

# MiSP Thermal Conduction Worksheet #1 L1

Name \_\_\_\_\_

Date \_\_\_\_\_

## HEAT TRANSFER

### Introduction

Areas that have heat energy are called *heat sources*. Areas that have little or less heat energy are called *heat sinks*.

In this lab activity you will determine the direction in which heat energy flows between a heat source and a heat sink, and you will determine how the temperature changes.

### Problems

- In which direction does heat energy flow: *from source to sink* or *from sink to source*?
- What happens to the temperature of hot and cold water connected with an aluminum bar?

### Hypothesis

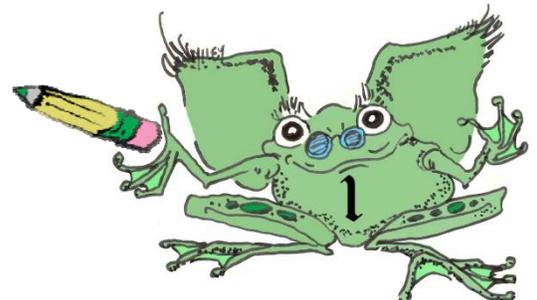
If a container of hot water (the heat source) is connected to a container of cold water (the heat sink) with an aluminum bar, the heat will transfer from the **heat source** / **heat sink** (*circle one*) to the **heat source** / **heat sink** (*circle one*).

### Materials:

- goggles
- 2 insulated containers with lids and an aluminum connecting bar
- warm water (approximately 100°C)
- cold water
- 2 thermometers
- color pencils
- timer

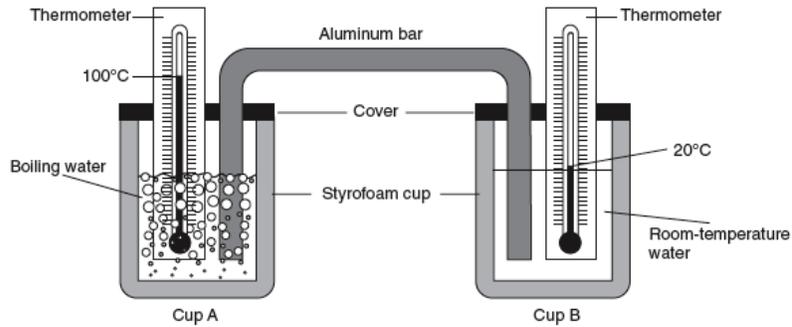
### Safety:

- Wear goggles.
- Use caution when handling the hot water.



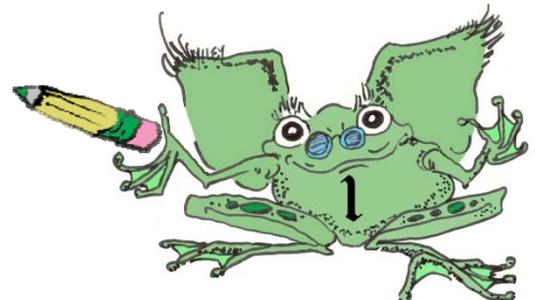
## Procedure:

(Note: Your teacher may supply water with temperatures different than those in this diagram.)



Check off each step as you complete it.

- Set up the heat transfer kit as in the diagram above. The thermometer bulbs and the bottoms of the aluminum bar should be near the bottom but NOT touching the bottom of each Styrofoam insulated container.
- Measure 150 ml of hot water and the same amount of cold water, and add the hot water to one insulated cup and the cold water to the other.
- Gently place the lids with aluminum bar and thermometers on the cups at the same time. (Be careful not to submerge the lids.)
- Wait 15 seconds for the thermometer to get a reading. Then record the initial temperature (time 0) of the water in each cup on the data table.
- Continue to record in the data table temperatures for both cups each minute for 15 minutes (or longer if your teacher indicates a different time).



**Record your data:**

Record in the data table the temperatures for both cups each minute.

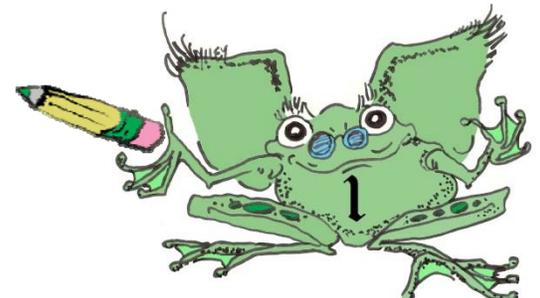
**Data Table Temperatures**

Time (minutes)	Temperature °C Hot water cup	Temperature °C Cold water cup
0		
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		

