Minerals and Rocks Simulation: Evolution
Activity One

Introduction
Earth has been changing and shifting for millions of years. Continents have broken apart and moved. Mountains have formed. Even the climate has changed. As the Earth has changed, so have all of its living things. Over time, new species have developed from earlier forms of life. One way scientists study these gradual changes in Earth's species is through fossils preserved in rocks. Fossils are the remains of animals or plants that have been preserved by nature. Often the remains get buried in mud, silt, or sand. Over thousands or millions of years, the sediment hardened into sedimentary rock. Fossils remain in the rock, sometimes as imprints and sometimes as mineral replacements of the original bone or shell. These fossils tell us about ancient life.

Directions
Use the simulation to identify and describe two types of sedimentary rocks.

Procedures
1. From the Main Screen select the Simulations icon. Then click the Minerals and Rocks icon.
2. Read Start Here and close the window. For more information, click Background and close the window. For detailed directions, click Help and read "How to Use this Simulation."
3. Click the Rocks tab. What are the three different types of rocks? What makes the three types different? (See Background.)

4. Find the four sedimentary rocks in the simulation. (To learn about the different rocks, roll your mouse over the names of each one.)

5. Now learn about and compare two sedimentary rocks: shale and sandstone. As you read about the rock, record its basic properties in the chart below.
6. What do you notice about the mineral content of these two rocks? What makes the rocks different?

<table>
<thead>
<tr>
<th>Rock Name</th>
<th>Color</th>
<th>Type by Origin</th>
<th>Mineral Content</th>
<th>Texture and Grain Size</th>
<th>Special Properties</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
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<td>2</td>
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7. Imagine you found a fossil in an area known to have a lot of shale and sandstone. How would you determine the type of rock you’d found?

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Minerals and Rocks Simulation: Evolution
Activity Two

Introduction
Fossils preserved in layers of sedimentary rock have taught us much of what we know about the history of life on Earth. While the fossils may reveal details about ancient organisms, they can also help us determine the age of the rock layers in which they formed. Each sedimentary rock layer was formed at a specific time in Earth’s history. By studying the fossils in each layer, we can determine how many millions of years ago the rock was formed. Fossils are found in sedimentary rocks. In the first activity, you learned about two different types of sedimentary rocks. In this activity, you’ll learn about two other types of sedimentary rocks, and then use fossils to determine the age of different layers of rocks.

Directions
Use the simulation to compare limestone and conglomerate, two types of sedimentary rock.

Procedures
1. From the Main Screen select the Simulations icon. Then click the Minerals and Rocks icon.
2. Read Start Here and close the window. For more information, click Background and close the window. For detailed directions, click Help and read “How to Use this Simulation.”
3. Click the Rocks tab. What are some of the different properties of rocks?

4. If you found a fossil in a rock, what type of rock would it be?

5. Now learn about and compare two sedimentary rocks: limestone and conglomerate. (To learn about the different rocks, roll your mouse over the names of each one.) As you read about the rock, record its basic properties in the chart below.
6. In which type of rock are fossils common?

7. In which rock might you find embedded shells?

8. Why does the color and texture of conglomerate vary?

9. What mineral is found in limestone? Where does this mineral come from?

10. Which type of rock is chalk? What is it made of?

11. How do fossils help paleontologists and geologists determine the age of a rock? For example, how could a fossil help them determine a rock formed about 200 million years ago? How do they know it didn't form 10 million years ago?
12. By studying the positions of sedimentary rock layers, scientists can determine the order in which the layers formed. The Law of Original Horizontality states that sedimentary rock layers form horizontally. The Law of Superposition states that the oldest sedimentary rock layers will be on the bottom and the youngest layers will be on the top. What might cause layers to move and make it difficult to interpret layers of rock?

13. Look at the diagram below showing fossils in different layers of rock. What type of rock is the youngest layer? What type of rock is the oldest layer?

Orthacanthus (ancient shark)  
Crinoids (marine invertebrate)  
Eurypterids (ancient horseshoe crab)  
Trilobite (marine invertebrate)  
Archimedes (marine invertebrate)

14. Which animal’s ancestors lived on earth first, the shark or the horseshoe crab?
Minerals and Rocks Simulation: Evolution
Activity One

Introduction
To understand the difference between rocks and minerals, you need to take a closer look at what they’re made of. Like all matter, rocks and minerals are made of tiny units called atoms. A substance made of only one kind of atom - or a "pure" substance - is called an element. Oxygen and carbon are examples of elements. When two or more elements combine chemically, they form a new substance with its own properties called a compound. For example, water is the compound of the elements hydrogen and oxygen. Minerals are solid, inorganic (nonliving) substances that occur naturally in the Earth's crust. Some minerals such as gold and silver are pure elements. Most minerals are compounds made of more than one element. Rocks are solid mixtures of minerals. Some are made of one mineral, but many are made of several minerals.

