# Interactions between the four Spheres of the Earth

**Supplies:**

- 4 blubber bags
- 2 Large plastic bowls
- 2 towels
- Lots of ice cubes
- Paper towels
- 30 Sponge squares (regular sponge cut in 1/2)
- 5 pipettes
- 11 clear cups
- 2 beakers
- Colored water
- Volcano molds
- Dish soap
- Vinegar
- Baking soda
- 25 ml graduated cylinder
- Trays for supplies
- 2 Small mason jars
- M&M's
- Butter mints
- Butterscotch candy
- Hot water
- Cold water
- Water
- Active Dry yeast
- Sugar
- Spoons
- Small plastic shot glasses
- Clear soap base
- Yellow food coloring
- Plastic ants
- Masking tape
- Sharpie
- Small crock pot
- Crock pot liner
- Scoop
- Paper plate
- Supply cups

**Prep:**

Order or purchase supplies

Print off station instruction cards, laminate if wanted.

Print off worksheets, one per student.

Make blubber bags by googling how to make them or follow the instructions below:

- With a ziplock bag inside out over your hand, scoop out a handful of Crisco or similar lard. Flip the bag over your hand so the Crisco is now inside the ziplock bag. Place another ziplock bag inside. Squeeze the Crisco around the ziplock bag making sure it's not at the top of the bag. Using duct tape, seal the two ziplock bags together so no Crisco can escape. This should make the Crisco trapped between the two bag and should keep hands clean while using.
- Make 4 bags, so 4 students at the station can test the blubber bags at the same time.
- Caution students when they are using the blubber bags to not poke, or use one finger, they will make a fist and place it inside the ziplcok bag. If they poke or punch the bag it can get a hole and Crisco will escape, making a mess.
- Blubber bags can be flattened and placed in the freezer to remain useable another time.

Freeze ice cubes. Place at least 2 trays worth and some water per bowl you use for the blubber bags. 2 blubber bags can fit in each bowl.

Place water in the fridge to be cold.

Melt the clear soap base in the crock pot (with liner) and add a few drops of yellow food coloring to tint it an amber color. It takes about 45 – 60 minutes to get a small crock pot to melt a chunk of soap. Cut into smaller pieces to melt faster.

Heat water to be around 80-90 degrees Fahrenheit.

## Notes:

This lesson is planned to have groups of 4-5 students rotate between each station for about 4 minutes each. They will see how each of the four spheres of the earth interact with each other. The power point presentation has the instructions and pictures to go along with each station and at the end has a timer to see how long each station goes for. For example: when you click the first time on Slide 18 the rocks start to slowly cross the screen. It takes 4 minutes to reach the end. When the rock reaches the end groups rotate stations and the next click starts the wind icon starts to move across the screen. Each station is 4 minutes, then 30-60 seconds for cleaning up and moving stations. If you would like to avoid stations, you can do each station at a time, you would just need to have more supplies than listed to work for your class.

## Lesson:

Use the power point presentation if you wish.

Ask students what the four spheres of the earth are: biosphere, geosphere, hydrosphere, and atmosphere. Review how the biosphere is made up of all living things, humans, plants, and animals included. The Geosphere includes all the rocks and minerals on earth. Hydrosphere is the total amount of water on the planet, oceans, rivers, underground, sewers, clouds. Atmosphere is a mixture of the gasses surrounding the earth.

Ask students if these 4 spheres ever interact with each other. Record and briefly talk about what they come up with.

Tell them today we will be seeing one example of how each sphere interacts with each other.

# Station instructions:

## Geosphere and biosphere:

Set up: Place a crock pot with liner and plug in. Add small pieces of the soap base and yellow food coloring, allow to melt for about an hour. Place plastic ants on the tray, along with the small clear shot glasses, tape, sharpie and a paper plate with the scoop on it.

- Ask students how fossils are formed or explain it to them. We will be seeing how fossils are created. When something living (usually plants or animal) dies, after a long time the geosphere will cover their body. This can be a landslide, or a storm that causes mud to cover them. Today we will be looking at a specific type of fossil called "true form fossils" when animals are trapped in sap from trees. Trees have a sticky substance that is yellowish called sap, if an insect gets trapped in the sticky substance it can die and then the sap hardens over years into amber and can preserve the insect.
- To begin have students write their name on a piece of masking tape with a sharpie, place their name on one of the small clear plastic cups. They will place 1 plastic ant in the bottom of their cup.
- Caution students about how crock pots get warm and to be careful while using the crock pot and melted soap base.
- Using a scoop fill the cup about halfway. Place their fossil on the tray to cool.
- Students can pop the soap out at home and use it if they choose.

## Hydrosphere and Atmosphere:

Set up: Cut sponges in half, until you have one per student. On the supply tray have a stack of paper towels, the dry sponges, 5 clear cups, 5 pipettes, and fill two larger cups with colored water.

