

## **Norwood Science Center**

### Technology Grade 1

#### **BACKGROUND INFORMATION:**

For a different explanation of temperature, visit the Weather page on the Science Center Web site.

Heat is a form of energy. Heat energy is measured by the use of a thermometer. There are two common scales used to measure heat; Fahrenheit, which is used by people in the United States, and Celsius. Everyone else on the planet uses Celsius. A third scale, the Kelvin or Absolute scale is used in science because it contains no negative numbers.

The most popular thermometer used in classrooms has a glass or plastic tube centered on a card. There is a bulb or reservoir at the bottom of the tube. The tube is sealed at the top. The tube contains rubbing alcohol that has been dyed red. In the old days the liquid was mercury. Mercury is an extremely toxic material. It was a lot of fun to play with but it is extremely hazardous, so we go with the red alcohol thermometers.

The smallest amount of alcohol you can have and still have the alcohol is called a molecule of alcohol. You could never see the alcohol molecule, but there are a great many in the tube centered on the plastic card. Each of these molecules has a given amount of

heat. When these molecules have heat they move around a little bit, bumping into the other alcohol molecules. At a measured temperature the molecules have bumped into each other and take up a certain space or volume. The distance the given volume of alcohol has moved up the glass tube determines this temperature.

When the heat is increased the molecules move faster, bump into each other at a higher rate and the volume of the alcohol increases. This is made more noticeable by the narrow tube. As the heat increases, the temperature reading increases.

On the other hand if the thermometer is placed in an environment where there is less heat, the molecules slow down. The rate at which they strike other alcohol molecules decreases and the volume decreases. That is why the temperature reading on a cold day is less; the alcohol has a smaller volume due to the decrease in heat.

**TITLE: THERMOMETERS**

**PURPOSE:** Classify objects according to relative temperature

**MATERIALS:** (per pair)  
Two thermometers  
One cup of warm water  
One cup of cold water  
Two temperature worksheets\*

**\*Note:**

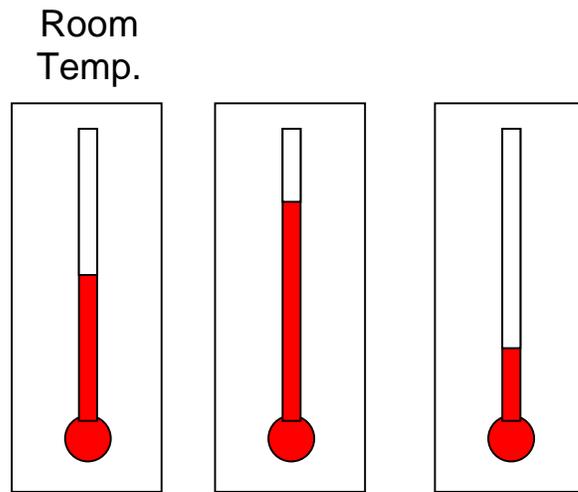
There is a second worksheet included in this document. It has the words warmer and cooler above the thermometer diagrams. This would be appropriate for students who are not yet comfortable writing out the words. They can just circle their choice.

Feel free to use one worksheet or the other, or mix them according to the needs of your students.

**PROCEDURE:**

01. Divide students into pairs.
02. Distribute one thermometer to each student.
03. Poll the students as to the meaning of the letters C and F on the top portion of the thermometer.
04. Have the students place the thermometer flat on their desk. The thermometer should be close enough to them that they can clearly see the red alcohol in the tube.
05. The thermometer is measuring Room Temperature. Ask the students if they think they are warmer or colder compared to the temperature in the room. A show of hands will do nicely.

