

DESIGN A
METHOD TO
CHANGE THE RATE
OF **HEAT
TRANSFER**



STATION INSTRUCTIONS

Utah SEEd Standard 6.2.4
Next Generation Science Standard: MS-PS3-3
Grade and Topic: 6th-grade Integrated Science
Middle School Physical Science


THE UNIVERSITY OF UTAH
College of Education


UTAHFORGE
U.S. Department of Energy

Station 1: Observing Conduction

Conduction is when heat is transferred through direct contact. In other words, heat moves from one object to another object because they are touching.

Do this:

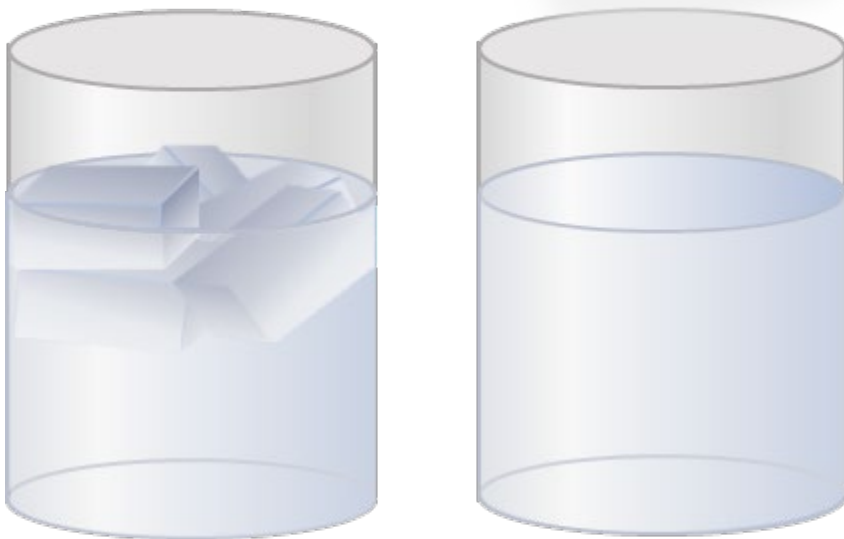
- Place your hand on the outside of each of the beakers.
- Notice whether the beakers feel warm or cold.

Write this:

- How does this demonstrate conduction?
- Which way is the heat flowing?
- How can you tell?

Discuss this:

- What could you do to increase conduction?
- What could you do to decrease conduction?



Station 1, cont.: Is it a Conductor? or is it an Insulator?

Conductors are materials that allow heat to flow through the material. Insulators stop the flow of heat through the material.

Do this:

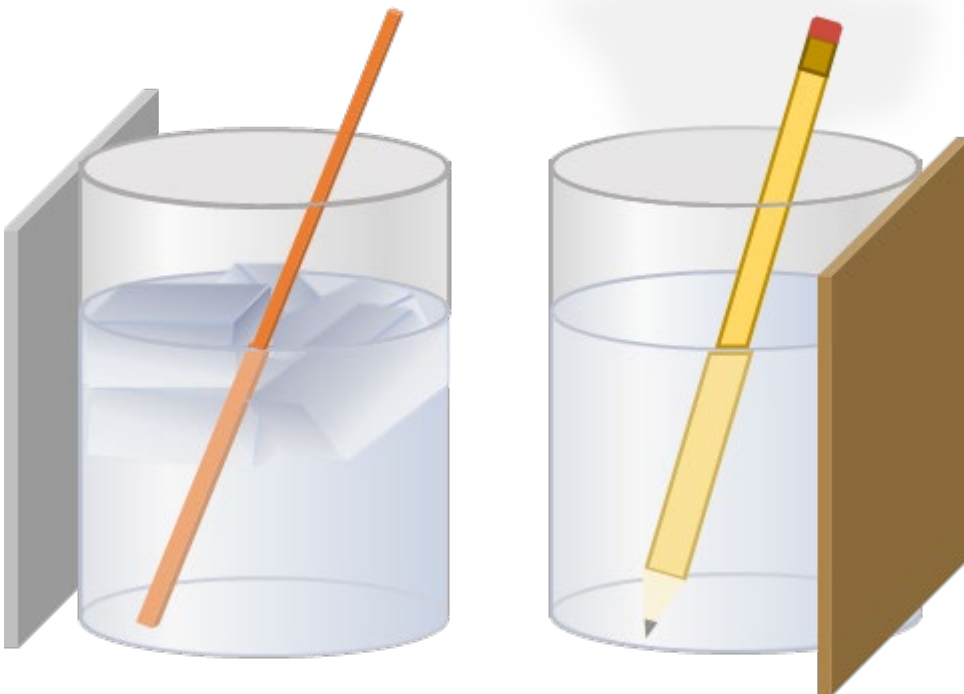
- Test whether each item is a conductor or insulator by feeling if the heat goes through the object.

