Effect of Temperature on the Rate of Reaction

Theory

The rate of a chemical reaction is influenced by various factors, including **temperature, concentration, surface area, and the presence of a catalyst**. In this experiment, we will investigate how temperature affects the rate of reaction between **sodium thiosulfate** and **hydrochloric acid**.

According to **collision theory**, for a reaction to occur, reactant particles must collide with enough energy to break bonds and form new ones. This energy is known as the **activation energy**.

Effect of Temperature on Reaction Rate

When temperature increases:

1. **Particles move faster**: Higher kinetic energy means reactant particles move more quickly.
2. **More frequent collisions**: Faster-moving particles collide more often.
3. **Higher energy collisions**: More particles have energy equal to or greater than the activation energy, leading to more successful reactions.

As a result, increasing temperature should **increase the rate of reaction**, while decreasing temperature should **slow it down**.

Hypothetical Experimental Data

Temperature (°C)	Time for Cross to Disappear (s)	Reaction Rate (1/time) (s^{-1})	Reaction Rate × 1000
10°C	140.0	0.0071	7.1
25°C	85.5	0.0117	11.7
40°C	47.2	0.0212	21.2
60°C	21.8	0.0459	45.9
80°C	12.4	0.0806	80.6

Science Practical Report Task

Your Task

Using the data and theory provided, **write a full scientific practical report** investigating how temperature affects the rate of reaction. Your report should include all sections listed below, following the **scientific method**.

Science Practical Report Structure

1. Title

- Clearly state the aim of the experiment.

2. Introduction

- Explain what the **rate of reaction** is.
- Introduce **collision theory** and its relation to temperature.
- Define the **independent and dependent variables** in the experiment.

3. Hypothesis

- State a clear **hypothesis** predicting the effect of temperature on reaction rate.

4. Variables

- Identify the **independent, dependent, and controlled variables**.

5. Materials

- List all equipment and chemicals used.

6. Method

- Provide a **step-by-step procedure** of the experiment.
- Write in **past tense** and **third person**.

7. Results

- Present the **hypothetical data table** (above).
- **Plot a graph** showing **temperature vs. reaction rate**.
- Show **sample calculations** for reaction rate.

8. Discussion

Answer the following:

1. **Describe the trend**: How does reaction rate change with temperature?
2. **Explain using collision theory**: Why does temperature affect reaction rate?

3. **Predict the reaction rate at 50°C** based on the data trend.
4. **Evaluate accuracy**: Were there any **possible errors** in the experiment?
5. **Suggest improvements** to make results more reliable.

9. Conclusion

- Summarize the findings.
- State whether the **hypothesis was supported**.
- Provide a **real-world application** of temperature effects on reaction rates (e.g., cooking, industrial reactions).

Notes for Students

- Write in **scientific language** (formal, objective, third-person).
- **I**nclude **graphs and sample calculations**.
- Use **logical explanations** based on **scientific principles**.