

LESSON NOTES

Subject: Chemistry

Year/Level: 12

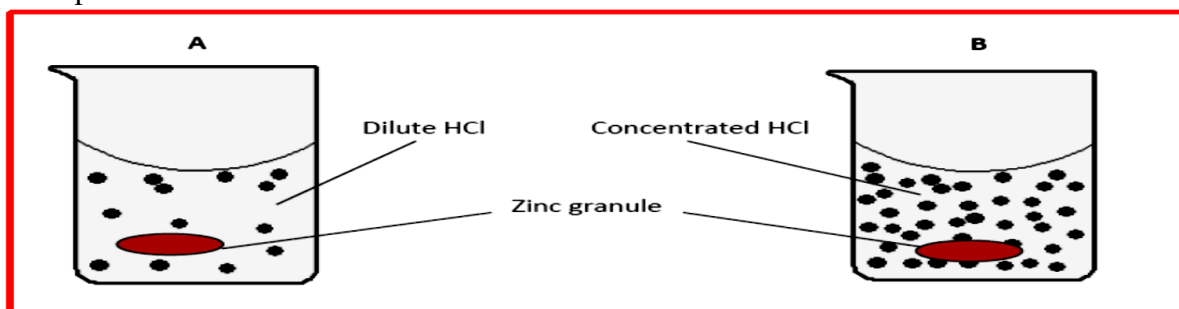
Week 11

Strand	3 Quantitative Chemistry
Sub Strand	3. 3 Physical Chemistry
Content Learning Outcome	To discuss factors that affect reaction rate.

1. Concentration

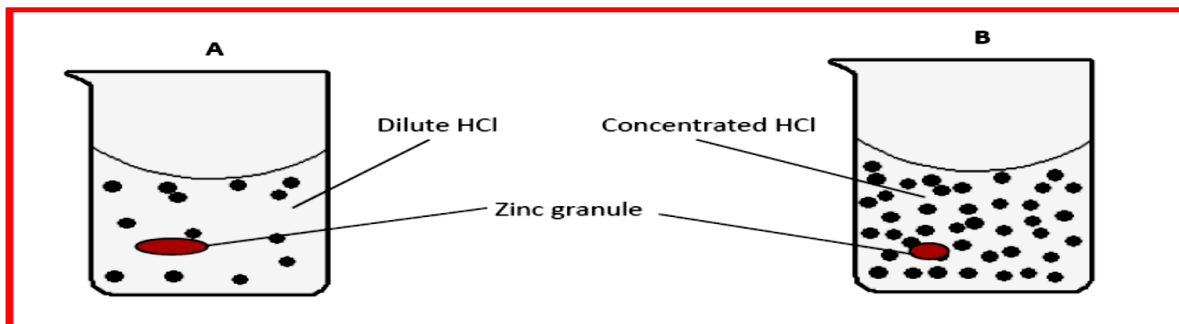
**Increase in concentration of the reactants increases the rate of chemical reactions.** This is because the **more the reacting particles, the more the collisions occurring between them, thus higher chances of effective collision.**

Example



This illustration shows that zinc granules (of same size) being placed in two different beakers of HCl solutions (dilute and concentrated solutions).

**After 10 minutes**



The illustration above shows that zinc granule reacted faster in conc. HCl than in the same volume of dilute HCl at a given time. This is because the concentrated HCl had more reacting particles to collide with zinc granule, thus more chances of effective collision, which increased the rate of the reaction.

2. Temperature

- **Increase in temperature increases the rate of chemical reactions.**
- As the temperature increases, **the reacting particles gain energy and move faster, resulting in greater chances of effective collision** between them to form products.
- **E.g.** increasing the temperature by 10 °C will approximately double the reaction rate. (This is mostly noticed when making tea)

3. Catalyst

- A catalyst is **a substance that increases the rate of chemical reaction by providing an alternative pathway for the reaction** (a pathway that has lower activation energy).
- This **allows greater number of colliding particles to have a kinetic energy greater than the new activation energy.**
- The catalyst **is not used** up during the reaction.

**Activation energy ( $E_a$ )**- is the minimum amount of energy needed to start up a chemical reaction.

### Activity

1. Discuss how increasing the conc. of reactants will increase the rate of a reaction.

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2. Define activation energy.

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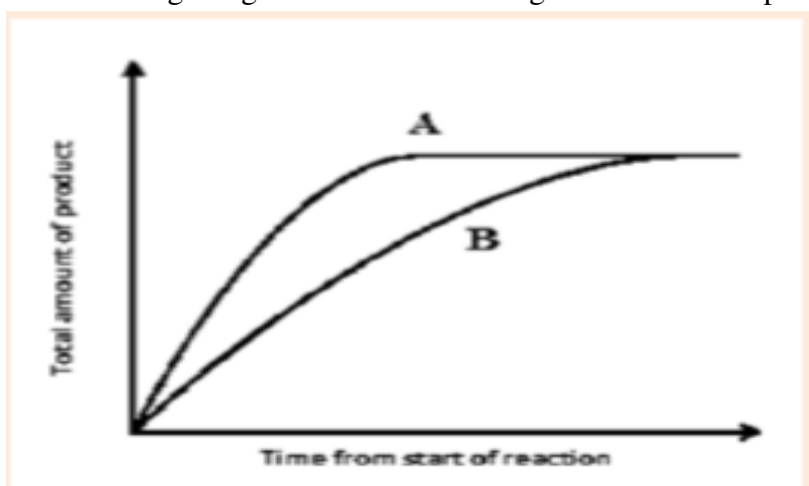


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3. Zinc powder reacts rapidly with  $2 \text{ mol L}^{-1}$  hydrochloric acid. List two ways of reducing the rate of the above reaction.

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4. Consider the diagram given below illustrating the effect of temperature on reaction rates.



- a) Which reaction was subjected to higher temperature? \_\_\_\_\_
- b) Briefly justify your answer using collision theory. \_\_\_\_\_

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