Chemical Kinetics

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During our studies, we have come across so many reactions. These reactions proceed at different speeds. The speeds of reactions vary from very slow to very fast. For example, rusting of iron takes place very slowly whereas precipitation of silver chloride, on mixing the solutions of silver nitrate and sodium chloride, takes place at once. On the other hand, there are several reactions which proceed at measurable speeds. Inversion of sucrose and hydrolysis of starch are two such reactions:

$$\underset{\text{Cane sugar}}{C_{12}H_{22}O_{11}} + H_2O \longrightarrow \underset{\text{Glucose}}{C_6H_{12}O_6} + \underset{\text{Fructose}}{C_6H_{12}O_6}$$

$$\underset{\text{Starch}}{2(C_6H_{10}O_5)_n} + nH_2O \longrightarrow \underset{\text{Maltose}}{nC_{12}H_{22}O_{11}}$$

The rates of such reactions can be studied and experimentally determined. The branch of chemistry which deals with the study of reaction rates and their mechanisms is called Chemical Kinetics.
Before we take up study of any such reaction, let us re-capitulate about rates of reactions and factors influencing it.
In any chemical reaction, reactants are consumed and new products are formed. This means that we can measure the rate of a reaction in terms of the rate at which the reactants are consumed or the rate at which the products are obtained. Rate of a reaction is defined as the rate of change in concentration of any of the reactants or products at a particular moment of time.

Factors Affecting Rate of a Reaction

There are a number of factors which influence the rate of a reaction. These are :

1. Concentration of the reactants
2. Temperature
3. Nature of the reacting substances
4. Presence of catalyst
5. Exposure to radiations.

In this chapter, we shall only study how the rate of p chemical reaction is influenced by concentration of the reactants and temperature.
It is observed that other factors remaining the same, the rate of a chemical reaction increases with the increase in concentration of the reactants. For example, we find that

a piece of wood bums at a much faster rate in oxygen than in air. It is because of higher concentration of oxygen in the former. The rate of reaction of almost all reactions increases with the increase in temperature. In most of the cases the rate of the reaction becomes almost double for every 10°C rise of temperature.