**Rate of Reaction**

* **Question:** How do different factors affect the rate of a reaction?
* **Introduction:** The rate of a chemical reaction is the time required for a given quantity of reactants(s) to be changed to products(s). Reaction rate usually is expressed in terms of moles per unit time. This rate is affected by several factors, including the nature of the reactants, concentration of the reactants, temperature, pressure, and the presence of catalysts. In this experiment, you will study the effects of temperature.

A chemical reaction is the result of effective collisions between particles of reactants. Increasing the temperature of a system raises the average kinetic energy of the particles of the system. This results in more collisions and, of greater importance, more effective collisions per unit time. This affects the rate of the reaction.

* **Safety:** Goggles, gloves, aprons and closed-toed shoes are required. Be careful when working with electrical equipment near water. After cleaning up your lab station including sponging off your entire lab bench, wash your hands before leaving the lab.

**Data Table**

*(Copy into your lab notebook before lab day.)*

|  |  |  |
| --- | --- | --- |
|  | Temperature in °C | Time |
| Room Temp |  |  |
| Cold Temp |  |  |
| Hot Temp |  |  |

* **Procedure:***(*✓ *each of the steps as you complete them.)*

Do This First!

* Start a hot water bath using one of your 250mL beakers. Fill beaker about 2/3 with tap water, put on hot plate, and let it heat up while you do other parts of the experiment. *(Set hot plate to 6 or 7).* Once it starts boiling TURN OFF HOT PLATE and let the beaker just sit there until needed later.

Room Temperature Reaction

* 1. Label one of your two test tubes “A” and the other “B”.
* 2. Using a graduated cylinder marked “A”, measure out 10mL of solution A and pour it into test tube A. Store in test tube rack.
* 3. Put your thermometer into test tube A and leave it in there for a few minutes so you can take an accurate reading later. While waiting, continue with the next few steps.
* 4. Using a graduated cylinder marked “B”, measure out 10mL of solution B and pour it into test tube B. Store in test tube rack.
* 5. Pour about 20mL of starch solution directly into your smallest beaker.
* 5. Now, read and record temperature of test tube A. Once you have done this, remove the thermometer.
* 6. Pour the contents of test tube B into the starch solution in your smallest beaker. Stir with glass stirring rod a few times to mix.
* 7. Be ready with stop watch. Get test tube A.
* 8. When you pour test tube A into your smallest beaker – start the stop watch and WATCH THE BEAKER CONTINUOUSLY! Stir with glass stirring rod.
* 9. When the contents of the small beaker changes color, record the time.
* 10. Pour contents of small beaker down the sink and rinse beaker.
* 11. IF YOU MISSED THE CHANGE AND DID NOT GET AN ACCURATE TIME – DO OVER!

Cold Temperature Reaction

* 12. Make an ice water bath: Fill your other large beaker about half way with ice and cover ice with water.
* 13. Repeat steps #2-11 above, except storing the test tubes in the ice water bath instead of the test tube rack in order to lower their content’s temperature. Make sure you wait until thermometer stops moving *(should be within a few degrees of O.)* before recording temperature and removing thermometer.

Hot Temperature Reaction

* 14. You are now ready for your hot water bath. If you have not done so already, turn off hot plate. *(If you wish to remove the hot water bath from the hot plate and place it on the countertop you may do so.)*
* 15. Repeat steps #2-11 above, except storing the test tubes in the hot water bath instead of the test tube rack in order to raise their content’s temperature. Make sure once again you wait until thermometer stops moving before recording temperature and removing thermometer.
* **Calculations:**

Make a **Temperature vs Time** graph of your data.

* **Conclusion:**

*“Based on data collected, the relationship between the rate of a reaction and temperature is as the temperature increases the rate of a reaction \_\_\_\_\_\_\_\_\_\_\_.”*