

Earth Science Activity Bag

Formation of Soil: Student Activity Guide

Have you ever looked at the soil under your feet? Most people don't ask themselves what it's made of, how it was made, or how it got there. However, it is made of things, and it was made in very specific ways. In this activity, we will look closely at that soil, its properties, and how it was formed.

These directions will get you started. Your teacher will be in contact to guide you and provide information.

Materials From The Bag

- 1 Plastic Vial
- 1 Plastic Tube
- 1 Pipette (dropper)
- 1 Paper Plate
- 1 Piece of Mesh (screen)
- 1 Rubberband
- 2 Food Trays (paper tray with red and white pattern)
- 1 Craft Stick
- 1 Plastic Bag
- Bag of Rocks

You Will Supply These Materials

- Water
- Liquid Dish Soap
- Spoon or Small Shovel
- Cup

Part 1: What Is Soil?

In this part of the activity, we will take a closer look at what's in your local soil.

1. Find an old spoon or small shovel and get the food tray from the bag. Head outside and find someplace where the soil is exposed. If you can't find bare ground, you might have to move aside some grass, leaves, or gravel. Fill your tray with **mostly dry** soil.
2. Empty the tray of soil onto the paper plate. Use the craft stick from the bag to separate the soil into little piles of similar things. *What do you notice?*
3. Allow the soil you collected to sit out for about a day, or until it gets dry.
4. When your sample is dry, separate some of the different things in it with the craft stick. Sort your soil into small separate piles, for example, sand, rock, clay, leaves, stems, and roots. *How do you think these things got to be where you found them?*

What's happening...

As you may have noticed, the soil is made of many different things. In addition to rocks, you can expect to find stems, grass, worms, insects, roots, etc. These things can vary from place to place and around the Earth

Part 2: Sizes Within The Soil

In this part of the activity, we will explore the different sizes of particles that make up soil.

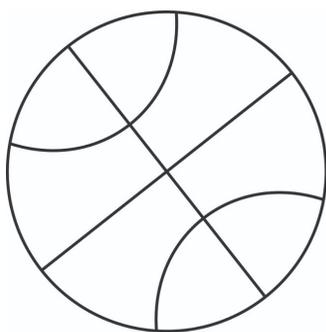
1. Take your soil and fill your plastic vial about half full. **Try to exclude leaves, stems, and roots.**
2. Fill the plastic vial with water leaving a little room at the top.
3. Place one drop of liquid dish soap into the vial and put the lid on tight.

Formation of Soil pg. 2

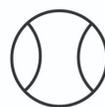
4. **Hold the lid on the vial** and shake the vial back and forth for twenty seconds.
5. Set the vial down. After one minute, record your observations. Wait ten more minutes and record your observations again.
6. Leave your vial undisturbed for 24 hours. Record your observations and draw what you see.
7. Soil scientists use this technique to separate soil by particle size. Look at your vial and see if you can locate different layers based on particle size. *Mark those layers on your drawing. What do you notice about the size of particles in the different layers?*

What's happening...

Soil has different sizes of particles and soil scientists classify these particles into sand, silt, and clay. Sand particles are the largest and clay particles are the smallest, with silt in between. If a particle of sand were the size of a basketball, then silt would be the size of a baseball, and clay would be the size of a golf ball. Most soils are made up of a combination of these three. After you shook the vial, the larger particles settled first. The smaller particles took longer to settle and are above the larger particles. *Based on the information above, look at your drawing and label sand, silt, and clay.*



SAND
(basketball)



SILT
(baseball)



CLAY
(golf ball)

Rinse out your vial to use for Part 5

Part 3: How Does Soil Feel?

Another way to determine the particle size is by how it feels.

1. Place a spoonful of soil into the plastic bag.
2. Fill a cup half full of water. Squeeze the top bulb of the pipette and place it in the cup of water. Let go of the bulb. This will fill the pipette up with water.
3. Squeeze the pipette of water into the bag and seal the bag. Remove as much air as possible before sealing.
4. Use your hands and squeeze the bag until the soil and water are mixed. As you are squeezing the mixture, what do you notice?
5. Continue to explore. You may add more water or soil. *Describe what you are feeling.*

What's happening...

Soil scientists describe the texture of sand as gritty. Silt particles have a smooth or floury texture and clay feels sticky.

Formation of Soil pg. 3

Part 4: Soils Ability To Hold Moisture

In this part of the activity, you will explore different soil types and their ability to hold moisture. You will need a timer or stopwatch (phone, computer, watch, or stopwatch) for this.

1. Locate the bag of rocks and fill the plastic tube leaving a little space at the top. **Save the remaining rocks for Part 5.**
2. Fill the pipette with water.
3. Squeeze the pipette of water into the plastic tube. Time how long it takes for the water to reach the bottom of the tube. Record your results.
4. Empty, rinse out and dry the tube.
5. Take your soil and fill the plastic tube leaving little space at the top. **Try not to include leaves, stems, and roots.**
6. Predict how long you think it will take for the water to reach the bottom of the tube.
7. Repeat steps 2-3. If after 30 seconds the water hasn't reached the bottom, add an additional pipette of water. Continue to observe. Continue to add one pipette of water every 30 seconds until the water reaches the bottom of the tube.
8. Compare your results to your prediction. *Why do you think soil scientists are interested in soil's ability to hold moisture?*

What's happening...

Larger particles have more space between them and allow water to pass through more easily. Small particles, such as silt and clay, with less space between them, hold water. The rate that water passes through soil depends on the balance and connectedness of large and small spaces in that soil.

Part 5: How Does Soil Form?

In this part of the activity, you will explore how soil is formed.

1. Take the rocks out of the bag and place them into the food tray. Look closely and write down what you see.
2. Put the rocks into the vial and put the lid on tight. Hold the lid and shake the vial hard for thirty seconds.
3. Remove the lid and place the mesh over the vial. Secure the mesh with a rubber band. **Gently** shake the vial into the tray. Look closely at what's in the tray. *What do you notice in the tray? What is different in the tray now from what you saw before? Where did it come from?*
4. Remove the mesh and place everything back into the vial. Put the lid on tight and shake the rocks again for another 30 seconds. Repeat step 3. *What do you think would happen if you did this for hours or years?*
5. You just experienced one way that rocks break apart in nature. *What other ways do you think rocks break apart in nature?*

What's happening...

Soil begins its life when rocks break down over a long time. This is called **weathering**. Weathering can happen from water, pressure, and ice, and from chemicals and living things. The kind of soil you get depends on the kind of rocks that broke down to make it. For example, in central North Carolina, a common rock is a kind of blue-gray slate. That slate breaks down into the red clay you often see by the side of the road. This YouTube shows soil made by weathering: <https://www.youtube.com/watch?v=kybPmB1zBUw>.