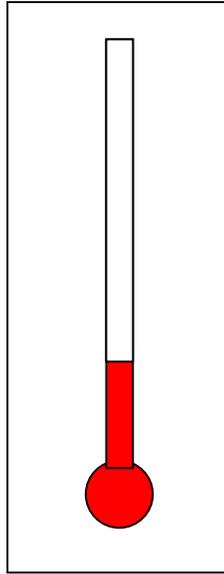
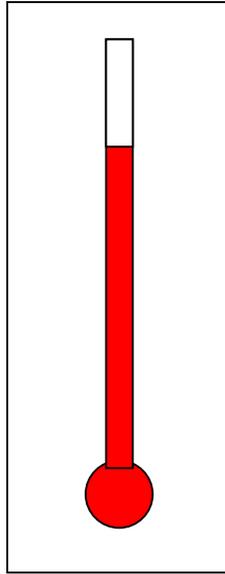
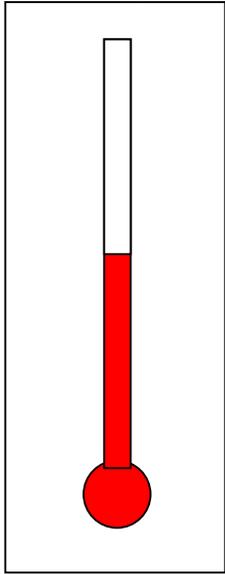
06. Tell the students they are to gently place their fingers on the little ball, or bulb, at the bottom of the thermometer. They want to cover the bottom portion of the thermometer with their little warm fingers.
07. As the students warm the thermometers the volume of the alcohol will increase. This will result in the level of the alcohol rising in the thermometer. The temperature will go up.
08. After the class has been settled down after this most wondrous event, distribute two cups to each pair of students.
09. Fill one cup half way with warm water.
10. Ask the students to place one finger in the air. That is the finger they will use to check the water. Both partners are to put one finger into the water just far enough so they may get a sense of the heat level, or temperature, of the water. The question asked is, “ Do you think the water is warmer or colder compared to the temperature of the room?”
11. The person who has the water on their desk is to pick up their thermometer, by the top of the card, and hold it over the cup of warm water.
12. On the count of three the student lowers the thermometer into the cup and lets it go so it leans against the back of the cup. This will allow both students to see the change in the thermometer.
13. Students are to watch the alcohol rise as the thermometer records the temperature of the warm water.
14. Distribute thermometer worksheets to each student. The thermometer on the left-hand side of the worksheet represents the thermometer as it read room temperature.



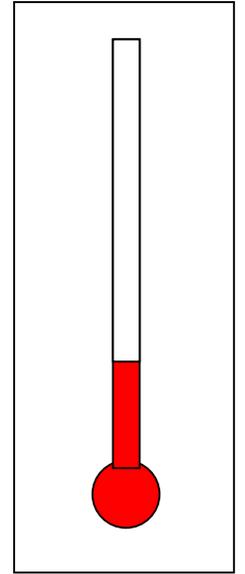
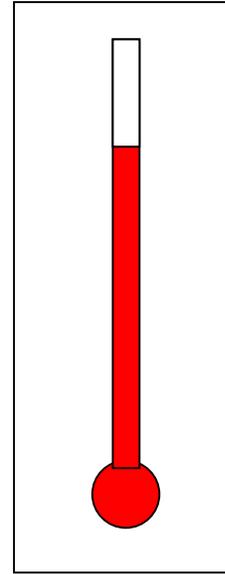
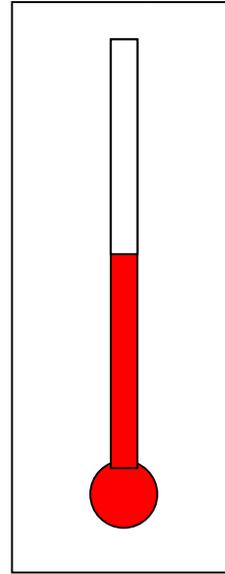
15. The students are to look at their thermometer in the warm water cup and decide if the alcohol went up or went down as the thermometer was placed into the warm water.
16. The students are to look at the two unlabeled thermometers on the worksheet. They are to figure out which of the two unlabeled thermometers represents the thermometer that is in the warm water.
17. Once the partners have decided which unlabeled thermometer represents the thermometer in the warm water they are to label it as warm(er).
18. Fill the second cup on the desks with cold water.
19. Each student makes the same temperature check with a single finger.
20. The student who is visiting gets to drop their thermometer into the cold water cup.

21. Students label the last unlabeled thermometer as colder.
22. For a really exciting time, have one student take the warm water thermometer out of the warm cup of water and place it in the cold-water cup. The change in temperature is dramatically demonstrated.
23. To bring the fun in the class to the limit, have the second student place one of the cold-water thermometers in the warm cup of water. Nothing like a graphic demonstration to reinforce a principle.

