

### Rate of a reaction

- (b) Rate of reaction continuously decreases with time.
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- (a) The rate of reaction depends upon conc. of reactant, surface area of reactant, temperature, presence of light and catalyst.
- (d) According to law of mass action.
- (b)  $2^2 = 4, 3^2 = 9$
- (c) The rate of chemical reaction  $\propto$  The product of the molar conc. of the reactants (at constant  $T$ )
- (c) Rate of reaction  $= \frac{dx}{dt} = \left[ \frac{0.2-0.1}{10} \right] = \frac{0.1}{10}$   
 $= 0.01 \text{ mol dm}^{-3} \text{ min}^{-1}$
- (c) As reaction progressing the concentration of the reactants decreases and the concentration of the product increases.
- (a)  $\frac{-d(N_2)}{dt} = -\frac{1}{3} \frac{d(H_2)}{dt} = \frac{1}{2} \frac{d(NH_3)}{dt} = \frac{3}{2} \times 40 \times 10^{-3}$   
 $= 60 \times 10^{-3}$
- (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.
- (b) Ionic reactions are very fast reactions i.e. take place instantaneously.
- (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)  $\frac{-dN_2}{dt} = \frac{-1}{3} \frac{dH_2}{dt} = \frac{1}{2} \frac{dNH_3}{dt}$

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

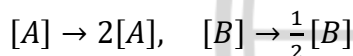
17.

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

$$m = 2, \quad n = 1$$

Thus,

$$\text{Rate} = k[A]^2[B] \text{ New concentrations:}$$



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)  $N_2 + 3H_2 \rightleftharpoons 2NH_3$

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

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

$$= 3 \times 10^{-4} \text{ mol litre}^{-1} \text{ sec}^{-1}$$

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

$$\text{Rate of appearance of B} = \frac{\text{Increase of conc. B}}{\text{Time taken}}$$

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

