## Rate of a reaction

**1.** (b) Rate of reaction continuously decreases with time.

**2.**

**2.** (a) The rate of reaction depends upon conc. of reactant, surface area of reactant, temperature, presence of light and catalyst.

**3.** (d) According to law of mass action.

**4.** (b) $R = K[RCl]$, if [*RCl*] =1/2, then rate = *R*/2.

**5.** (b) $2^2 = 4, 3^2 = 9$

**6.** (c) The rate of chemical reaction ∝The product of the molar conc. of the reactants (at constant *T*)

**7.** (c) Rate of reaction = $\frac{dx}{dt} = \left[\frac{0.2-0.1}{10}\right] = \frac{0.1}{10}$

$= 0.01 moldm^{-3}min^{-1}$

**8.** (c) As reaction progressing the concentration of the reactants decreases and the concentration of the product increases.

**9.** (a) $\frac{-d(N_2)}{dt} = -\frac{1}{3}\frac{d(H_2)}{dt} = \frac{1}{2}\frac{d(NH_3)}{dt} = \frac{3}{2} \times 40 \times 10^{-3}$

$= \mathbf{60 \times 10^{-3}}$.

**10.** (b) Greater are the concentrations of the reactants, faster is the reaction. Conversely, as the concentrations of the reactants decreases, the rate of reaction also decreases.

**11.** (b) Ionic reactions are very fast reactions i.e. take place instantaneously.

**12.** (b) Rate = $K(A)^2(B)^1$ on doubling the active mass of *A* the rate of reaction increase 4 times.

**13.** (c) '*A*' will disappear at twice the rate at which '*B*' will decrease.

**14.** (d) When volume is reduced to $\frac{1}{4}$, concentrations become four times.

**16.** (b) $\frac{-dN_2}{dt} = \frac{-1}{3}\frac{dH_2}{dt} = \frac{1}{2}\frac{dNH_3}{dt}$

$\frac{dH_2}{dt} = \frac{3}{2} \times 0.001 = 0.0015 kghr^{-1}$.

**17.**

For an **elementary reaction**, the order with respect to each reactant equals its stoichiom etric coefficient:

$m = 2, \quad n = 1$

Thus,

Rate $= k[A]^2[B]$ ***New concentrations***:

$[A] \rightarrow 2[A], \quad [B] \rightarrow \frac{1}{2}[B]$

3. ***New rate***:

$\text{Rate}_{\text{new}} = k(2[A])^2\left(\frac{1}{2}[B]\right) = k \cdot 4[A]^2 \cdot \frac{1}{2}[B] = 2k[A]^2[B]$

***Answer***: $(c)$ ***Increase by two times***

**18.** (b) $-\frac{dc}{dt}$ refers as decrease in concentration of the reactant with time.

**19.** (d) The rate of a reaction depends upon concentration of reactant.

**20.** (a) $-\frac{1}{3}\frac{d[A]}{dt} = -\frac{d[B]}{dt} = \frac{+d[C]}{dt} = \frac{+d(D)}{dt}$.

**21.** (b) $N_2 + 3H_2 \rightleftharpoons 2NH_3$

$$\frac{-\Delta[N_2]}{\Delta t} = -\frac{1}{3}\frac{\Delta[H_2]}{\Delta t} = \frac{1}{2}\frac{\Delta[NH_3]}{\Delta t}$$

$$\therefore \frac{\Delta[H_2]}{\Delta t} = \frac{3}{2} \times \frac{\Delta[NH_3]}{\Delta t} = \frac{3}{2} \times 2 \times 10^{-4}$$

$$= 3 \times 10^{-4} mollitre^{-1} sec^{-1}$$

**22.** (a) Increase in concentration of $B = 5 \times 10^{-3} moll^{-1}$ $Time = 10sec$

Rate of appearance of $\text{B} = \frac{\text{Increaseofconc. B}}{\text{Timetaken}}$

$$= \frac{5 \times 10^{-3} moll^{-1}}{10sec^{-4^{-1^{-1}}}} = 5 \times 10^{-4} mol\ l^{-1}\ Sec^{-1}$$