Mini-Geyser

Introduction

What are geysers? How do they work? In this demonstration, an actual working model of a geyser will be constructed.

Concepts

- Geysers
- Heating
- Eruption

Materials

Boiling stone
Demonstration tray
Dish, Tupperware®, plastic
Drill bit, ¼″
Drill, electric
Flask, Erlenmeyer, 250-mL or 500-mL
Hot plate
Plumber's putty
Ring stand
Ring support, metal
Rubber stopper, one-hole (to fit Erlenmeyer flask)
Safety shield
Tubing, glass, 12″ to 24″ in length

Safety Precautions

Although this demonstration is considered nonhazardous, always follow appropriate safety rules. Take all safety precautions when placing the glass tube into the one-hole rubber stopper. Use a demonstration safety shield.

Procedure

1. Set up the demonstration in a large demonstration tray.
2. Drill a hole in the middle of the plastic container using a ¼″ drill bit and an electric drill.
3. Fill the Erlenmeyer flask approximately ¾ full with water. Place a boiling stone in the flask.
4. Place the Erlenmeyer flask on a hot plate. *Caution:* Do Not Plug in the Hot Plate.
5. Insert the end of the glass tubing into a one-hole stopper. Carefully slide the glass tubing until it becomes flush with the bottom of the stopper.
6. Place the stopper on the Erlenmeyer flask (see Figure 1).
7. Obtain a support stand and a support ring. Slide the metal ring over the glass tubing.
8. Insert the other end of the glass tubing into the hole in the plastic container so that the end of the tubing is halfway between the top and bottom of the plastic container.
9. Seal any gaps around the glass tubing and plastic container using putty.
10. Place the support ring under the bottom of the plastic container and tighten the ring to the ring stand (see Figure 2 on page 2). This will help support the weight of the water that will be added to the plastic container.
11. Place the entire apparatus on a large demonstration tray.
12. Fill the plastic container with cold water until the end of the glass tubing is covered by two to three centimeters of water.
13. Keep students at a safe distance. Place a safety shield between the students and the apparatus.
14. Plug in and turn on the hot plate. Allow the water to heat and back away from the apparatus.
15. The geyser will gush and it will erupt when the cold water from the plastic container is sucked back into the flask. Many eruptions should occur until the water becomes too hot.

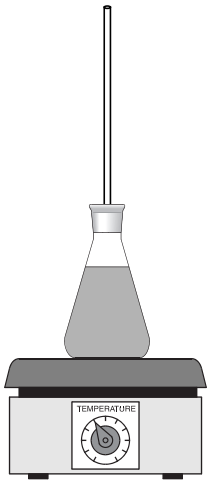

Figure 1.

Publication No. 10388
061616

Disposal

Please consult your current *Flinn Scientific Catalog/Reference Manual* for general guidelines and specific procedures, and review all federal, state and local regulations that may apply, before proceeding. The assembled geyser apparatus may be saved and used in future classes.

Tips

• Allow enough space between the geyser apparatus, yourself, and your students.

• When disassembling the apparatus, remove the plastic container first to avoid spilling a large amount of water.

• Be sure to allow the apparatus to cool completely before disassembling.

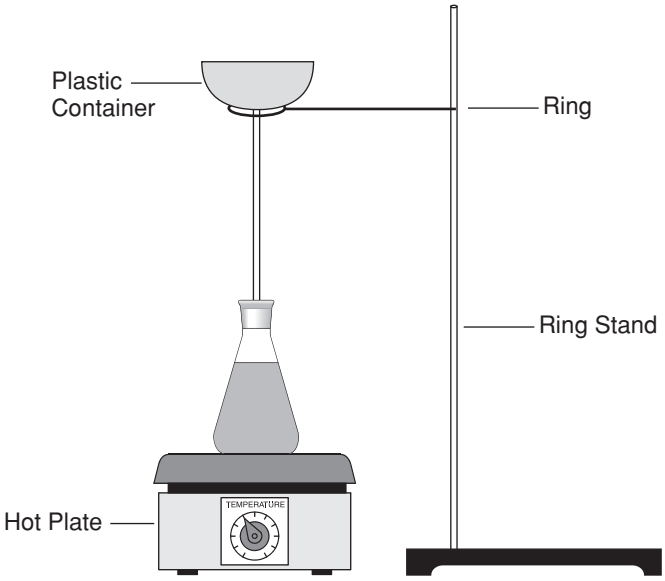

Figure 2.

Discussion

Geysers are a type of hot spring that erupts in a spout of steam or hot water. Geysers are formed when rainwater soaks and percolates into deep cracks in the Earth. The water is heated to very high temperatures by the core of the Earth, and expands underground. When the water reaches its boiling point, it is pushed up and erupts through cracks in the ground. Geysers generally erupt at regular intervals. For example, Old Faithful in the Yellowstone National Park erupts once every hour, spewing about 45,000 liters of water into the air during each eruption!

In this demonstration, there are three main stages in the geyser's cycle—heating, eruption, and recharging. The heating stage is when the water in the flask boils until eruption occurs. The heating cycle is directly dependent on the length of the glass tube being used and the amount of heat given off by the hot plate. Eruption occurs when the water is expelled out of the glass tubing. As the water begins to flow up the glass tube, the pressure in the Erlenmeyer flask is reduced. This reduces the boiling point of the water and converts the liquid form of water into steam. The recharging stage occurs immediately after the eruption stage takes place. Some of the cool water from the plastic container begins to flow down into the Erlenmeyer flask, which causes the steam in the flask and tube to condense. The overall pressure of the geyser system is reduced and more water is directed down the tube due to the higher atmospheric pressure outside the system.

Connecting to the National Standards

This laboratory activity relates to the following National Science Education Standards (1996):

Unifying Concepts and Processes: Grades K–12
Evidence, models, and explanation
Form and function
Content Standards: Grades 5–8
Content Standard D: Earth Science, structure of the Earth system
Content Standard F: Science in Personal and Social Perspectives, natural hazards
Content Standards: Grades 9–12
Content Standard D: Earth and Space Science, energy in the Earth system
Content Standard F: Science in Personal and Social Perspectives, natural and human-induced hazards

Materials for the *Mini-Geyser* are available from Flinn Scientific, Inc.

Catalog No.	Description
GP9010	Tubing, Glass, 6 mm
AP5429	Demonstration Tray

Consult your *Flinn Scientific Catalog/Reference Manual* for current prices.