

Reaction Rate and Temperature of Vinegar Lab

Prelab Questions

- 1) Write the equation for the reaction between magnesium and acetic acid.
- 2) Why must you cut and clean all the magnesium pieces to be exactly the same?
- 3) How much acetic acid is actually in vinegar?
- 4) Why must the volumes of vinegar be the same in each reaction?
- 5) Are reaction time and reaction rate the same thing? Explain.

Procedure

- 1) Place an equal volume of vinegar in each of six test tubes.
- 2) Cut and sand a 12 cm piece of magnesium ribbon until it is clean and shiny.
- 3) Cut the magnesium ribbon into six equal pieces of 2 cm each.
- 4) Place one test tube in a water bath in which you have placed some ice cubes to make the water about 10° below room temperature.
- 5) After 2 min, when the temperature of the vinegar should be the same as that of the water bath, drop in a piece of the magnesium ribbon. Record the time it takes for the ribbon to react completely with the acid in the vinegar. Proceed with the other trials while this reacts.
- 6) Repeat with a test tube of vinegar that is at room temperature.
- 7) Meanwhile, begin heating water in another water bath, Place the remaining four test tubes of vinegar into the water bath. Monitor the temperature of the bath.
- 8) When the bath is 10°C above room temperature, remove one of the tubes, record the temperature, and drop in a piece of magnesium ribbon. Record the time it takes to react completely.
- 9) Keep an eye on the temperature of the water bath so that you can remove a test tube each time the temperature goes up another 10 °C and run another reaction.
- 10) Repeat until you have six values total. The lowest value should be at 10 °C BELOW room temperature, and the highest value should be at 40 °C ABOVE room temperature.

11) Make a graph to show the relationship between temperature increases of 10 °C and reaction time. Time should be on the y-axis and temperature on the x-axis.

Post Lab Questions

Write a formal lab report with the graph included.

- 1) Why is it so important to leave the test tube in the ice bath for the whole reaction but not the ones at higher temperatures?
- 2) Why do the reactions at higher temperature happen faster than the ones at the lower temperatures? Explain at the molecular level.
- 3) Does doubling the temperature double the reaction rate?
- 4) Is there a linear relationship between reaction time and temperature?
- 5) Pick one possible source of error in this lab and thoroughly discuss how the results of the lab would be different if it occurred.