

ACTIVITY NO – 4 – Dependence of temperature on reaction rates

Subject	Chemistry
Class	XII
Chapter/Unit	Chemical Kinetics
Topic	Effect of temperature on reaction rate: Arrhenius law
Time	30 minutes
Nature of Activity	Pair Work

What will I learn(Learning Outcome)?

To demonstrate that as the temperature of a reaction increases, rate of the reaction will increase.

Skills: Applying, Analyzing and Creating.

What I have to do?

To demonstrate that as the temperature of a reaction increases, rate of the reaction will increase by plotting graph.

What do I require?

- 250 cm³ Conical flask
- 10 cm³ Measuring cylinder
- 50 cm³ Measuring cylinder
- Sodium thiosulphate solution 40 g dm⁻³
- Hydrochloric acid 2 mol dm⁻³

What do I need to know?

- **Collision theory**

One approach is the collision theory of chemical reactions, molecules are supposed to react if they Collide with a relative kinetic energy along their line of centers that exceeds E_a . The number of binary Collisions between two unlike molecules per second per unit volume.

➤ **Teacher's Activity**

Teacher will

1. Give instructions as, a voltmeter is used to study the relative reduction potential of various metals and the concentration dependence of voltage in concentration cells.
2. Make pairs of the students and will explain the steps of the activities.
3. Ensure that each participant of the pair performs the activity on his/her own.

How will I proceed

➤ **Student's Activity**

1. Put 10 cm³ of sodium thiosulfate solution and 40 cm³ of water into a conical flask.
2. Measure 5 cm³ of dilute hydrochloric acid in a small measuring cylinder.
3. Warm the thiosulfate solution in the flask if necessary to bring it to the required temperature. The object is to repeat the experiment five times with temperatures in the range 15–55 °C.
4. Put the conical flask over a piece of paper with a cross drawn on it.
5. Add the acid and start the clock. Swirl the flask to mix the solutions and place it on a piece of white paper marked with a cross. Take the initial temperature of the mixture.
6. Look down at the cross from above. When the cross disappears, stop the clock and note the time taken. Record the final temperature of the mixture in the flask.
7. As soon as possible, pour the solution down the sink (in the fume cupboard if possible) and wash away.

What have I observed?

- For each set of results, calculate the value of 1/time. (This value can be taken as a measure of the rate of reaction for this experiment).

- Plot a graph of $1/\text{time}$ on the vertical (y) axis and average temperature on the horizontal (x) axis.

Observation Table

S. No.	Time (1/T)	Temperature	

What have I learnt?

- Above experiment shows, as the temperature increases for a particular reaction then reaction rate _____.

What am I curious to learn?

- What is the mechanism of catalyst in chemical reaction? Does it always increase the rate of reaction?
- What is the other possible factor on which rate of reaction depends?

Let me evaluate myself

- What is Activation energy?

- What is rate of Reaction?

- Derive the Arrhenius equation?

- Rate constant depends on only

- How does change in temperature affect the rate of reaction? How can this effect the rate constant of the reaction represented quantitatively.

6. With the help of diagram explain the role of activation complex in a reaction.
