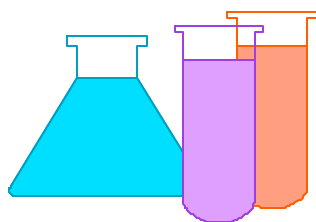


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## Matter in Motion

**Concept:** Temperature effects on liquids and gases

**National Science Standards:**

A	B	C	D	E	F	G

A. **Background:** Diffusion is the spontaneous mixing of gases, liquids, and solids that occurs because of the random movement of molecules. The direction of flow is from an area of high concentration to one of low concentration. Eventually, the solution reaches the same concentration throughout. In this activity, water temperature is the variable. As temperatures increase, molecules move faster.

**Objective:** Students will demonstrate the relationship between temperature and the speed at which the molecules are moving.

III. **Suggested grade levels:** 3-5\*

IV. **Estimated time:**

- Teacher prep: 10-15 minutes
- Activity: 15-20 minutes

**Materials needed per group:**

- 2 clear beakers or other appropriate containers (The container must be able to hold warm water.)
- food coloring (one color)
- 2 eyedroppers
- warm and cold water
- paper and pencil
- GOGGLES

**Safety/Disposal:** Make sure that the water is warm, but not hot, to prevent any chance of scalding. Caution students about working with glass containers (if used). Liquids can be discarded by pouring down the drain.

**Procedure:**

1. Students should predict in which beaker (or other container) the color will spread more rapidly, warm or cold.

2. Put very cold water in one beaker and warm (not hot!) water in the other. Fill each about one-half full.
3. Draw some food coloring into each of the eyedroppers.
4. Holding one eyedropper over each beaker, quickly add 4-5 drops of food coloring to each container at the same time.
5. Compare the movement of the color in the two containers.
6. Record any observations.

**Wrap-up:**

- Expected results: In warm water, the food coloring should diffuse more rapidly than in the cold water.
- What did you observe during your experiment? Compare the predictions to the results. Were your predictions correct? Why do you think the food coloring moved the way it did? What was the variable in this activity?
- Follow-up questions: What would happen if we used a different color? What would happen if we used a different brand of food coloring? Does one color diffuse faster than another color?

**Extensions:**

- Use stopwatch and thermometer to measure actual time required for maximum diffusion at different temperatures. Graph the results.
- Repeat experiment using two different colors as the variable.
- Repeat experiment using 3 beakers, adding a beaker of ice water.
- Repeat experiment with different liquids such as salt water, sugar water, alcohol, etc. (Goggles should be worn with this extension.)

**Resources/Bibliography:**

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