

Unit 7- CHEMICAL KINETICS

Learning Objectives

After studying this unit, the students will be able to

- Define the rate and order of a reaction,
- Derive the integrated rate equations for zero and first order reactions,
- Describe the half life period,
- Describe the collision theory,
- Discuss the temperature dependence of the rate of a reaction, and
- Explain various factors which affect the rate of a reaction.

Important Notes and Points

- ❖ Half life for an nth order reaction involving reactant A and $n \neq 1$

$$t_{1/2} = \frac{2^{n-1} - 1}{(n - 1)k[A_0]^{n-1}}$$

- ❖ Chemical kinetics has many applications in the field of pharmaceuticals. It is used to study the lifetimes and bioavailability of drugs within the body and this branch of study is called **pharmacokinetics**. Doctors usually prescribe drugs to be taken at different times of the day. i.e. some drugs are to be taken twice a day, while others are taken three times a day, or just once a day.
- ❖ Pharmacokinetic studies are used to determine the prescription (dosage and frequency). For example, Paracetamol is a well known anti-pyretic and analgesic that is prescribed in cases of fever and body pain. Pharmacokinetic studies showed that Paracetamol has a half-life of 2.5 hours within the body i.e. the plasma concentration of a drug is halved after 2.5 hrs. After 10 hours (4 half-lives) only 6.25 % of drug remains. Based on such studies the dosage and frequency will be decided. In case of paracetamol, it is usually prescribed to be taken once in 6 hours depending upon the conditions.