated to be 4.6 billion years old.
2. A prokaryote is a cell that does not have a nucleus. Most prokaryotes are single-celled organisms.
3. Water + Carbon Dioxide → Oxygen + Glucose (sugar)
4. Sunlight is needed for photosynthesis to happen.
5. Answers will vary, but should include plant life or photosynthetic animals such as plankton.

Half Life Classwork

1. B
2. A half-life is the period of time it takes for half of the radioactive substance to decay.
3. Carbon-14
4. a. 100 grams
b. 50 grams
c. 25 grams
5. a. 250 grams
b. 62.5 grams
c. 31.25 grams
6. a. 3 grams
b. 1.5 grams

Rock Strata Classwork

1. The **deeper** a fossil is in the ground, the older it is.
2. The half-life of an element can help scientists determine an object's age. This is because scientists can analyze how much of the element still remains.
3. Absolute age gives you the exact age of a fossil whereas relative age provides you with an estimated age of the fossil.
4. Index fossils help scientists determine the relative age of very old rock layers and fossils that are difficult to date.
5. a. Layer 4
b. Layer 1
c. The horse fossil in layer 2 can be aged at something between 100,000 and 1.2 million years old.
d. The new fossil that was found would have to be close to the same age as the first fossil because they are found in the same rock layer.

Rock Strata Homework

1. Geologists study rocks.
2. Absolute age is the exact age of a rock or fossil.
3. Radiometric dating is a technique that allows scientists to date an object by comparing the ratio of a radioactive element with the amount that has decayed.
4. 50% remains after one half-life. 25% will remain after two half-lives.
5. Relative age is an estimated age that is determined by comparing the age of an object or event to another object or event.
6.
 - a. The dinosaur fossil in Layer 5 is oldest because it is deepest in the rock
 - b. The skull in Layer 1 is youngest because it is closest to the surface
 - c. I would predict that the skull in Layer 3 would be between 2,000 and 4,000 years old since fossils that were this age were found in the surrounding layers.
 - d. The skeleton and the leaf are close to the same age because they are found in the same layer of the Earth.