

8.1 RATE OF REACTION

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Learning outcomes

After the completion of the lesson, candidates should be able to:

1. explain and use the term rate of reaction, frequency of collisions, effective collisions and non-effective collisions
2. explain qualitatively, in terms of frequency of effective collisions, the effect of concentration and pressure changes on the rate of a reaction
3. use experimental data to calculate the rate of a reaction

Introduction

Chemical kinetics is the study of rates of reaction.

Rates of reactions can be defined as the change in the amount of reactant or product per unit time.

Rate of reaction = change in concentration/time

Let us consider a simple reaction as follows



$$\text{Rate of reaction} = \Delta[B]/t = -\Delta[A]/t$$

Collision theory of reaction rate

Ineffective collision

Effective collision

Proper orientation

Sufficient energy

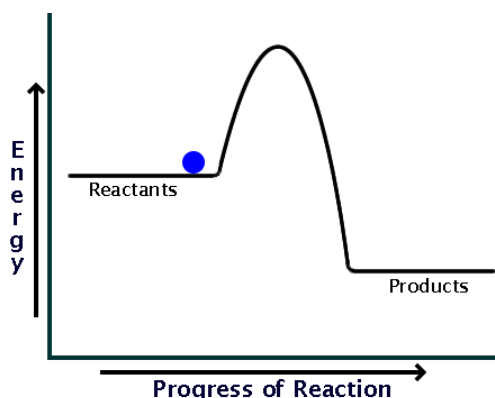
[How to speed up chemical reactions \(and get a date\) - Aaron Sams](#)

The effect of concentration and pressure changes

As concentration increases, the **frequency of collisions** increases; this results in an increase in the rate of reaction.

Similarly, when **pressure is increased** in a gaseous reaction, the **frequency of collisions increases, increasing the rate of the reaction.**

The activation energy of a reaction, E_A , is the minimum energy required by colliding particles for a collision to be effective. Reaction pathway diagrams show how the activation energy provides a barrier to reaction.



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