

Name _____

Investigating the temperature of the Air

Introduction

How can a hang glider stay up in the air for hours without a motor? How can a bird soar over an open field without flapping its wings? They can do these things largely because of heat transfer and the motion of the air. As the wings of a glider or a bird lift it up in the air, gravity pulls it down. This means that glider pilots and soaring birds need to find constant upward forces to stay in the air. Do you know where these huge forces come from?

In this lesson you will investigate what happens to air when it is heated or cooled by the surface beneath it.

Problem: State the problem we are investigating in this lesson.

1. _____

Hypothesis: Predict how the air temperature will change when the surface is heated or cooled.

2. _____

Materials

- 2 Convection Tubes
- 1 120 mL plastic container of hot water
- 1 120 mL plastic container of crushed ice
- 1 digital thermometer
- 1 ruler
- 1 paper towel
- 2 rubber bands
- 2 pieces of plastic wrap

Procedures

1. Collect materials
2. Record initial temperatures of both the ice and hot water.
3. Record the starting temperature of both thermometers in both cylinders on the data table. Write them across from Time 0:00. Thermometer A is the top thermometer.
4. Place the containers of hot water and ice underneath the convection tubes. Mrs. Reese will start the stop watch.
5. Record the changes in temperature in each convection tube every minute for 5 minutes in the Data table. If the temperature goes higher than the thermometer's highest temperature, you can record 30+ °C on your data table. (Do not touch the outside of the cylinder. Your hand may affect the temperature readings.)
6. If it gets difficult to see inside the convection tube, use a paper towel to remove moisture from the base. Attach paper towel to a ruler with a rubber band and use this device to clear the cylinder and base.

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Data

| | Hot Water Starting Temp | | ICE Starting Temp | |
|----------------|-------------------------|----------------------------|-------------------------|----------------------------|
| Time (Minutes) | Convection Tube A (Top) | Convection Tube B (Bottom) | Convection Tube A (Top) | Convection Tube B (Bottom) |
| 0:00 | | | | |
| 1:00 | | | | |
| 2:00 | | | | |
| 3:00 | | | | |
| 4:00 | | | | |
| 5:00 | | | | |
| | | | | |

Analysis

1. How did the temperature of each container of water affect the temperature of the air above it?
2. The movement of heat is called heat transfer. Describe the heat transfer between the container of hot water and the air. Describe the heat transfer between the container of cold water and the air.
3. Under what conditions was it difficult to see through a cylinder? Why do you think this happened?
4. Reread the introduction to this lesson. Which surface do you think birds would fly better over? Why do you think this is?