Heat Transfer By Conduction

Name_____Date_____Period___Group___

INTRODUCTION: Where there is a difference in temperature between any two objects or regions in contact, energy will be transferred from objects or regions with higher potential heat energy to objects or regions of lower potential heat energy by conduction.

While some heat is released from Earth's interior, most energy is absorbed at Earth's surface in the form of radiant energy from the sun. Conduction of heat is a slow process for moving heat within the air or ocean water. However, conduction is a significant process in transferring heat between Earth's surface and the air in contact with that surface.

It's also an important means of transferring heat energy between objects used on a daily basis, as in the excess heat of a car's engine being absorbed by the water in the cooling system, to be expelled through the radiator or to warm the passenger compartment. An electric blanket also transfers it's heat energy to a person by the process of conduction.

OBJECTIVE: To measure and explain heat flow by means of conduction from one region to another.

Problem: If a container of cold water is connected to a container of hot water with a metal bar, in which specific direction will heat flow, from the cold water to the hot water, **or** from the hot water to the cold water ?

MATERIALS: All equipment and materials are shown in the below diagram.

Procedures:

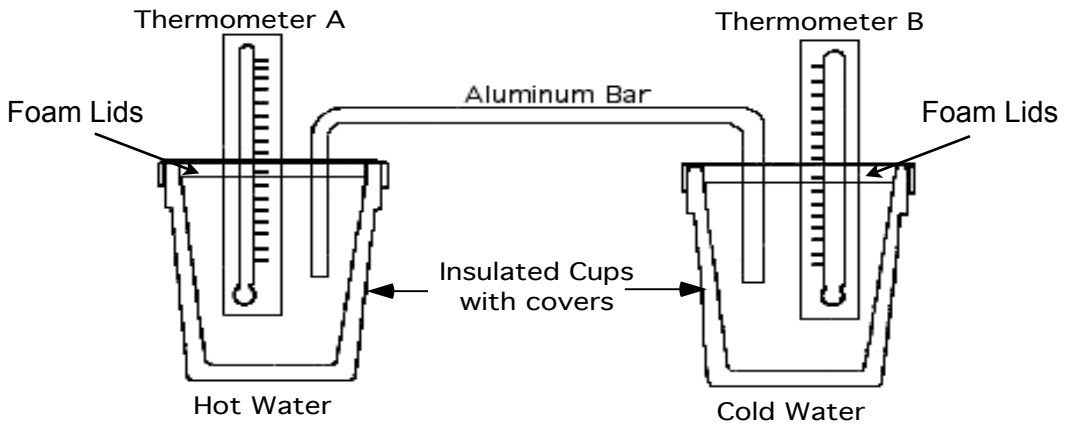
1. Assemble the equipment as illustrated by the diagram below.

2. You need to fill one insulated cup/calorimeter with cold water 1/2 inch from the top while your teacher fills the other with hot water to a similar depth. Quickly replace the lid assembly.

3. When the thermometer in the "hot" cup/calorimeter reaches its highest point, record this temperature to the nearest 0.1ºC next to Time "0" on your data chart. At exactly the same time your partner should read and record the temperature of the "cold" cup/calorimeter. Now start your timer and keep it running until you're done with the investigation. Do not stop the timer while recording temperatures!

4. Now continue to take temperature readings for both cups at one minute intervals for a total of 20 minutes.

5. Graph the recorded data by connecting points, drawing both curves on one graph. Use time for the x-axis and temperature for the y-axis. Include the correct units. Make a labeled key to indicate which curve is for the hot water and which curve is for the cold water. You can use different symbols for the hot and cold data points or you can color code the two curves. Continue drawing the tick marks present, keeping them the same distance apart, and continue numbering each axis using the same numerical scale already started for you.



Questions:

1. At the start, which cup/calorimeter had the greater temperature? _____

2. Which calorimeter lost heat energy, the hot one **or** the cold one? _____

3. From which calorimeter **to** which calorimeter did the heat energy flow?_____

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4. Some of the heat lost by the hot water did not make it into the cold water. Identify two specific places or things where the heat energy did go. (complete sentence answer)

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Time in Minutes	Temperature of "Hot Cup" in ºC to nearest .1ºC	Temperature of "Cold Cup" in ºC to nearest .1ºC	Time in Minutes	Temperature of "Hot Cup" in ºC to nearest .1ºC	Temperature of "Cold Cup" in ºC to nearest .1ºC
0			11		
1			12		
2			13		
3			14		
4			15		
5			16		
6			17		
7			18		
8			19		
9			20		
10			21		

5. If the experiment were left standing for 24 hours, what would happen to the temperatures of the two calorimeters? Tell specifically what would happen to the hot calorimeter **as well as** the cold calorimeter! (complete sentence answer)

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Sources of Error : Identify ***two*** things that people may have done incorrectly that would have caused them to get totally different answers from the rest of the class. These errors must be unique, in other words they have not been applicable in previous labs. They must be ***new*** sources of error. Be ***specific*** about what might have been done.