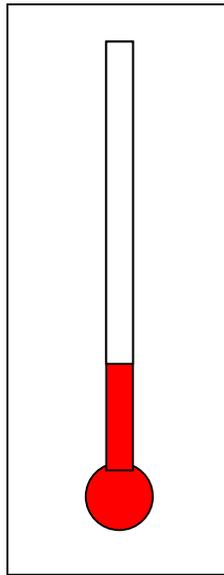
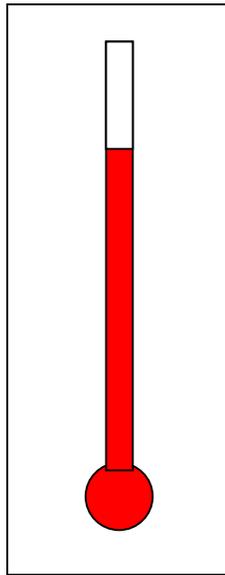
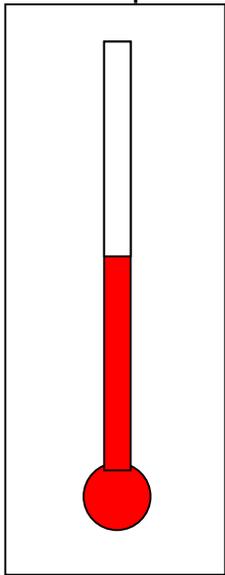
Room  
Temp.



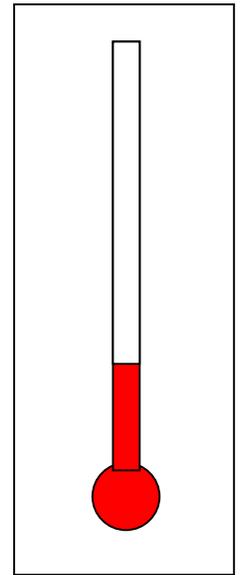
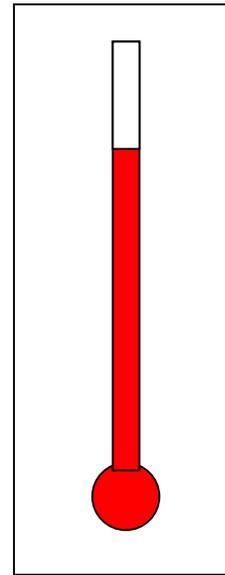
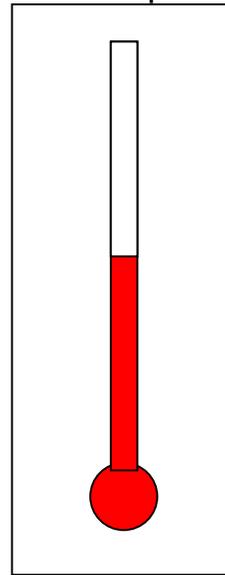
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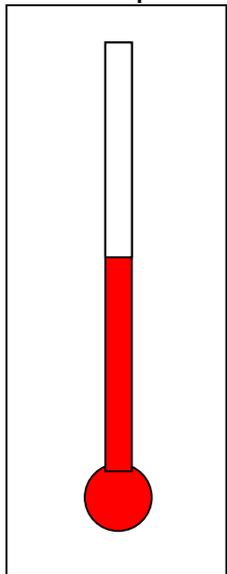
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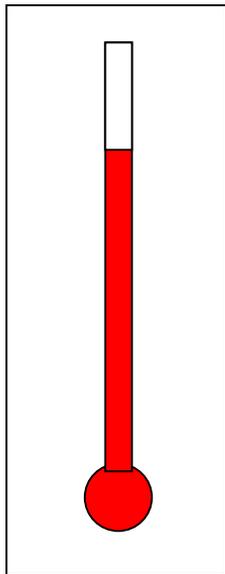
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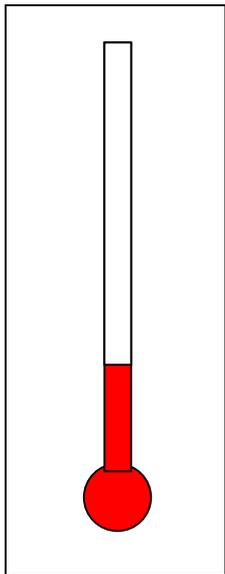
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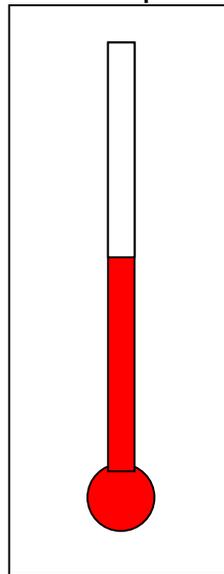
Warmer  
Cooler



