



Lab

Watching Heat Move

Before letting students work on this lab, make sure they are familiar with the three types of heat transfer. There is quite a bit of setup with the three different stations. The lab can be broken up into three parts, with each station being done separately. Even with the time-consuming nature of this lab, it is a very good lab for learning heat transfer. This is a concept you will be glad your students learn when they take physics and chemistry in high school, so it is worth the time.

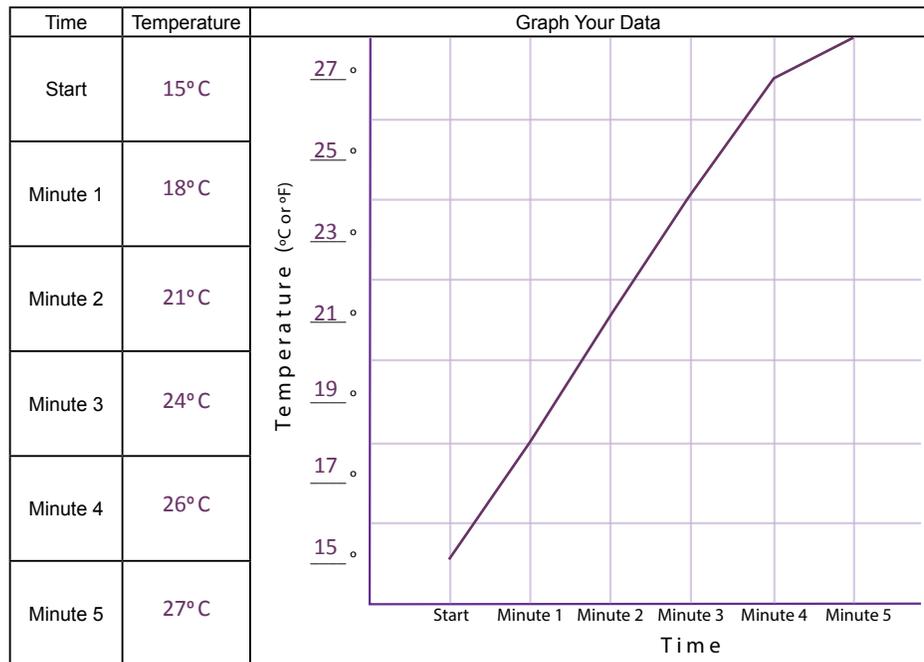
Note: Station 2 can be a little finicky. Make sure the aluminum foil is tightly folded over. This lab uses three different heat sources. Adult supervision is recommended.

Lab Sheet Suggested Answers

Station 1

Hypothesis: *Radiation is the correct choice. If your student does not choose radiation, you should go over the three types of heat transfer. The three types of heat transfer is an important concept to learn and understand.*

Graph Your Data: *Answers will vary. Below is a sample graph, so you can get an idea what the graph should look like.*



Observations:

What is the relationship between time and temperature? *The temperature increased with each passing minute.*

Did the temperature increase at a steady rate or not? *The temperature increased at a steady rate until 27° C when it began to taper off.*

Conclusions:

What type of heat transfer did you observe at Station 1? *The heat transfer observed was radiation.*

Do you think the temperature of the thermometer was as hot as the light bulb? Give a reason why you think it was or wasn't. *No. I think some heat was lost to the air.*

Was there direct contact of the thermometer to other molecules? *There was direct contact of the thermometer to air molecules.*

Was there airflow to the thermometer? *Air moves constantly, so there was some airflow to and around the thermometer.*

How did the heat travel from the light bulb to the thermometer? *Heat traveled from the light bulb to the thermometer as waves of electromagnetic radiation.*

Give an example from astronomy or earth science of how this type of heat transfer occurs naturally. *The sun heating the earth*

Station 2

Hypothesis: How do you predict heat will be transferred at this station? *conduction*