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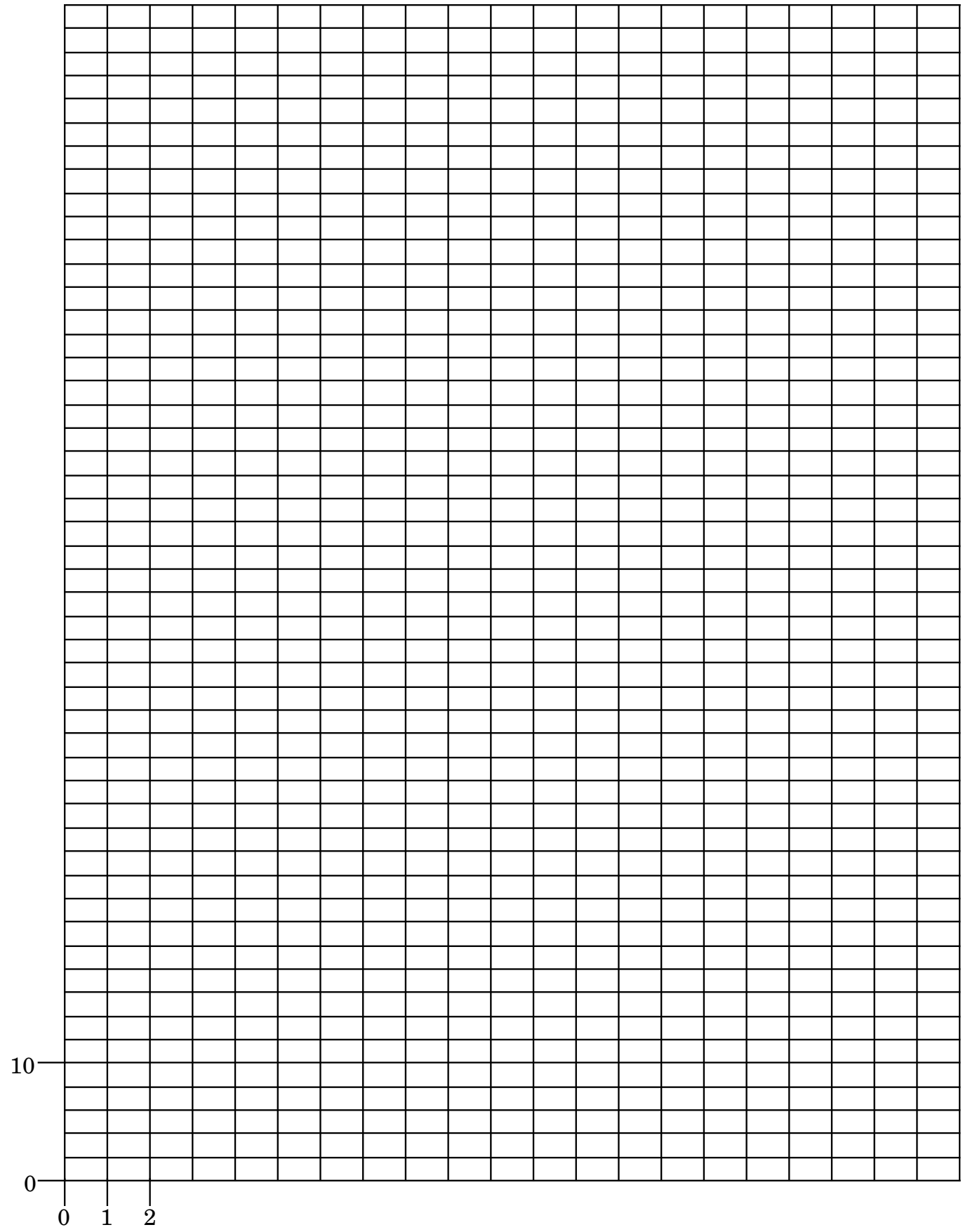

Key: Cold- Hot-