Write this:

- Which objects are conductors?
- Which objects are insulators?
- What patterns do you notice?

Discuss this:

- Which objects are the best conductors?
- Why do you think these are good conductors?
- Which objects are the best insulators?
- Why do you think these are good insulators?

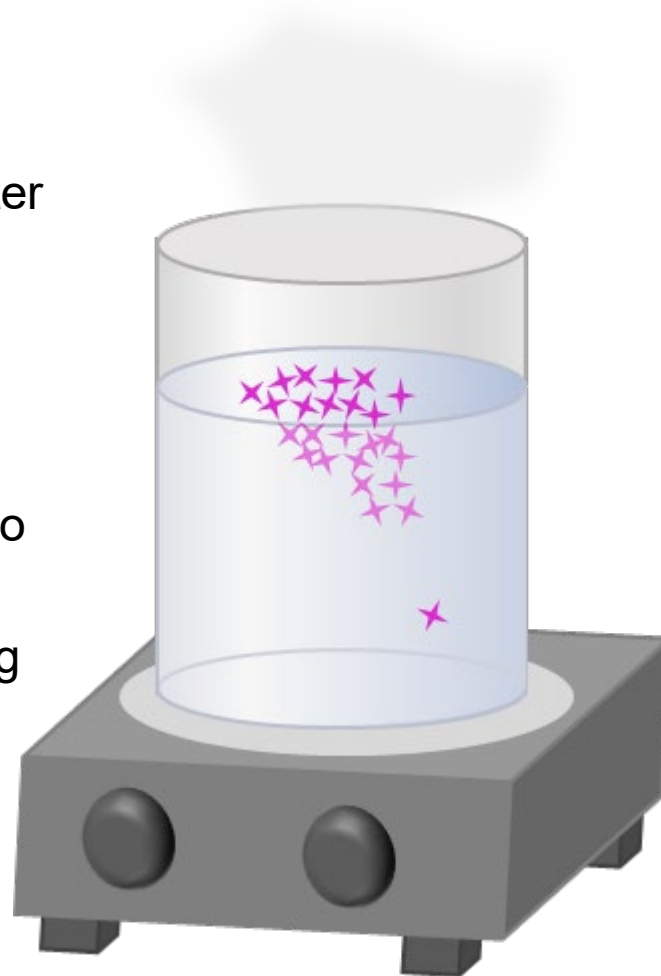


Station 2: Observing Convection

Convection is heat transfer through the movement of fluids. Convection can be forced, like when the furnace blows hot air. Convection also occurs naturally when a fluid is heated from below. This causes the hot fluid to rise, pushing the water above it out of the way, and pulling in the water from the side. As the hot water rises, it cools, which makes it fall back to the bottom ...and the cycle repeats...

Do this:

- Place the beaker of water on the hotplate.
- Turn on the hotplate. DON'T touch the hot surface!
- Sprinkle some glitter into the water.
- Observe the glitter rising and falling.



Write this:

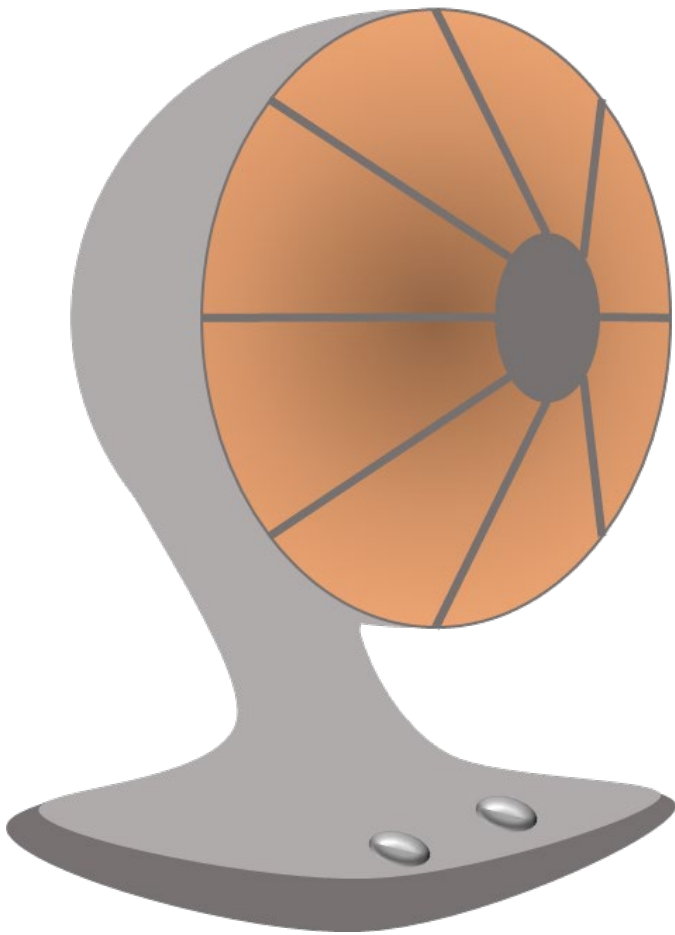
- How does this demonstrate convection?
- Which way is the heat flowing?
- How can you tell?