Time	Temperature at 1 st thermometer	Temperature at 2 nd thermometer
Start	19.9° C	19.9° C
Minute 1	21.8	20.4
Minute 2	25	21.1
Minute 3	28.7	21.4
Minute 4	32.8	21.7
Minute 5	37.3	22.2
Minute 6	42.3	22.7
Minute 7	47.2	23.3
Minute 8	52	24.2
Minute 9	56.7	24.9
Minute 10	61.7	25.9

Observations:

What is the relationship between time and temperature? *The temperature increased with each passing minute.*

Did the temperature increase at a steady rate or not? *The temperature at both thermometers increased at a steady rate.*

Conclusions:

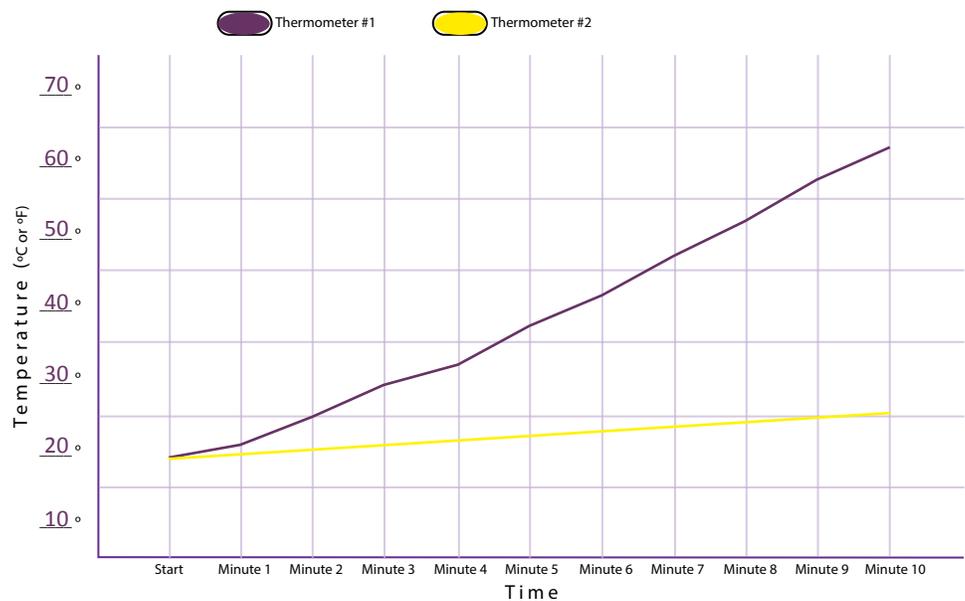
What type of heat transfer did you observe at Station 2? *The heat transfer observed was conduction.*

How did the heat move through the aluminum foil? *The aluminum foil was in contact with the burner, and the heat from the burner moved its way through the aluminum foil.*

Explain your observations about changes in the temperature difference at each thermometer. *The temperature increased more slowly for the thermometer that was farther away from the heat source.*

What happened to the heat going from thermometer one to thermometer two? In other words, why didn't the temperature at both thermometers go up by the same amount? *Some of the heat was lost to the air through radiation. Therefore, not as much heat transferred through the aluminum foil to the second thermometer.*

Give an example from astronomy or earth science of how this type of heat transfer occurs naturally. *When you step on sand and it is hot. The sand is conducting heat to the soles of your feet.*



Station 3

Time and temperature numbers will vary.

Hypothesis: How do you predict heat will be transferred at this station? *convection*

Observations:

What is the relationship between time and temperature? *The temperature increases with passing time.*

Describe what happened to the food color and to the glitter as the water heated. *The food color began to swirl around the bottom in long tendrils coming from the food color drips that it been dropped into the cold water. The glitter moved from the bottom, where it was hot, up to the top of the water. Then the glitter floated to the outside of the baking dish. It fell to the bottom and the sides as the pieces cooled.*

Conclusions:

What type of heat transfer did you observe at Station 3? *Convection*