Name Date Period

Heat Transfers

Introduction:

Heat is transferred between objects in 3 ways, conduction, convection, and radiation. In this lab you will observe and identify each type of heat transfer. Be careful to follow the instructions to each experiment carefully so that they will work. Read the background information on types of heat transfer to help you identify which one is occurring in each experiment.

Types of Heat Transfer:

Conduction is heat transfer between two objects that are touching each other. When two objects touch and one has a higher temperature than the other; heat is transferred to the object with the lower temperature. When you touch something hot it feels hot because heat is being transferred from the object to your hand. When you touch something cold it feels cold because heat is being transferred from your hand to the object.

Convection is the transfer of heat between molecules of a liquid or gas as they move in a circular pattern due to changes in temperature and density. For example, when you turn on a lava lamp, the wax at the bottom heats up and begins to melt. As the temperature of the wax melts it becomes less dense so it starts to rise. As it rises it gets farther from the heat source, so it starts to cool. As it cools it becomes denser and sinks; starting the process over.

Radiation occurs when heat is transferred between two objects that are not touching each other. In radiation, heat is transferred from one object to another by electromagnetic waves of energy. For example, when you stand in sunlight you can feel the energy that traveled to your body through electromagnetic waves across millions of miles distance.

Safety Precautions: Be careful with glassware so that it doesn't crack or break. Be careful not to spill. Do not touch light bulbs, the heat pad, or any other hot object. Use a hot pad to carry hot objects from one place to another.

Procedures. Write the data for each experiment on your paper. If there are questions for the experiment, answer them. Write a summary paragraph for each experiment.

Experiment 1:

Materials: 2 thermometers, 2 dark cloths, heat lamp

1. Get two thermometers. Record the temperatures of the classroom in °Celsius for 0 minutes.
2. Wrap the thermometers in dark cloths, label it with your group's name, and place one wrapped thermometer in front of a heat lamp and leave the other on your table.
3. Draw the table below on your paper and record the temperature of the thermometer every 5 minutes for 20 minutes. (You may move on to other experiments once this one is set up.)

Time	Temperature °C With light	Temperature °C Without light
0 minutes		
5 minutes		
10 minutes		
15 minutes		
20 minutes		

4. Write 1-3 sentences explaining the cause of change in temperature experienced by the thermometer. Make sure you identify the objects that heat is transferred between and state what type of heat transfer is taking place.

Experiment 2:

Materials: hot water, cold water, small glass bottle with a lid, 4 small marbles or rocks to weigh down the small bottle, 1000 mL beaker, paper towels, hot pads

1. Pour 800 mL of cold water into a 1000 mL beaker. Place paper towels under your beaker in case it spills during the experiment.
2. Get a small glass bottle and put 4 small marbles or rocks in it. Fill the bottle with colored hot water.
3. Carefully lower the glass bottle into the cold water so that the bottle sits upright in the water. Do not let any of the hot water spill as you lower it into the 1000 mL beaker.
4. Draw a picture of your results. Draw arrows inside your picture to show what direction(s) the water moves and color the different temperatures of water different colors.
5. Draw and color another picture of your experiment after all of the hot water has moved out of the glass bottle.
6. Write 1-3 sentences describing the movement of hot water out of the glass bottle as well as any movement of the cold water. Explain why the water moves in the way that it does. Make sure you relate the movement of water to its temperature and density and state what type of heat transfer is taking place.

Experiment 3:

Materials: 100 mL beaker, hot water, hot pads, metal spoon and a wooden splint, chopstick or popsickle stick.

1. Get a 100 mL beaker.
2. Hold the beaker in your hand. Does it feel hot or cold?
3. Pour hot water into the beaker. Be careful not to spill. If needed, use a hot pad to carry the beaker back to your desk.
4. Touch the side of the beaker with two fingers. Does it feel hot or cold? How does its temperature compare to before you poured the hot water in?
5. Place a metal spoon and wooden object in the water and allow them to sit for 5 minutes. Record how each feels.
6. Write a 1-3 sentences explaining the cause of change in temperature experienced by the beaker and spoons. Make sure you identify the objects that heat is transferred between and state what type of heat transfer is taking place.