Directions
Use the simulation to identify two mystery minerals.

Procedures
1. From the Main Screen select the Simulations icon. Then click the Minerals and Rocks icon.
2. Read Start Here and close the window. For more information, click Background and close the window. For detailed directions, click Help and read “How to Use this Simulation.”
3. Make sure the Minerals tab is selected. Closely observe the mineral sample. Like all minerals, this sample has unique properties. You can identify the mineral by answering questions about its properties.
4. Trial 1 To begin, click the Luster button under the photo and answer the question. Record the property in the chart below. Click the other buttons to describe the mineral’s Color, Streak, Hardness, and other Special Properties. Each time, record the properties in the chart below. You can also roll your mouse over the mineral names to learn more about each one.
5. As you choose different properties, you'll narrow down the list of possible minerals. When you have one possible mineral remaining, click the Check Sample Identity button. If you have more than one mineral or none remaining, at least one of the properties was described incorrectly. Click the properties and try again. When you've correctly identified the mineral, write its name in the chart below.
6. Provide one other detail about the mineral, such as where it is found or how it’s used.
7. Trial 2 Repeat the steps above with a new mineral sample. Record the results above.
8. Provide one other detail about the mineral, such as where it is found or how it's used.

9. How were the two minerals similar? How were they different?
Minerals and Rocks Simulation: Evolution
Activity Two

Introduction
Rocks and minerals, like all matter, are made of atoms. But while minerals are made of elements or compounds, rocks are solid mixtures of minerals. In the first activity, you identified two mystery minerals. In this activity, you'll explore the properties of two types of rocks. Then you'll compare pure minerals with mineral compounds.

Directions
Use the simulation to explore the properties of two types of rocks.

Procedures
1. From the Main Screen select the Simulations icon. Then click the Minerals and Rocks icon.
2. Read Start Here and close the window. For more information, click Background and close the window. For detailed directions, click Help and read "How to Use this Simulation."
3. Click the Rocks tab. Closely observe the rock sample. Like all rocks, this sample has unique properties. You can identify the rock by learning about its different properties.
4. Trial 1 To begin, click the Color button under the photo. Record the property in the chart below. Click the other buttons learn about the rock's Type by Origin, Mineral Content, Texture/Grain Size, and other Special Properties. Each time, record the properties in the chart below. You can also roll your mouse over the rock names to learn more about each one.
5. As you choose different properties, you'll narrow down the list of possible rocks. When you have one possible rock remaining, click the Check Sample Identity button. When you've learned the correct identity of the rock, write its name in the chart below.

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<th>Type by Origin</th>
<th>Mineral Content</th>
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</table>

6. Trial 1 Repeat the steps above with a new rock sample. Record the results above.
7. How were the two rocks similar? How were they different?

8. Did the two rocks share any of the same minerals?

9. Describe how the two rocks formed. (Hint: Consider their type by origin.)

10. Describe the appearance of the two rocks. What is the most distinctive physical property of each one?

There are over 100 known elements, but only eight make up 98% of all the rocks and minerals on earth. Minerals are made of one or more element. Since elements are identified by symbols, every mineral can be described using symbol for the elements it's made of. The chart below shows the chemical formulas for some of the minerals featured in the simulation.

<table>
<thead>
<tr>
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<th>Chemical Formula</th>
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<tr>
<td>Diamond</td>
<td>C</td>
</tr>
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<td>Fluorite</td>
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<tr>
<td>Gold</td>
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<td>SiO₂</td>
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<tr>
<td>Sulfur</td>
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11. Minerals that are pure, or made of only one element, are called "native minerals." Which of the minerals above are native minerals?

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12. If C is the symbol for carbon, which mineral is made of pure carbon?

__________________________________________________________________________

13. About half of the rocks and minerals that make up the earth contain oxygen (O). Which minerals above contain oxygen?

__________________________________________________________________________

14. When two elements are chemically combined, the atoms of the elements bond together to form a molecule. The chemical formula not only shows which elements make up a mineral, it also describes how many atoms of each element are found in each molecule of the mineral. For example, a molecule of water (H2O) is made of two atoms of hydrogen and one atom of oxygen. How many Iron (Fe) atoms are in a molecule of magnetite?

