

Name: _____

Date: _____

Field Investigation: Convection

Learning goals

In this field investigation you will...

- Safely use magnifying glasses to focus sunlight.
- Investigate convection to see why greenhouses work.

Investigation overview

You will work as part of a group to see how convection cools Earth's surface. You will use magnifying glasses to heat water in two different petri dishes. One dish will be covered, like the plants in a greenhouse. The other will be open to the outside air. Comparing these two will demonstrate how important convection is for maintaining a comfortable environment.

Going to the investigation site

You will be going outdoors, so you should wear shoes that are not open at the end. Sandals and other shoes that are open at the end are not appropriate for doing investigations outdoors.

Your teacher will assign you to groups of 4 or 5. Your group will be given two petri dishes, one thermometer, and one stopwatch. The petri dishes will have a small square of black cloth or construction paper. One of the petri dishes has a cover.

Your group should choose which pieces of equipment each is responsible for:

- 1 person should be responsible for the covered petri dish.
- 1 person should be responsible for the uncovered petri dish.
- 1 person should be responsible for the thermometer.
- 1 person should be responsible for the stopwatch.
- If there are 5 people in the group, the last person is responsible for reading instructions to all group members while the investigation takes place. If there are only 4 people in a group, the person responsible for the thermometer will do this job.

Your teacher will then lead you outside. Stay with your group and follow close behind the teacher. The ground may be wet, so be extra careful that you do not slip on moist grass or rocks. If you have to cross a street, your teacher will indicate when and where to do so.

At the investigation site

Your teacher will assign you a location at the investigation site. The teacher will go from one group to another to get them started. Remember that the safety rules for labs apply to field investigations as well. Do not engage in horseplay while waiting for the teacher to get to your group.

When your teacher visits your group, water will put in each of your two petri dishes. Cover one of the dishes with a petri dish cover. The group member with the stopwatch should start timing once the cover is in place.

The students responsible for the petri dishes will be given magnifying glasses. Each will use the magnifying glass to focus sunlight onto the black square in the petri dish assigned to him or her. *Remember that you should never stare directly at the Sun.*

Very important: magnifying glasses are not toys and must be used carefully. Never use a magnifying glass to focus sunlight onto yourself or another person. Do not look at the Sun through your magnifying glass. Unless instructed by your teacher, do not focus sunlight onto dry leaves, paper or other flammable objects.

Continue to focus the light onto the square for 10 minutes. Then the group members holding the magnifying glasses and stopwatches can put their instruments down to record the answers to the questions below.



1. After the 10 minutes are over, the group member who has the thermometer should carefully observe the glass cover. Do you see anything unusual?

2. What is the temperature of the water in the open dish? _____

3. Remove the lid from the closed dish. What is the temperature of the water inside? _____

4. Discuss these two temperatures with your group. Why do you think the water in one of the dishes got hotter than the water in the other?

5. Challenge: Some spots on the Moon's surface get extremely hot, hotter than boiling water. The Moon and the Earth are about the same distance from the Sun. Why do you think some regions on the Moon's surface get so much hotter than any region on Earth?

Preparing to return to the classroom

After you have finished answering the questions above, return the magnifying glasses to your teacher. When all groups are finished, the teacher will lead you back to the classroom. Make sure you and your group stay near the teacher. Watch your footing on the way back to the classroom. If you have to cross a street, your teacher will tell you when and where to do so.

When you get back to the classroom, pour the water down the drain. Your instructor will tell you what to do with the black square.

You should wash your hands after any lab or field investigation. Use the procedure below:

1. Rinse your hands with warm water.
2. Apply soap and work the soap into a lather.
3. Scrub your palms, the back of your hands, around your fingers, and under your nails for 30 seconds or longer.
4. Completely rinse your hands.
5. Use a clean towel to dry your hands and shut off the water.
6. If the towel is cloth, place it in a hamper to be laundered. If the towel is paper, place it in a recycling bin.