**Graph your data:**

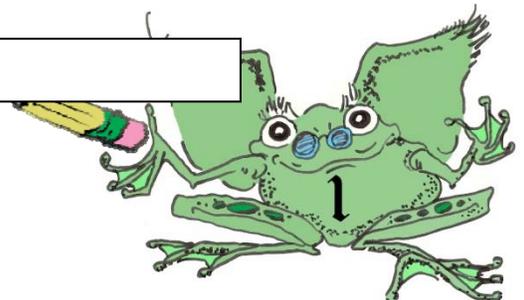
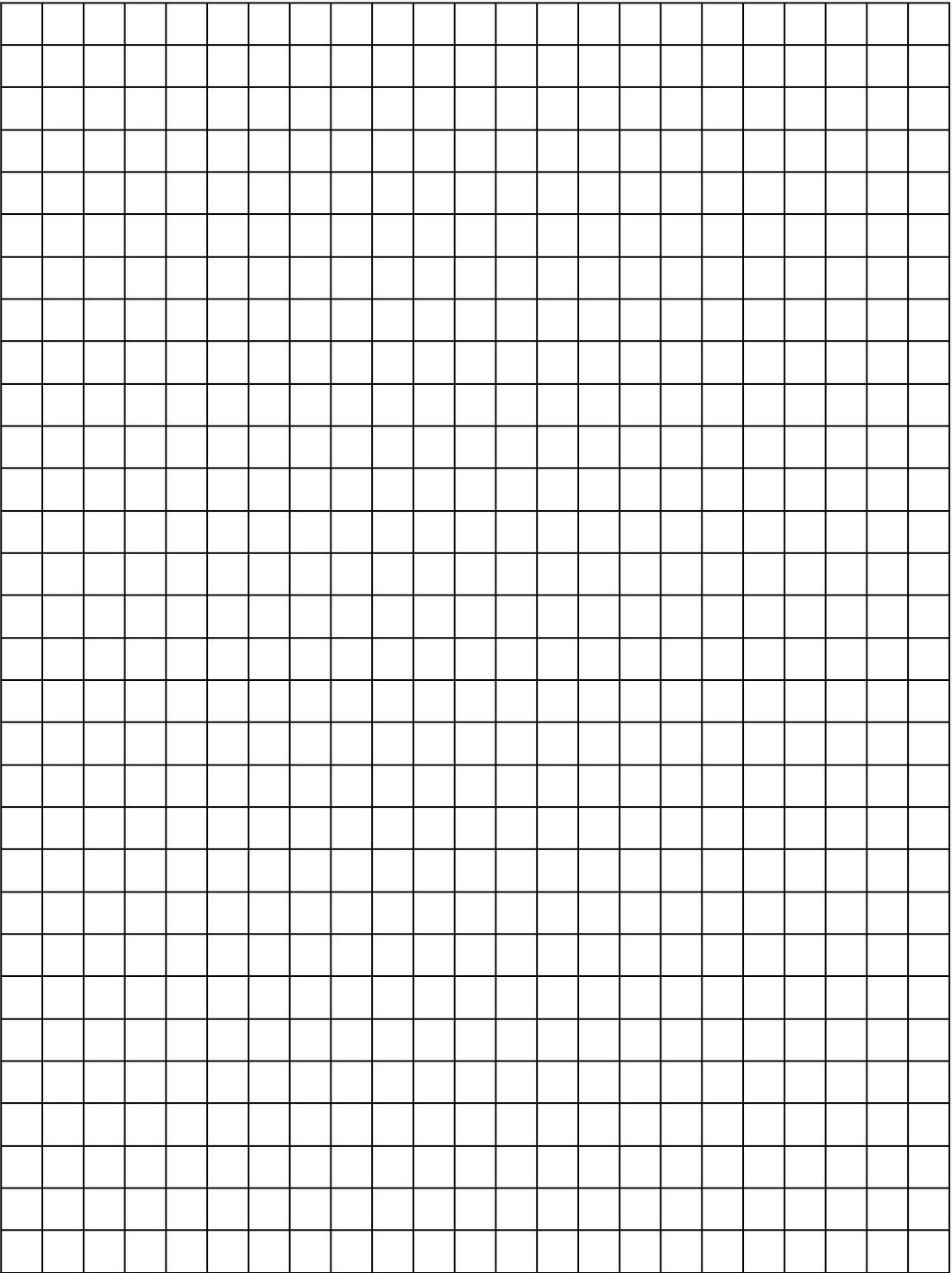
Graph the above data on the next page to show the relationship between time (minutes) and the temperature (°C) in each cup.

- Label the  $x$ -axis.
- Label the  $y$ -axis.
- Connect the dots for each cup's data set (hot water cup, cold water cup). Use two different colors and write a key for the graph.



Title: \_\_\_\_\_

Key  
Warm water line:  
Cold water line:



## Discussion Questions:

Answer each of the following questions.

1. Which container is the heat source? \_\_\_\_\_

2. Which container is the heat sink? \_\_\_\_\_

3a. Which container “lost” heat energy? \_\_\_\_\_

3b. Since energy is never lost or created, where did the heat energy go?

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4. In this experiment, the heat energy moved from the \_\_\_\_\_ container to the \_\_\_\_\_ container or from the **heat source** / **heat sink** (*circle one*) to the **heat source** / **heat sink** (*circle one*).

5. What method of energy transfer occurred in this experiment? (*Circle one.*)

**Conduction**

**Convection**

**Radiation**

6. How did the graph of the cold water cup temperatures compare to the graph of the hot water cup temperatures?

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7. Predict how the temperature in the cold water cup would compare to the temperature in the hot water cup if the experiment was allowed to continue for a longer time.

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