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15. Describe the chemical makeup of Hematite.

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16. Which two minerals contain the same elements? How are they different?

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__________________________________________________________________________
Minerals and Rocks Simulation: Elements
Activity One

Introduction
Rocks and minerals, like all matter, are made of tiny units called atoms. A substance made of only one kind of atom - or a “pure” substance - is called an element. Oxygen and carbon are examples of elements. When two or more elements combine chemically, they form a new substance with its own properties called a compound. For example, water is the compound of the elements hydrogen and oxygen.

Minerals are solid, inorganic (nonliving) substances that occur naturally in the Earth's crust. Some minerals such as gold and silver are pure elements. Most minerals are compounds made of more than one element. Rocks are solid mixtures of minerals. Some are made of one mineral, but many are made of several minerals.

Directions
Use the simulation to identify two mystery minerals.

Procedures
1. From the Main Screen select the Simulations icon. Then click the Minerals and Rocks icon.
2. Read Start Here and close the window. For more information, click Background and close the window. For detailed directions, click Help and read “How to Use this Simulation.”
3. Make sure the Minerals tab is selected. Closely observe the mineral sample. Like all minerals, this sample has unique properties. You can identify the mineral by answering questions about its properties.
4. Trial 1 To begin, click the Luster button under the photo and answer the question. Record the property in the chart below. Click the other buttons to describe the mineral’s Color, Streak, Hardness, and other Special Properties. Each time, record the properties in the chart below. You can also roll your mouse over the mineral names to learn more about each one.
5. As you choose different properties, you'll narrow down the list of possible minerals. When you have one possible mineral remaining, click the Check Sample Identity button. If you have more than one mineral or none remaining, at least one of the properties was describe incorrectly. Click the properties and try again. When you've correctly identified the mineral, write its name in the chart below.
6. Trial 2 Repeat the steps above with a new mineral sample. Record the results above.

7. How did you determine the hardness of the two minerals? Which mineral was harder?

8. For the first mineral, were the color and the streak the same? Why are the color and streak sometimes different? (See Background.)

9. How were the two minerals similar? How were they different?
Minerals and Rocks Simulation: Elements  
Activity Two

Introduction
A mineral is a pure element or a compound, a pure substance in which two elements are chemically bonded. In the first activity, you identified two mystery minerals. In this activity, you'll identify two rocks. Then you'll compare pure minerals with mineral compounds.

Directions
Use the simulation to identify two types of rocks.

Procedures
1. From the Main Screen select the Simulations icon. Then click the Minerals and Rocks icon.  
2. Read Start Here and close the window. For more information, click Background and close the window. For detailed directions, click Help and read "How to Use this Simulation.”  
3. Click the Rocks tab. Closely observe the rock sample. Like all rocks, this sample has unique properties. You can identify the rock by learning about its different properties.  
4. Trial 1 To begin, click the Color button under the photo. Record the property in the chart below. Click the other buttons learn about the rock’s Type by Origin, Mineral Content, Texture/Grain Size, and other Special Properties. Each time, record the properties in the chart below. You can also roll your mouse over the rock names to learn more about each one.  
5. As you choose different properties, you'll narrow down the list of possible rocks. When you have one possible rock remaining, click the Check Sample Identity button. When you've learned the correct identity of the rock, write its name in the chart below.

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6. Trial 1 Repeat the steps above with a new rock sample. Record the results above.  
7. How were the two rocks similar? How were they different?
8. Did the two rocks share any of the same minerals?

9. Describe how the two rocks formed. (Hint: Consider their type by origin.)

10. Describe the appearance of the two rocks. What is the most distinctive physical property of each one?

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12. Minerals that are pure, or made of only one element, are called "native minerals." Which of the minerals above are native minerals?
13. There are over 100 known elements, but only eight make up 98% of all the rocks and minerals on earth. These eight elements are: oxygen (O), silicon (Si), aluminum (Al), iron (Fe), calcium (Ca), sodium (Na), potassium (K), magnesium (Mg). Oxygen alone makes up almost half of earth’s rocks and minerals. Which mineral contains oxygen?

14. Which minerals contain calcium?

15. When two elements are chemically combined, the atoms of the elements bond together to form a molecule. The chemical formula not only shows which elements make up a mineral, it also describes how many atoms of each element are found in each molecule of the mineral. For example, a molecule of water (H2O) is made of two atoms of hydrogen and one atom of oxygen. How many oxygen atoms are in a molecule of quartz?

16. Describe the chemical makeup of corundum.