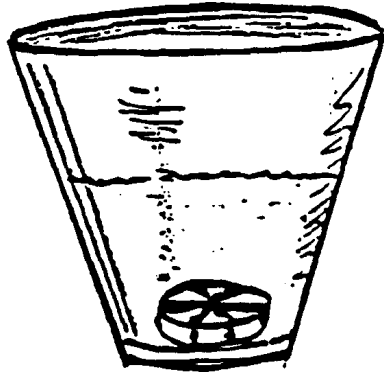


LESSON CLUSTER 6

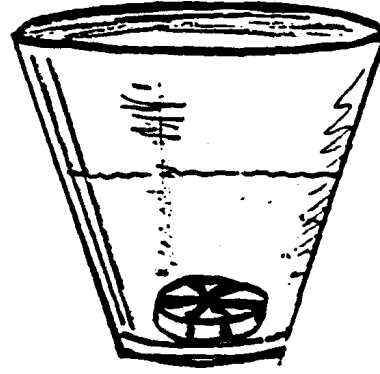
Heating and Cooling, Expanding and Contracting

Activity 6.1: Candy in Hot and Cold Water

Try doing this experiment: Fill two cups half full with water, one with hot water and one with cold water. Both cups should have the same amount of water. Drop identical pieces of hard candy into each cup. Do not stir the water. Wait and watch for about 10 minutes.



HOT WATER



COLD WATER

While you are waiting try making some predictions:

1. a) How do you think what happens in the two cups will be the same?

- b) How do you think what happens in the two cups will be different?

- c) Explain your predictions.

Look at the two cups after 10 minutes and compare them. Were your predictions correct? Try describing and explaining what you see.

2. a) How are the two cups the same?

b) How are the two cups different?

3. There are many ways that the two cups are the same after 10 minutes, and one important way is that some of the candy dissolved in each cup. Try to write an explanation of how this happened. Look back at Lesson Cluster 5 if you need to. Remember to answer the question about and the question about molecules in your explanation.

Explain what happened to the candy in the water.

4. An important difference is that the candy dissolved faster in one of the cups.

In which cup did the candy dissolve faster? _____

What was different about the molecules of hot and cold water that would make the candy dissolve faster or slower? (Write down your best guess, then discuss your answer with the class.)

Question Set 6.2: Heating and Cooling Solids

1. Try to summarize the main points of this lesson by writing two sentences, one about heating solids, and one about cooling solids. Your sentences should mention both changes in substances and molecules.

Heating solids: _____

Cooling solids: _____

2. Three of my friends were arguing about why heating the metal ball made it bigger. This is what they said:

Barry: The ball gets bigger because the heat makes the metal molecules expand.

Mary: The ball gets bigger because you are adding heat molecules to the ball.

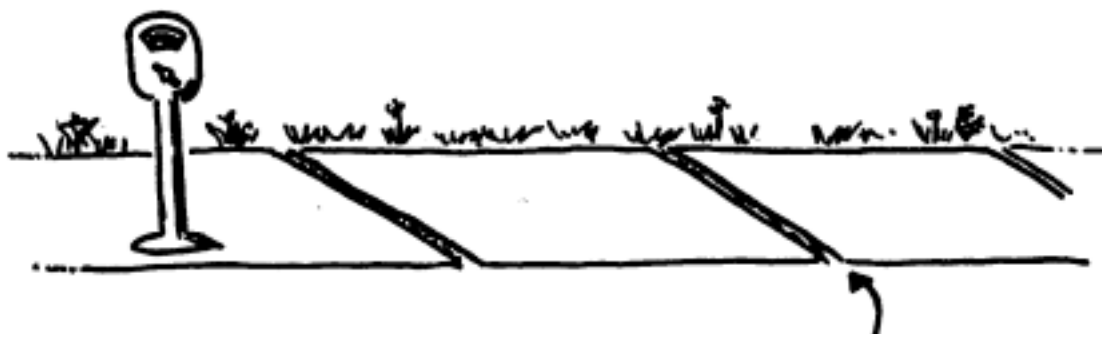
Terry: The metal molecules are still the same size but they move farther apart.

Who was right? _____ Why do you think so? _____

3. My friend taught me a way to open stuck jar lids. If you run hot water over the lid, it gets a little looser and some times you can open it. Try to explain why this works.



4. Most sidewalks have cracks filled with tar every few yards. These are called expansion joints. During the summer these cracks are very narrow. During the winter they are wider. Explain why this happens. (Hint: First explain what happens to the concrete slabs, then explain what happens to the size of the cracks.)



EXPANSION JOINTS

Activity 6.3: The Thermometer

NOTE: DO NOT TOUCH THE BULB OF THE THERMOMETER DURING THIS ACTIVITY.

1. Look very carefully at the thermometer that your teacher gave you. The colored column looks thick when you look at it from the front, but that is because the glass magnifies it. Look at the thermometer from the side. Can you see how thin the column of colored liquid really is? Where is almost all of the colored liquid in the thermometer?

2. Read the temperature on the thermometer. What is the thermometer reading? _____ Do you think the thermometer reading would change if you turned it in different directions? Now, without touching the bulb, try reading the thermometer when it's on its side and upside down. Does turning the thermometer around change the reading?

3. Now put the thermometer into warm water and watch what happens to the column of the colored liquid. Try explaining it.
 - a) What do you think happens to the molecules of the colored liquid when the water warms it up?

- b) How does that make the colored liquid move?

4. My friend says that the liquid goes up when the bulb gets warmer because "heat rises." Do you think that is the correct explanation? _____
How could you show that you were right?

5. Try putting the bulb of the thermometer in cold water. What happens to the colored liquid?

How could you explain what happened?

Activity 6.4: The Dancing Dime

1. Your teacher will give you an empty soda bottle from the refrigerator. The bottle isn't really empty, though.

What substance is inside it? _____

Do you think that substance is hot or cold? _____

2. Wet the rim of the bottle and place a dime on it. Make sure that the space between the dime and the rim is wet enough to seal the opening so that nothing can get in or out. Wrap your hands around the bottle to warm it. What happened?

3. Can you explain what happened? Talk about both substances and molecules in your explanation.

4. Instead of placing a dime on the rim of a cold soda bottle, my friend placed a balloon over the rim.

a. What do you think would happen to the balloon as the bottle got warm?

b. Use molecules in your answer to explain what happened to the balloon.

c. My friend said that if you turn the soda bottle upside down, the balloon would get smaller. Was my friend right? _____

Use what you know about molecules to explain your answer.

Question Set 6.4: Lesson Cluster Review

1. Try to summarize the main points of this lesson cluster by answering the two questions below. Talk about substances and molecules in each answer.

a) What happens when substances are heated?

b) What happens when substances are cooled?

2. In the ball and ring experiment, my friend figured out a good way to get a hot ball through a cold ring. He heated the ring! Explain why his method worked.

3. Is it correct to say that heat makes the molecules of a substance expand? Why or why not?

4. If you want something to dissolve fast, should you mix it with hot water or cold water? _____

Why?
