

Together Apart Unis en séparation

Rockin' Detectives

Grade 4 - Understanding Earth and Space Systems Rocks and Minerals

Lesson Plan	Safety Notes	Some of the activities can be messy and are great to do outdoors. Use caution with any heat sources.
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Description

In this lesson, students will learn concepts about rocks and minerals and start building their tool box of knowledge on how to identify each.

These are the concepts that will be covered in this lesson:

- What is the difference between a rock and a mineral?
- What are the 3 types of rocks and how are they formed?
- What is the rock cycle?

Materials

Igneous Activity

- tall container (such as a tall glass)
- 5 tablespoons of baking soda
- 400 mL of white vinegar
- 10 mL of dish soap
- 100 mL of cold water
- food colouring (optional)

Sedimentary Activity

- 3-4 different colours of playdough
- Small figures such as lego characters, plastic dinosaurs or trees, or even small pieces of branches for outside

Metamorphic Activity

- small square of foil paper (4cmx4cm) or foil cupcake holder
- pieces of wax crayons (small bits from a variety of wax crayons)
- oven (need permission and assistance from adult)
- oven mitts

Bonus Activity

- 3-4 rocks collected from your yard
- Activity sheet "Rockin Detective Activity"



Science Background

What is the difference between a **mineral** and a **rock**?

Minerals:

- occur naturally in nature (people did not make it)
- are inorganic (was not made by organisms)
- are solid (they can not be liquid or gas)
- have a definite chemical composition (there is a chemical formula to make them e.g. Halite which is table salt is NaCl, Na = sodium, Cl = chloride)
- have an internal structure (the atoms are arranged in a systematic pattern)

Rocks:

- occur naturally in nature (people did not make it)
- are made up of 2 or more minerals
- are either igneous, sedimentary or metamorphic

Think of rocks and minerals like baking a cake:

Imagine you are a chef required to bake a cake. In order to do this you will need to find ingredients such as flour, eggs, and sugar. Once the ingredients are mixed together and baked you get your cake. In terms of rocks and minerals, the ingredients in the cake represent the minerals and the cake itself is the rock. You need to add ingredients, the minerals, along with erosion, pressure, heat, etc., to make a rock.

Let's take a closer look at rocks:

There are three types of rocks: igneous, sedimentary and metamorphic.

Igneous rocks:

These rocks are formed from molten material as it becomes a solid. This can happen it two (2) different ways:

Intrusive igneous rocks form when molten material pushes itself into spaces and crystalizes slowly below the Earth's surface. Since they cool slowly it allows for the formation of large crystals. Examples of intrusive igneous rocks are granite, pegmatite, gabbro and diorite.

Extrusive igneous rocks form when molten material erupts onto the Earth's surface and cools quickly. Because it cools quickly the crystals formed are small and some cool so fast that they don't really have any crystals, they'll look like glass. For example, rocks from a volcanic eruption are extruded from the earth. Examples of extrusive igneous rocks are basalt, pumice, obsidian, rhyolite.



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Sedimentary rocks:

Sedimentary rocks are formed by the accumulation and compression of sediments over a long period of time. The sediments can include small pieces of minerals, small pieces of plants and other organic materials. These sediments move towards bodies of water like rivers, lakes and oceans and will accumulate at the bottom. Over long periods of time the bottom layers will turn into rocks. Examples of sedimentary rocks are sandstone, limestone, kaolinite (chalk), flint.



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Metamorphic rocks:

Metamorphic rocks have been changed or modified by heat, pressure and chemical processes. They are typically buried far below the Earth's surface. Examples of metamorphic rocks are gneiss, slate, marble, quartzite.

Together these three (3) types of rocks form the rock cycle. The rock cycle allows us to understand the types of physical and chemical changes that can occur that will result in formation of new rocks.

- Igneous rocks can change to metamorphic rocks through heat and pressure.
- Igneous rocks can change to sedimentary rocks through weathering, erosion compaction and cementation.
- Igneous rocks can change back to igneous rocks by melting into magma and cooling.
- Sedimentary rocks can change to metamorphic rocks through heat and pressure.
- Sedimentary rocks can change back into sedimentary rocks through weathering, erosion compaction and cementation.
- Metamorphic rocks can change to igneous rocks by melting into magma then cooling.
- Metamorphic rocks can change to sedimentary rocks by weathering, erosion, compaction and cementation.



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- Mix the ingredients together with a spoon
- Place the container in a safe location as the next step will cause a mess
- Add the white vinegar to the container and watch the eruption

This experiment helps to show the process that forms igneous extrusive rocks. Can you see bubbles in the "lava" flow that you just created? Depending on the composition of the magma as well as the amount of gas built up in a volano you will see some igneous extrusive rocks with lots of little holes in them. These would be the gas that escaped when the rocks crystalized very rapidly. Pumice is a great example of this.



Sedimentary Activity:

- Make 3-4 flat strips using the different colours of playdough.
- Stack 2 flat strips together. You should have 2 layers.
- Place the small object (lego, branch, etc.) on top of your first flat strip of playdough then stack the remaining layers.

The stacks of playdough represent the different layers of sediments that have compressed together over long periods of times to form a sedimentary rock. The small object such as the lego or branch represent a fossil. Fossils can help us date how old the rock layers are based on what type of fossil can be found in the different layers.

Metamorphic Activity:

- Heat the oven to the lowest temperature setting. You can also do this using hot water in a container. Use caution with either method.
- Place small bits of wax crayons on a piece of aluminum foil or in a foil cupcake cup. Use as many different colours as you'd like.
- Place your foil cup in the oven. Once all the pieces are melted use oven mitts to pull the foil out of the oven and place it on a heat proof surface to cool. Alternatively, float your cup in hot water until the way melts. Be careful not to burn yourself.
- When the melted crayons have cooled enough to touch, have a look at them. At the beginning you started with bits of crayons. These bits of crayons represent pieces of igneous, sedimentary or even other metamorphic rocks. When we placed these in or over a heat source they melted together to form a new multicoloured crayon which represents our metamorphic rocks. Metamorphic rocks are rocks that have been changed through heat and pressure.

Bonus Activity:

Use the "Rockin Detective" handout to identify some rocks in your backyard. Use the pictures on the sheet to see if you can match them up.

Debrief

Igneous, sedimentary and metamorphic rocks are the three types of rocks. These rocks can change into the other types of rocks through physical and/or chemical changes. By understanding what type of rocks you have it helps to paint the picture of how they were formed. Rocks are like books, you just need to learn the language and then you can unlock their stories.



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Handout (Rockin' Detectives)

Activity: Use the picture below to help you identify some of the rock you collected in your yard.

Rock Types	Pictures of Rocks			
Igneous Rocks	Granite	Diorite	Pumice	
Metamorphic Rocks	Gneiss	Slate	Schist	
Sedimentary Rocks	Image: Constraint of the second se	Mudstone	Sandstone	