

SCOPE, SEQUENCE, and COORDINATION

A National Curriculum Project for High School Science Education

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SCOPE, SEQUENCE, and COORDINATION

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Learning Sequence Item:

967

Factors that Affect Reaction Rates

March 1996

Adapted by: Mohamad Elkhatab and Linda W. Crow

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Lab Activities

1. Motion to Dye For
2. All Stirred Up
3. Temperature Changes
4. Other Indicators

Readings

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Science as Inquiry

Motion to Dye For**How does temperature affect the motion of particles in a liquid?****Overview:**

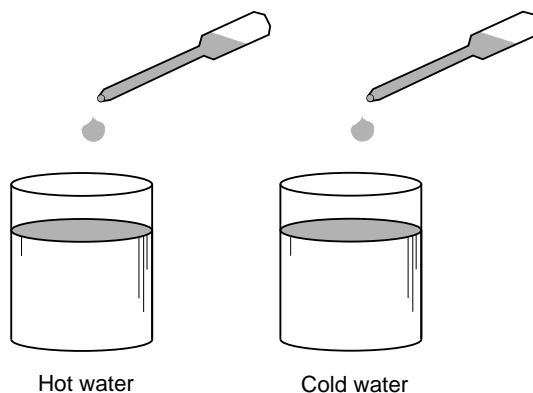
Watch the movement of the dye carefully. What does it show?

Procedure:

Fill a large container 3/4 full with very hot water. Allow it to sit for a minute. Add one drop of dye (or ink) to the center of the container. Observe. Repeat the procedure, but this time using cold water.

Questions:

1. Describe the movement of the food coloring in hot water.
2. Describe the movement of the food coloring in cold water.
3. In each case, how does the temperature of the water affect the motion of the dye?



Science as Inquiry

All Stirred Up**How does stirring affect mixing?****Overview:**

Have you ever used a sugar cube in tea or coffee? How did you get it to dissolve? Find out by trying this activity.

Procedure:

Place a sugar cube into a beaker and add 50 mL of cool tap water. Time how long it takes the sugar cube to dissolve. Next, create at least 2 methods to speed up this dissolving time. Remember to change only one variable at a time. Keep careful records of your trials.

Questions:

1. How did your methods affect the dissolving time?
2. If you could change more than one variable, what would you do to shorten the dissolving time as much as possible?

Science as Inquiry

Temperature Changes**How does temperature affect reaction rate?****Overview:**

Can heating a solution change the reaction rate? Think again of dissolving sugar in hot and cold tea.

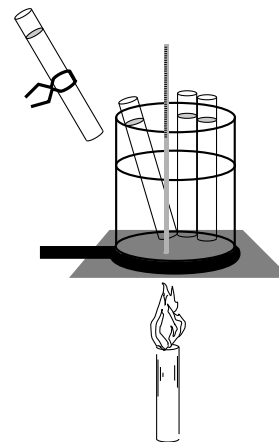
Procedure:

Place a small piece of magnesium in a test tube half-filled with vinegar. Notice that a gas is produced. How can you tell if a gas is being produced? Time how long it takes for the magnesium to completely react with the vinegar.

With five other test tubes half-filled with vinegar, vary the temperature of the vinegar (making it both colder and hotter) and repeat the experiment at least 5 times. Time how long it takes the magnesium to completely react in each case. Describe your experiments and construct a graph of temperature versus time.

Questions:

1. How can you tell if a gas is being produced?
2. How can you tell if the magnesium has reacted completely?
3. How did heating the vinegar affect the reaction?
4. How did cooling the vinegar affect the reaction?
5. Using your graph, predict how fast the reaction would occur if you heated the vinegar to 60°C.



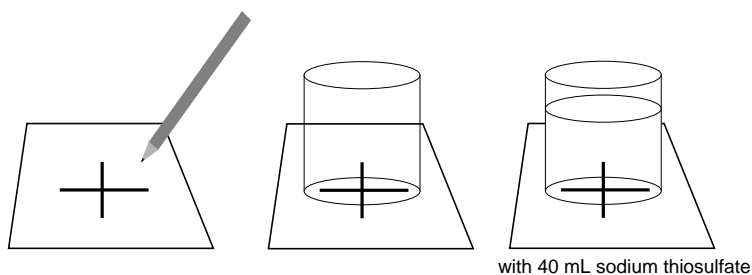
Science as Inquiry

Other Indicators**How do concentration and temperature affect a reaction?****Overview:**

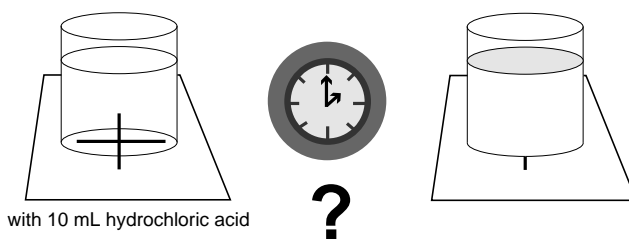
Sometimes when you add some common liquids to ice tea, the color changes. Some reaction has occurred! Watch the next procedure and see if you can detect any change.

Procedure:

Draw a cross with a dark pencil on a piece of white paper. Then place a 100 mL beaker on the cross and add 40 mL of sodium thiosulfate solution into the beaker. Finally, add 10 mL of hydrochloric acid and time how long it takes for the mixture to become so cloudy that you can no longer see the cross.



Repeat the experiment but vary the temperature of the sodium thiosulfate by heating it. Also, repeat the experiment and vary the amounts of sodium thiosulfate, hydrochloric acid and water. Keep in mind the total volume (sodium thiosulfate plus hydrochloric acid, plus water) in each case must equal 50 mL.

**Questions:**

1. How did the temperature of the sodium thiosulfate solution affect the rate of the reaction?
2. How did the amount of sodium thiosulfate, water and hydrochloric acid affect the rate of the reaction?