

Exploring Heat Transfers Lab

Introduction

Energy travels through space or material. Heat energy is transferred in three ways: **radiation, conduction, and convection**. **Radiation** is the transfer of energy by waves. Energy can travel as electromagnetic waves through air or empty space. The sun's energy travels through space by **radiation**. After sunlight heats the planet's surface, some heat radiates back into the atmosphere. In conduction, heat is transferred from molecule to molecule by contact. Warmer molecules vibrate faster than cooler ones. They bump into the cooler molecules. When they do, they transfer some of their energy. **Conduction** happens mainly in the lower atmosphere. **Convection** is the transfer of heat by a current. **Convection** happens in a liquid or a gas. Air near the ground is warmed by heat radiating from Earth's surface. The warm air is less dense, so it rises. As it rises, it cools. The cool air is dense, so it sinks to the surface. This creates a **convection** current. **Convection** is the most important way that heat travels in the atmosphere.

Problem/ Purpose

Observe and identify key characteristics of the three heat transfers by visiting different lab stations.

Procedure

1. Over the course of the class period, you will travel to four different tables to complete mini "labs and activities."
2. You will have five minutes at each table, Mr. Brennan will announce when to rotate.
3. The rotation of the tables will follow numerical. Example Table 1 will rotate to Table 2. Table 4 will rotate to table 1.
4. Each table will have its own unique activity and instructions. You must read the directions of each activity before you begin.
5. You will record your answers on this document under each respective Table section.
Example: Table 1 will be recorded under Table Section 1

Table Section 1 and Table Section 5.

Directions: Categorize the twelve cut-out illustration into the three heat transfers. Place each illustration on the Heat Transfer Chart under the heat transfer it demonstrates. Answer the following questions. When your done check your answers with the key in the envelope.

1. Write the numbers of the illustrations that are **Conduction**.

2. Write the numbers of the illustrations that are **Convection**.

3. Write the numbers of the illustrations that are **Radiation**.

4. Are there any illustrations that show more than one heat transfer, write the numbers of the illustration below.

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Table Section 2 and Table Section 6.

Directions: Record the temperature of the four thermometers for three minutes at one minute intervals and answer the questions that follow.

Surface	Temp at Minute 1	Temp at Minute 2	Temp at Minute 3
Black Sand			
Light Sand			
Black Felt			
White Felt			

1. What heat transfer is being demonstrated at this station? What evidence do you have to support your choice?

2. What surfaces of surfaces absorbed more heat? Which surfaces reflect more heat? How do you know?

3. What surfaces of Earth would absorb more heat than other surfaces? Which surfaces would reflect more heat?

Table Section 3 and Table Section 7.

Directions: Take an ice cube from the cooler and place it in a bag. Have one person start the stopwatch and time how long it takes to use your body to melt the ice cube. When you are finished pour the water into sink and make sure there are no puddles on the table or ground.

1. What heat transfer is being demonstrated at this station? What evidence do you have to support your choice?

2. Why did the ice melt? Where did the heat move to?

3. Where on Earth does this heat transfer naturally take place?

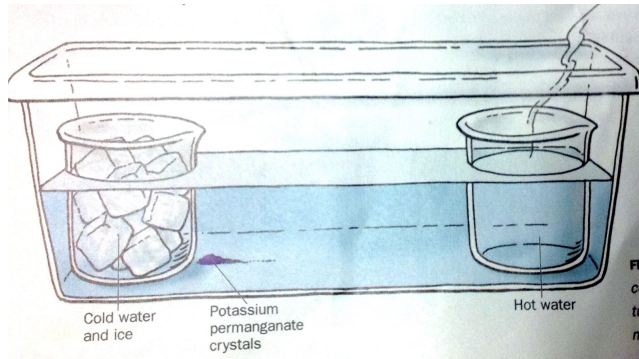
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Table Section 4 and Table Section 8.

Directions:

- A. Fill 1st beaker with ice and place at one end of the of the plastic container.
- B. Fill the 2nd beaker with hot water and place at the opposite end of the plastic container.
- C. When your set up looks like the picture below inform Mr Brennan he will give you a spoon of Potassium Permanganate Crystals.
- D. He will place the PMC near the Ice. Looking from the side of the container watch the movement of color and crystals in the water. Record your observations.

Set Up



1. What heat transfer is being demonstrated at this station? What evidence do you have to support your choice?

2. What caused the dye to sink? What caused the dye to rise?

3. Where on Earth does this heat transfer naturally take place?

Analysis Question: Answer in full and complete sentences

1. Choose one on the three heat transfers and design a lab activity you could do to demonstrate it. What evidence would you look to show that you've achieved a heat transfer. Be creative in your designs.
