

Name: _____

Period: 1 2 3 4 5 6 7 8

Molecules in Motion Lab

Question: Is the speed of water molecules different in hot and cold water?

Description: Put a drop of yellow and a drop of blue food coloring into hot water and into cold water and observe.

Hypothesis (what do you expect to see and why?): _____

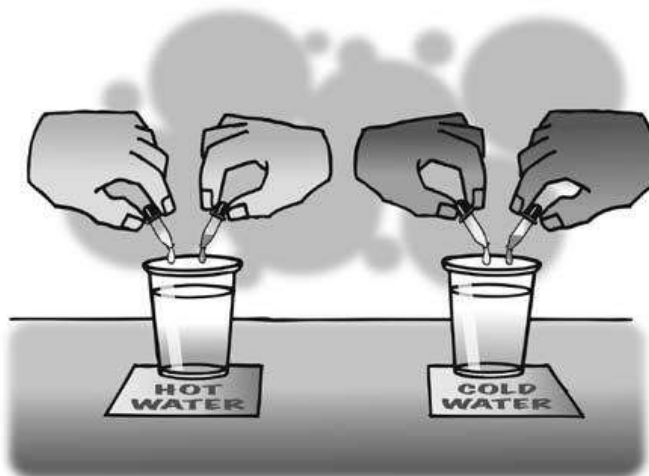
Materials:

At your desk:

- 2 clear plastic cups
- 4 droppers
- timer

From the classroom supplies:

- Food coloring (yellow and blue)
- paper towel
- hot water
- cold water



Variables:

There are a number of variables involved. For each, **either** explain how we are making it constant **or** why we will not or cannot make it constant.

- Cup
- Food coloring
- Time
- Temperature

At least one more variable might affect our results... what is it? Can you think of others? Explain like above.

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Procedure:

1. Measure 150 mL of hot water from the sink with the water fountain. Carefully pour it into one plastic cup.
2. Measure 150 mL of cold water from another sink. Carefully pour it into the other plastic cup.
3. Get about $\frac{1}{4}$ inch of yellow food dye in two of the droppers.
4. Get about $\frac{1}{4}$ inch of blue food dye in two of the droppers.
5. Working together at your table, carefully place 1 drop of yellow and 1 drop of blue food coloring into the hot water cup and 1 drop of yellow and 1 drop of blue food coloring into the cold water cup **ALL AT THE SAME TIME and start your timer.**
6. Place the droppers on the paper towel.
7. Watch the cups (do not touch!) and record your data on the table on the back of this sheet.

Data:

Time	Cold Cup Observations	Hot Cup Observations
Right away		
15 sec		
30 sec		
45 sec		
1 min		
1 min 30 sec		
2 min		

Analysis:

1. Describe how the behavior of the food coloring in the hot and cold water was the same or different.
2. What do those observations suggest about how the behavior of the molecules in the hot and cold water is the same or different?
3. Draw a picture to show what the water molecules in each cup might have been doing:

How might that explain your observations?

4. In our States of Matter PhET simulation, we got to see what happened when the temperature (average thermal energy) of a substance changed. Based on your observations today and the simulation, fill in the blanks with the words increases or decreases.

Heating a substance _____ molecular motion.

Cooling a substance _____ molecular motion.

As molecular motion increases, the space between molecules _____.

As molecular motion decreases, the space between molecules _____.

Conclusion:

Was your hypothesis correct? Explain. _____

Application: You measure exactly 100 milliliters of room temperature water in a graduated cylinder. You heat the water to 99 °C and notice that the volume increases to 104 milliliters. Use what you know to explain why you think the volume of water in the cylinder increases when it is heated.

