

## Heat: An Agent of Change

## Three Methods of Heat Transfer

### STUDENT ACTIVITY

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#### PROBLEM

In what ways does heat move from one object to another?

#### PROCEDURE

Participate in an introductory class discussion about heat. Write your definition of "heat" as you understand the word now.

Give examples of heat moving from a hot object to a cooler object.

#### Station 1: Wax Dot Demonstration:

Read the safety rules for this station before beginning. Remember to wear your safety goggles at all times.

Examine the equipment on the table. You will notice the metal rod has wax dots on it. How will you get the wax dots to melt in order, without putting the heat directly on the wax? Talk with your group about it and write your ideas here.

While one person sets up the equipment to try your idea, another member of your group should draw and label the set-up in the lab book to share later with the other members of the group. Be sure to label the heat source.

Try your idea. What happened?

If the wax melted, discuss your ideas about how the heat got from the source to the wax and how it interacted with it. If it didn't melt, what adjustments could you make to your procedure? If you have time, make the adjustments and test it again.

If you know the term for this kind of heat transfer, write it here. If you don't, wait until the discussion of this experiment. (It's OK if you don't know it now!)

**Station 2: Hot Air Rises:**

Your challenge in this station is to get the paper spiral to twirl using only this equipment. Discuss with your group how this could be done and why you think this would work.

Decide on a set-up to test your ideas. While one person is setting it up, another person should be drawing and labeling your set-up and the heat source. Are your safety glasses still on?

Try your ideas. What happened?



If the spiral moved, write an explanation of what happened here. If it didn't, think about how you could alter the experiment to get the results you desire. If you have time, try it.

If you know the name for the this type of heat transfer, write the name of it here. (If you don't know, it's OK.)

**Station 3: Measuring Infrared's Temperature:**



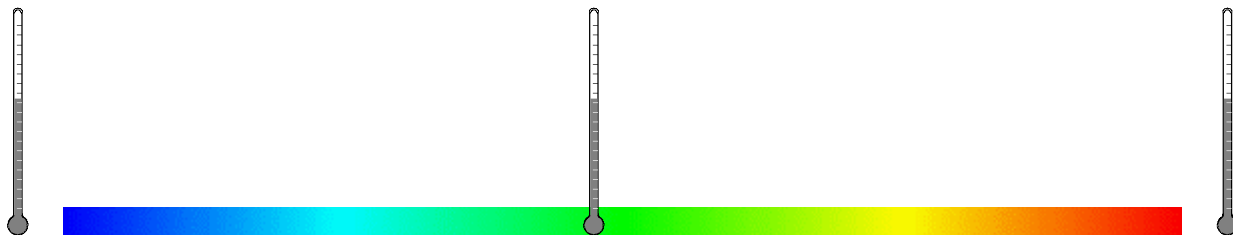
This station is a little more complex than others, and accurate measurement is critical. Be very accurate with your readings. Did you know that safety goggles do not interfere with accurate thermometer readings? Are you wearing yours?

The prism will break up white light into its various colors that we call the **spectrum**. Position the prism so that the spectrum can be seen on a tabletop. Place a thermometer or thermistor on each end of the spectrum (infrared and ultraviolet). Then place the third one on any color of the spectrum your group chooses. Allow the instruments a little time to adjust to the new placement. While this is happening, draw and label the set-up and heat source in your lab book.

Thermometer in ultraviolet

Thermometer in visible light

Thermometer in infrared

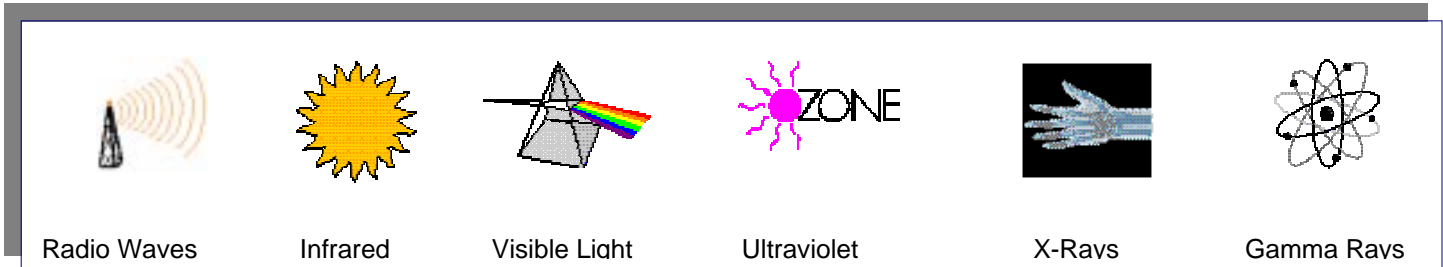


Read the thermometers. What did you notice?

Explain what happened and try to answer these questions:

Where did the energy come from that caused the thermometers to change temperatures? How did it get from there to the thermometers? What did you notice about the differences in the temperatures across the spectrum? If you know the correct name for this kind of heat transfer, write it here. (It's OK if you don't know now.)

### Various Wavelengths of Energy



#### Station 4: Friction:

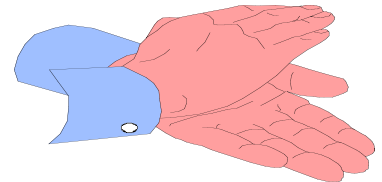
Put your hands to your cheeks. Describe the temperature of your hands.

Rub your palms together very quickly for about a minute. Place your hands on your cheeks again. Describe the temperature of your hands now.

You should have noticed a change in temperature. If you did not, rub your hands together for a longer period of time until you feel a change. What other things do you observe about your hands?

What caused the heat?

What types of energy are involved?



You have illustrated what would happen in an automobile engine if we did not put oil into the engine. The pistons would rub against the wall of the engine and become so hot that they would "freeze up." That's a funny word because just the opposite is happening. They are expanding because they are getting hot and can't move against the cylinder walls.

What is the oil used for?

Now you know why everyone says to check a car's oil often.

If you know the correct name for this kind of heat transfer, write it here. (It's OK if you don't know now.)

## CONCLUSION

### Homework Assignment:

As you return home tonight, find at least one example of each kind of heat transfer and be ready to report on it to class tomorrow.

Fill in the following chart summarizing the differences you have discovered between the three methods of heat transfer.

<b>Methods of Heat Transfer</b>	<b>Occurs Mainly in What Materials?</b>	<b>Example</b>