Discuss this:

- What could you do to increase convection?
- What could you do to decrease convection?

Station 3: Observing Radiation

Heat is transferred by radiation in the form of infrared light. All things lose energy by radiating that energy away. Heat is transferred when that energy is in the form of infrared radiation. This is how IR cameras and night vision goggles work.



Do this:

- Turn on the heat lamp. DON'T touch the heat lamp.
- Hold your hand in front of the heat lamp.
- Notice what you feel.

Write this:

- How does this demonstrate radiation?
- Which way is the heat flowing?
- How can you tell?

Discuss this:

- What could you do to increase radiation?
- What could you do to decrease radiation?

Station 3, cont.: Changing the Radiation, pg 1

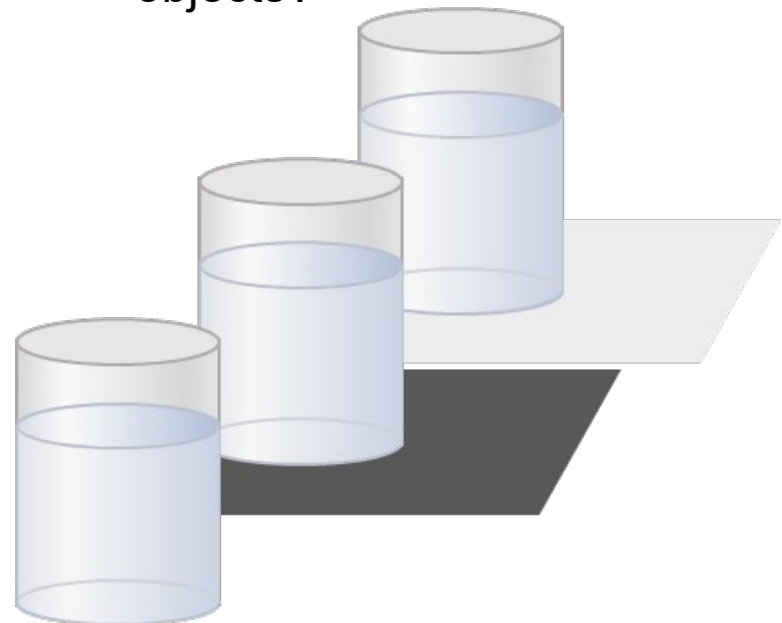
Different materials can affect how much heat is absorbed. Some colors absorb more heat, other colors absorb less heat. Some materials reflect radiation. You can change how much radiation is being absorbed by placing different materials in front of or behind the object.

Do this:

- Place several beakers of water in front of the heat lamp.
- Try to space them so they get the same amount of heat from the lamp.
- Place different sheets under or in front of the beakers.
- Have one beaker of water that is just there, as a comparison.
- Turn on the heat lamp for a minute or two, then turn it off.
- Compare the temperatures of the water in your beakers.

Write this:

- Which materials made the water heat up the most?
- Which objects made the water heat up the least?
- Did it matter where you placed the objects?



Station 3, cont.: Changing the Radiation, pg 2

Hints to make it work better:

- Do several tests with 3-4 beakers at a time, so that all the beakers are at the same distance from the heat source.
- Replace the water between tests, so that all the beakers are at the same temperature to start.
- Always use a beaker of water that is just there, for comparison.
- You might want to start with the beakers at the same temperature for each test, and heat for the same time each test.
- If you don't notice the temperature changing, try heating the water for a few minutes longer.

Discuss this:

- Why do some materials make the water hotter and some materials keep the water cooler?

