Rates of Reaction

Chemistry – Leaving Cert

Quick Notes

Rates of Reaction

The rate of a reaction is the change in the concentration of either reactants or products per unit time. The instantaneous rate of reaction is the change in concentration per unit time of any one reactant or product at a given moment in time. To monitor the rate of production of oxygen from hydrogen peroxide, manganese dioxide is used as a catalyst and the volume of oxygen gas produced is measured at specific time intervals. Factors that affect the rate of reaction are 1- nature of reactants 2- particle size 3- concentration 4- temperature and 5- catalyst. Nature of the reactants – ionic reactions are usually faster than covalent reactions because covalent reactions require bonds to be broken but this is not the case with ionic bonds where the ions merely come together. Particle size- finely divided particles react faster than large particles because of the greater surface area. Concentration- an increase in concentration causes an increase in the rate of reaction. Temperature- an increase in temperature brings about an increase in the rate of a reaction. Experiments involving the rate of reaction between sodium thiosulfate and hydrochloric acid show that rate is proportional to concentration and that rate is inversely proportional to temperature. Catalyst- a catalyst is a substance that alters the rate of a chemical reaction but is not used up in the reaction itself. A catalyst that slows down a reaction is called an inhibitor e.g. glycerine. Some general properties of catalysts are that they are specific, required in very small amounts and they remain chemically unchanged at the end of a reaction. Types of catalysis are homogenous, heterogeneous or autocatalysis. In homogenous catalysis both the catalyst and reactants are in the same phase. In heterogeneous catalysis the catalyst is in a different phase to the reactants. Autocatalysis is when one of the products of the reaction also acts as a catalyst for that reaction. Catalyst are believed to work by one of two methods – 1: The Intermediate Formation Theory where a temporary intermediate acts as a catalyst or 2: The Surface Adsorption Theory where molecules of a substance are drawn onto the surface of a solid catalyst. A catalytic converter consists of a ceramic honeycomb lined with platinum, palladium and rhodium catalysts which cause harmful gases such as carbon monoxide and nitrogen monoxide to combine with each other and form harmful gases such as water and nitrogen. The activation energy is the minimum energy which colliding particles must have for a reaction to be successful. A catalyst lowers the activation energy of a reaction.