

Balloon gymnastics

Overview: Heat causes all kinds of things to happen. We'll zoom in on the micro scale of molecules as we explore in today's lesson.

What to Learn: Heat energy influences all kinds of observable phenomena on our planet.

Materials

- water
- plastic bottle
- balloon
- stove top and saucepan or the setup in the video

Lab Time

1. Pour a couple of inches of water into an empty soda bottle and cap with a 7-9" balloon. You can secure the balloon to the bottle mouth with a strip of tape if you want, but it usually seals tight with just the balloon itself.
2. Fill a saucepan with an inch or two of water, and add your bottle. Heat the saucepan over the stove with adult help, keeping a close eye on it. Turn off the heat when your balloon starts to inflate. Since water has a high heat capacity, the water will heat before the bottle melts. (Don't believe me? Try the Fire-Water Balloon Experiment first to see how water conducts heat away from the bottle!)
3. When you're finished, stick the whole thing in the freezer for an hour. What happened to the balloon?
4. Record all observations in the worksheet

Balloon Gymnastics Observations

1. What happens to the balloon when the balloon is heated? What is happening to its air molecules?

2. What happens to the balloon when you put it in the freezer? What is happening with its molecules now?

Reading

This material may be helpful to interpret today's experiment:

Is it warmer upstairs or downstairs? The upstairs in a house is warmer because the pockets of warm air rise because they are less dense than cool air. The more the molecules move around, the more room they need, and the further they get spaced out. Think of a swimming pool and a piece of aluminum foil. If you place a sheet of foil in the pool, it floats. If you take the foil and crumple it up, it sinks. The more compactly you squish the molecules together, the denser it becomes.

As for why mountains and valleys are opposite, it has to do with the Earth being a big massive ball of warm rock which heats up the lower atmosphere in addition to winds blowing on mountains and changes in pressure as you gain altitude... in a nutshell, it's complicated! What's important to remember is that the Earth system is a lot bigger than our bottle-saucepan experiment, and can't be represented in this way.

Exercises Answer the questions below:

1. Draw a group of molecules at a very cold temperature in the space below. Use circles to represent each molecule.

2. True or False: A molecule that heats up will move faster.
 - a. True
 - b. False
3. True or False: A material will be less dense at lower temperatures.
 - a. True
 - b. False

Answers to Exercises: Balloon Gymnastics

1. Draw a group of molecules at a very cold temperature in the space below. Use circles to represent each molecule. (should be grouped very tightly)
2. True or False: A molecule that heats up will move faster (true)
3. True or False: A material will be less dense at lower temperatures (false)