- How much water can a cloud hold? With this interaction we will be looking to see how clouds hold water and what happens when the cloud has too much water.
- Students will place a paper towel down, and a clear cup, pipette, and sponge half in front of them. Have them feel the sponge before starting, what does it feel like? How heavy is it?
- Using the colored water (2 students can share) they will suck up a pipettes worth of water and squeeze it on the sponge. Students will count the number of pipettes (not drops) they place on the sponge. Students continue adding water until the sponge is full and begins to "rain". Students can experiment to see if they can make it rain a light drizzle, or a heavy rain. Did where they put the

water make a difference? For example, if they placed every pipette in the same place versus placing water all over the sponge.
- When they are finished, students squeeze the sponge back into their cup, and add it to the shared colored water. Wipe up any water that spilled and throw away their paper towel.
- If you have trays, you can place paper towels on the tray and have students place their wet sponges on the tray to dry. The next group will get dry sponges to start.

**Atmosphere and Biosphere:**

Set up: Place two towels on the table. In two large plastic bowls, place a lot of ice and some water. Place one bowl on each towel. Place the blubber bags flat on the towel and have a roll of paper towels.

- Does the atmosphere affect animals? Why don't we see polar bears in the desert? Why are there no giraffes in the artic? Animals have adaptations to survive in their own habitats, and sometimes their habitats are in harsh conditions. How are polar bears able to survive the freezing cold temperatures of the artic? They have blubber to keep them warm. We're going to experiment to see if this really works or not.
- Remind students of how to be careful with the blubber bags. They make a fist on one hand and gently place it in the blubber bag and place the blubber bag in the ice water in a bowl. They then place their other, bare, hand in the bowl as well.
- If the bowls are large enough, 2 students can use the same bowl at the same time.
- Students love to compete, and some will try to keep their hands in the ice water the whole 4 minutes. Remind them it's just to feel the difference between their hands and once their bare hand feels cold, or stings, to pull it out.
- Students need to be careful about not having the edge or top of the bag slip under the water, that allows ice water to get inside which minimizes the effect.
- Once done, students lay the bags flat on the towel, dry their hands and throw away the paper towel.

**Hydrosphere and Geosphere:**

Set up: On the tray place the candies and two mason jars, have a pitcher of water and a garbage nearby.

- What are some ways water and the earth interact? Erosion is a great example. But does water affect all soil and rocks the same way? We are going to

experiment to see how water affects different types of rocks.

- In each of the two jars place 2 m&ms, 2 buttermints, and one butterscotch candy. Add water to both jars. Put the lids on tight. One jar you will leave on the table. The other jar, take turns shaking the jar for a couple minutes. After shaking, open the lids and compare the difference between the types of candy and between the jar you shook and the jar you did not shake.
- Pour out the water and throw away the candy to clean up.

**Hydrosphere and Biosphere:**

Set up: Have a pitcher of warm water (80-90*) and a pitcher of cold or ice water. On the supply tray have 2 cups per group, a small cup of sugar, a spoon per group, and yeast in a cup with a spoon.

- When we think of living things and water interacting we can think of some simple ways, like drinking water! But did you know the temperature of water can affect the growth of plants? Today we're going to see how the growth of fungus can change depending on the water temperature. We think of a fungus as gross or bad but there is a lot of good fungus and we use them a lot in cooking, mushrooms are a fungus and today we're going to see how yeast, a fungus, can grow in different temperatures.
- Pour about 3 inches of warm water into one cup and pour the same amount of cold water in the other cup.
- Add a small spoonful of sugar into each cup and stir until it's dissolved.
- Using the yeast spoon (it needs to stay in the yeast!) place a spoonful into each cup. Do not stir, just observe what you notice and how you can tell the yeast is growing. Which water does it grow the most?
- Place cups off to the side and throw away after class.

**Atmosphere and Geosphere:**

Set up: Place volcano molds on the supply tray with a 50 ml graduated cylinder, cup of backing soda, dish soap and spoons. If you have extra trays have one per group to put the volcano mold on to catch the mess.

- Can you think of a way the earth and air interact with each other? Sometimes it's hard to think of an interaction! Today we're going to make volcanos! But how do volcanos and the air interact? When you make your volcano and see what happens, think about how you know a gas is given off (bubbles are created) and do you think real volcanos give off a gas? Yes! Does the gas given off affect the quality of air we breathe? It sure does! There can be ash and sulfur dioxide gas

in the air. That can make it hard to breath and the sulfur dioxide gas can cause acid rain. That's a big effect from a volcanic eruption!

- Each group will place a volcano mold on a tray. Pour 25 mls of vinegar into the graduated cylinder. Add a spoonful of baking soda into the volcano mold. Add 1-2 drops of soap. If students add more soap, it does not affect the amount of bubble they get, it's just harder to clean up.
- Pour the vinegar into the mold and observe what happens.

**Conclusion:**

Once the stations are done, review with the students what type of interactions they saw and what they learned from them. Review the worksheet and see if there were any misconceptions.