LAB: HEAT TRANSFER by CONDUCTION

NAME _____

INTRODUCTION: Where there is a differences in temperature between any two objects or regions in contact, energy will be transferred from high potential to low potential by conduction. While some heat is released from Earth's interior, most energy is absorbed at Earth's surface from 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.

OBJECTIVE: You will be able to measure and explain heat flow by means of conduction from one region to another.

VOCABULARY:

conduction: - the transfer of heat between colliding molecules, especially in solids.

rate of change: - the change in some field value divided by the change in time; or the speed at which change occurs.

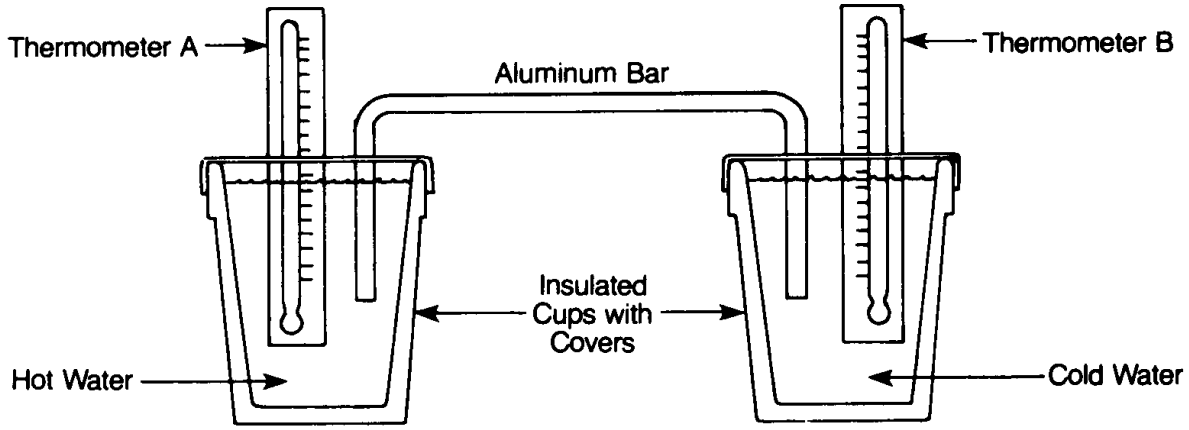
calorimeter: - a device for measuring heat generated within it by a phase change.

conservation of energy: - the principle that energy can neither be created nor destroyed, but can be transformed from one type to another without any loss of energy, in a "closed system," where no energy is gained or lost.

PROCEDURE:

1. Calibrate the thermometers as directed by your instructor.
2. Assemble the equipment as illustrated by the diagram below.

! Make sure the thermometers are inserted at equal depths into the water !



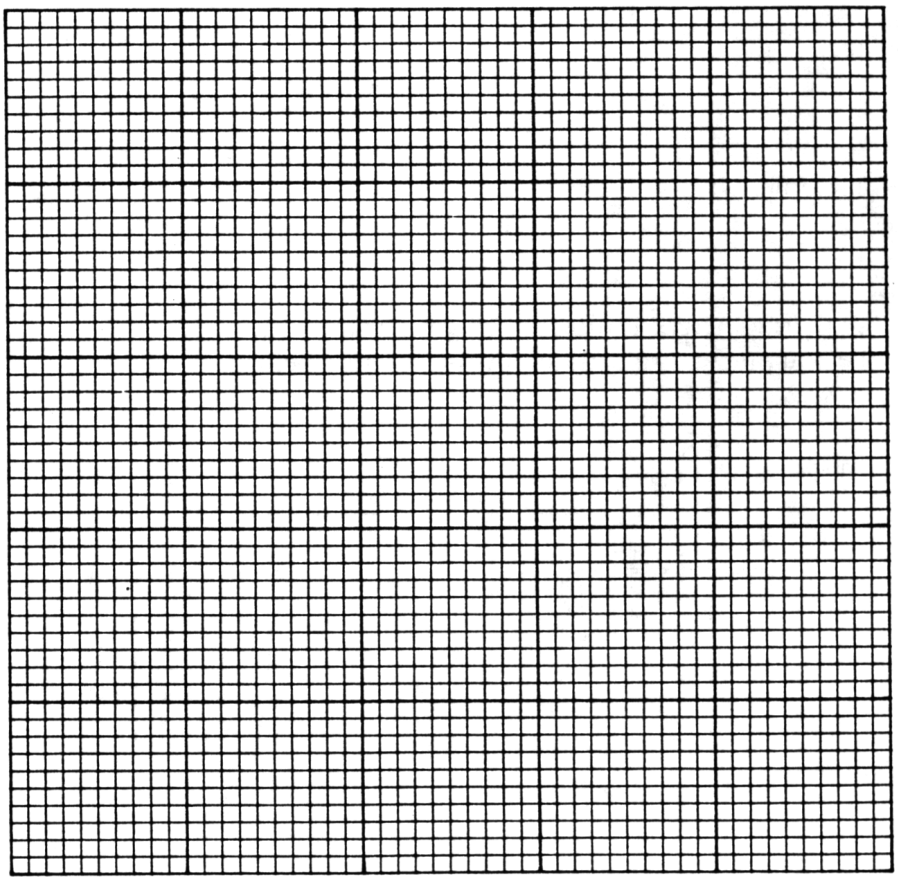
3. Fill one insulated cup with cold water and the other with boiling water. Quickly replace the lid assembly.
4. When the thermometer in the "hot" cup reaches its highest point, record this temperature under Time 0 on your Report Sheet. At exactly the same time your partner should read and record the temperature of the "cold" cup.
5. Continue taking temperature readings for both cups at one minute intervals for a total of 20 minutes.
6. Graph the recorded data, drawing both curves on one set of axes. Use time for the horizontal axis.

REPORT SHEET

TIME IN MINUTES	0	1	2	3	4	5	6	7	8	9	10
Temperature of "Hot Cup" in °C											
Temperature of "Cold Cup" in °C											

TIME IN MINUTES	11	12	13	14	15	16	17	18	19	20
Temperature of "Hot Cup" in °C										
Temperature of "Cold Cup" in °C										

HEAT TRANSFER BY CONDUCTION GRAPH



Red line =

Blue line =

DISCUSSION QUESTIONS: *(Answer in Complete Sentences)*

1. At the start which calorimeter had the most potential energy?

2. Which calorimeter lost energy?

3. Which calorimeter was a heat source?

4. In which direction did the heat energy flow?

5. Compare the amount of energy lost by one cup to the amount of energy gained by the other cup.

6. Explain the difference between the amount of energy lost by one cup and amount of energy gained by the other.

7. How does your graph show that there is a change in the *rate* of the heat lost or gained as time passed?

8. How did the *rate* of heat loss from the hot cup change during the experiment?

9. If the experiment were left standing for 24 hours, what predictions could you make about the temperatures of the cups?

10. How could you modify the equipment to increase the rate of heat transfer from the hot cup to the cold cup?

11. Explain why there is a change in rate of energy exchange as time passes.

CONCLUSION: Explain *how* heat energy is transferred from the water in one calorimeter to the water of the other calorimeter.