17. *Rate constant k of a reaction is dependent on temperature :* $k = Ae^{-E_a/RT}$

k has the least value at :

(A) *high T and high* E_a **(B)** *high T and small* E_a

(C) *low T and low* E_a **(D)** *low T and high* E_a

18. *The reaction A* $\longrightarrow$ *B follows first order kinetics. The times taken for* 0.8 *mol of A to produce* 0.6 *mol of B is* 1 *hour. What is the time taken for conversion of* 0.9 *mol of A to produce* 0.675 *mol of B ?*

(A) 0.25 *hour* **(B)** 2 *hours* **(C)** 1 *hour* **(D)** 0.5 *hour*

FACTORS AFFECTING RATE OF REACTIONS Section - 5

Factors Affecting Rate of Reactions :

The rate of reaction depends upon following factors :

1. Concentration :

In general the rate of a reaction is directly proportional to the concentration of reactants, i.e., the rate increases as the concentration of reactant(s) increases. For gaseous reaction, rate is proportional to the *partial pressures* of reactant(s).

2. Nature of Reactants :

- The rate of reactions in which complex molecules are taking part is slower than those in which simple molecules take part. A chemical reaction involves the rearrangement of atoms (i.e., breaking and reforming of bonds), hence the rearrangement of molecules involving many bonds is rather slow process and consequently the rate of a reaction is slower.
- Physical state of reactants also play key role in determining reaction rates. The greater is the surface area of a solid surface, the faster is the rate of reaction involving solid molecules. For example, the burning of wood is slower than the burning of a pulverized wood (due to increased surface area).

3. Effect of Catalyst :

The catalyst in general enhances the rate of reactions without actually taking part in the reaction. The catalyst is used up during the reaction but at the end of reaction it is recovered as such. The phenomenon of increase in the rate of a reaction with the help of a catalyst is known as *catalysis*. Catalysts generally lower the activation energy which enables more reacting molecules to cross the energy barrier and hence increased rate of reaction.

4. Effect of Temperature :

The rate of a reaction increases by increasing the temperature. It is quite clear from Arrhenius equation $\left(k = A\,e^{-E_a/RT}\right)$, that for small rise in temperature rate of reaction increases tremendously (increases exponential). In fact it is one of most significant factors that affects the rate most strongly. *A* 10°*C rise in temperature, for most of the reactions, doubles the rate of reaction.* On increasing the temperature, the number of molecules possessing activation energy increases (i.e, effective collisions) by a large quantity, as compared to the total increase in molecular collisions.