

EXERCISE 18

Reaction Rates

OBJECTIVE

To determine the factors that affect the rates of chemical reactions.

The rate at which chemical reactions take place is mainly influenced by the concentration of the reacting substances, the temperature, nature of reacting substances, and the use of a catalyst.

Equipment

1. Test tubes
2. Beaker
3. Thermometer
4. A watch with second hand

Procedure

- I. Concentration:
 1. Mix 15 ml of .1 M sodium arsenite and 20 ml of 2 M acetic acid in a beaker; then add 5 ml of 2 M sodium thiosulfate. Mix and observe the time between the addition of sodium thiosulfate and the appearance of a yellow-orange color.
 2. Record the temperature of the mixture.
 3. Repeat the above procedure except use 2.5 ml of sodium thiosulfate diluted with 5 ml of water; record the time the yellow-orange color appears.
 4. Record the temperature of the mixture.
 5. Which of the two reactions is faster?
 6. Why?

Procedure (continued)

II. Temperature:

- Mix 15 ml of .1 M sodium arsenite and 20 ml of 2 M acetic acid in a beaker. Cool this mixture to 10°C. Add 5 ml of 2 M sodium thiosulfate which has been cooled to 10°C. Note the time between adding the sodium thiosulfate and the appearance of yellow-orange color.
- What is your conclusion?

III. Nature of Reacting Substances

- Add one drop of .2 M AgNO₃ to 2 ml of 1 M NaCl. Does the reaction take place immediately?
- Place 2 ml of disodium hydrogen phosphate, Na₂ HPO₄, in a test tube. Add 5 drops 6 M HNO₃. Then add 30 drops ammonium molybdate, (NH₄)₂MoO₄. Stir the mixture and allow it to sit. Record the length of time for precipitate to form.
- What can you conclude from these two procedures?

IV. Catalyst:

- Prepare five clean test tubes and label them respectively: no catalyst, MnO₂, CuO, PbO₂, and SiO₂. Mix 10 ml of 3% H₂O₂ solution and 30 ml of distilled water and put about 5 ml into each test tube. Put into each test tube about .2 g of the appropriate substance being tested for catalytic action and note if there is any sign of gas evolution. Compare results with the sample that contains no catalyst and report.
- Write the equation for the decomposition of H₂O₂.

ANSWER SHEET - 1

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NAME _____ SECTION _____ DATE _____

1. Time _____

2. Temperature _____

3. Time _____

4. Temperature _____

5. Which reaction is faster..... _____

6. Conclusion:

7. Time _____

8. Conclusion:

9. Does the reaction take place immediately? Time..... _____

10. Does the reaction take place immediately? Time..... _____

11. Conclusion:

ANSWER SHEET - 2

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12.	<u>Catalysts</u>	<u>Reaction Rate</u>
	No catalysts	_____
	MnO ₂	_____
	CuO	_____
	PbO ₂	_____
	SiO ₂	_____

13. Equation