Questacon at HOME

Energy Activity sheet

Exploring Insulation 2: Keep Your Cool

BACKGROUND

House insulation is good for keeping us warm in winter, but it's also good for keeping us cool in summer! How can something that keeps us warm also help to keep us cool? In this experiment, we will design insulation to stop ice cubes melting, and learn about how insulation works in both hot and cold weather!

MATERIALS

- Ice cubes
- A plate or tray to hold the ice cubes
- A glass
- Insulating materials, e.g. Styrofoam, paper, fabric, cardboard, alfoil etc.
- Scissors, sticky tape and/or glue
- Timing device
- Pen and paper
- A sunny day!

SAFETY

This activity uses ice, which may become a slip hazard when it melts. When doing this experiment in the sun, remember to wear sunscreen, a hat and sunglasses. Adult supervision is recommended for young experimenters.

PROCEDURE

Setting up: Put two ice cubes on your plate. Cover one with a glass and leave the other ice cube uncovered. Place both of the ice cubes in direct sunlight. Make a prediction – will one ice cube melt faster than another? If yes, which one?

Make observations: Using a watch or timer, check the ice cubes every two minutes to find out how long it takes for each piece of ice to melt. Were the results what you expected?

Test materials: Wrap or cover the glass with one of your insulating materials (if possible), place it over another ice cube and repeat the experiment. You could also try wrapping or covering an ice cube directly. Make notes on which materials are best at insulating the ice cube.

Create insulation: Using what you have learned about your materials, design and test the ultimate insulation for an ice cube. Which works best – using the glass or not? Creating layers? Making the insulation tight or leaving space for air? Try a few different designs.

TIPS & TRICKS

- To ensure a fair test, make sure that you use ice cubes that are all in one piece – cracked or broken ice cubes will melt faster
- Resist the urge to constantly check your ice cubes, as this will stop your insulation working! Instead, check them at set time intervals.
- Changes in outside temperature will affect your results. Perform this experiment during mid-afternoon, when the temperature is warm and relatively stable.

WHAT'S THE SCIENCE?

Heat is a type of energy, and can be transferred via convection, conduction or radiation. In liquids and gases, **convection** means that hot air or liquid will rise, but the denser, cooler particles will sink down. Heat can travel through solid materials via **conduction** – this is why a frying pan will get hot when it's placed on a stove. Some materials conduct heat better than others. **Radiation** is when heat moves via light (like heat from the sun).

In this experiment, the sun's radiation was transferring heat energy to the ice cubes. When you place a glass over the ice cube, it acts a bit like a greenhouse – allowing the sun's radiation to transfer through and then trapping the heat energy inside. In the same way, the windows in our house let heat energy inside in the summertime.

Insulation slows the rate of heat transfer. Shiny materials, like foil, help reflect radiated heat away, whereas air-filled materials like Styrofoam act as a barrier to heat flow. In the same way, shade cloths, curtains, and insulation can stop the sun from heating up our house.

WHAT QUESTIONS COULD I ASK?

- Which ice cube do you think will melt faster? Why?
- Do you think this experiment would work the same way in the shade?
- How will you design your insulation? What materials will you use?

WHAT'S NEXT?

- **Change location:** Try the experiment inside, or in the shade. How do the results differ? Why?
- **Change your surface:** Put your ice cubes on a different surface, like grass, metal, plastic or brick. How does this affect your experiment? Why?
- **Play with colours:** Does colouring your insulation black or white make a difference?
- **Try it with hot stuff!** See some of the other Questacon-At-Home print out sheets for activities on insulation such as **Exploring Insulation 1: Feelin' Hot**. What principles are the same across the two activities? What is different? What conclusions can you draw from trying out both activities?