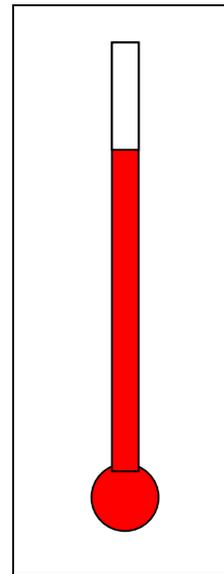
Warmer  
Cooler



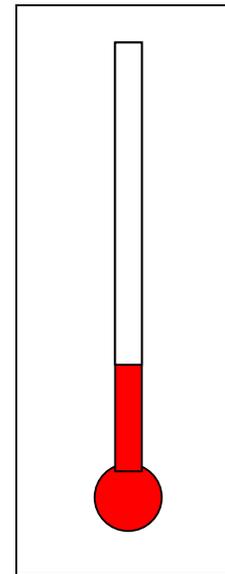
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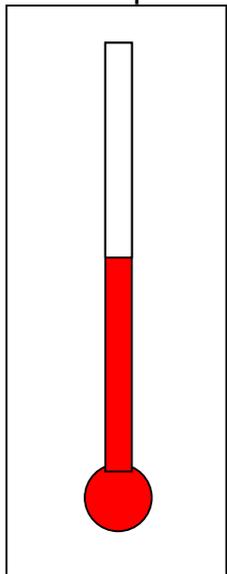
Warmer  
Cooler



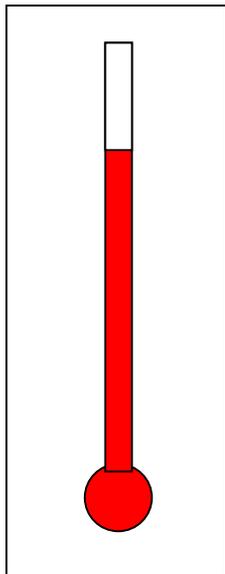
Warmer  
Cooler



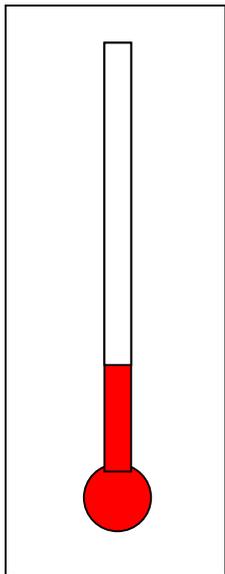
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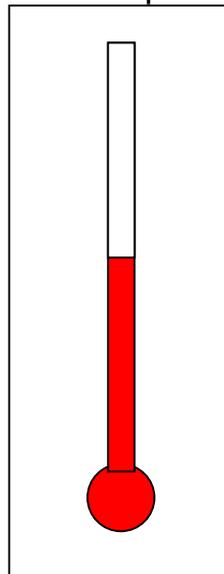
Warmer  
Colder



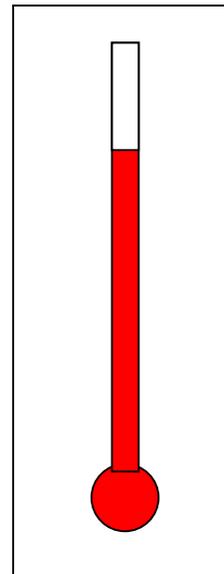
Warmer  
Colder



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Warmer  
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Warmer  
Colder

