## PART B – CHEMISTRY

31. **d) 1/6**
Conceptual

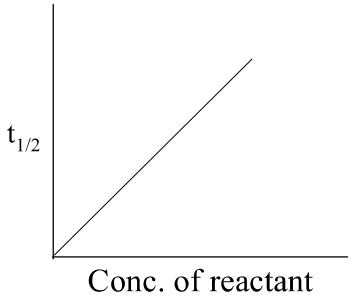
32. **b) mol lit$^{-1}$ sec$^{-1}$**
Conceptual

33. **b) $2 \times 10^{-2}$**
Conceptual

34. **d) $1.14 \times 10^{-2}$ M s$^{-1}$**
Conceptual

35. **a) 2**
Conceptual

36. **a)**




Conceptual

37. **a) 0.069 min$^{-1}$**
Conceptual

38. **a) 2 minutes**
Conceptual

39. **a) 1 and 2**

$2.5 \times 10^{-3} = K[2]^{\alpha}[1.0]^{\beta}$ ...(1)

$5 \times 10^{-3} = K[1.0]^{\alpha}[1.0]^{\beta}$ ...(2)

$1 \times 10^{-2} = K[2]^{\alpha}[2.0]^{\beta}$ ...(3)

Dividing equation (1) and (2)

$\frac{1}{2} = \left[\frac{1}{2}\right]^{\alpha}$ hence $\alpha = 1$

Dividing equation (1) and (3)

$$\frac{2.5\times10^{-3}}{1\times10^{-2}} = \left(\frac{1.0}{2.0}\right)^{\beta}$$

$\frac{1}{4} = \left(\frac{1}{2}\right)^{\beta}$, $\beta = 2$

40. **a) $2.1 \times 10^{-7}$ mole $L^{-1}$ $min^{-1}$**

$k_{obs} = k.k_c = 1.2 \times 10^{-1} \times 1.4 \times 10^{-2} = 1.68 \times 10^{-6}$ $mole^{-1}$ L $min^{-1}$

Rate = $k_{obs}$ $[NO]^2$ $[H_2] = 1.68 \times 10^{-6} \times 0.5^2 \times 0.5$

$= 2.1 \times 10^{-7}$ mole $L^{-1}$ $min^{-1}$

41. **a) Activation energy**

Catalyst affect only activation energy. It brings down the activation energy of reaction.

42. **a) $1.15 \times 10^{-3}$ $sec^{-1}$**

| | | | |
|---|---|---|---|
| A | $\rightarrow$ | 2B + | C |
| P | | 0 | 0 |
| P – x | | 2x | x |

At equilibrium

180 = P – x + 2x + x

180 = 90 + 2x

2x = 90, x = 45

$$K = \frac{2.303}{t}\log\frac{P}{P-x} = \frac{2.303}{10}\log\frac{90}{90-45} = \frac{2.303}{10}\log 2 = \frac{0.6932}{10}$$

$= 0.6932 = \frac{0.06932}{60} = 1.1555 \times 10^{-3}$ $sec^{-1}$

43. **b) 10 mins**

Conceptual

44. **b) $2^{n-m}$**

$r_0 = K[A]^n [B]^m$

$r_1 = K[2A]^n [B/2]^m$

$r_2 = K\,2^{n-m} [A]^n [B]^m$ or $r_1 = r \times 2^{n-m}$

45. **c) $\frac{7}{8}$**

Conceptual

46. **d) 3**

aG + HB → Product

∵ rate α $[G]^a$ $[H]^b$

∴ a = 1, b = 2

Overall order = 1 + 2 = 3

47. **a) 100 kJ $mol^{-1}$**

Conceptual

48. **c) $1.386 \times 10^{-4}$**

$$K = \frac{2.303}{t}\log\frac{C_0}{C}$$

$$= \frac{2.303}{2\times10^4}\log\frac{800}{50}$$

$$= 1.38\times10^{-4}\ \sec^{-1}$$

49. **d) Bi-molecular reaction**

Two reactants leads to bimolecular reaction may be of I or II order.

50. **a) K is indepdent of [A] and [B]**

Rate constant 'K' is characteristic constant for a given reaction.

51. **d) $1 \times 10^6$ $s^{-1}$ and 38.3 KJ $mol^{-1}$**

According to arrhenius equation

$$\log k = \log A - \frac{Ea}{2.303RT}$$

$$given, \log K = -(2000)\frac{1}{T} + 6.0$$

$$\log A = 6 \Rightarrow A = 10^{-6} S^{-1}$$

$$\frac{-Ea}{2.303RT} = \frac{-2000}{T}$$

$$E_a\ 2000\times2.303\times8.314\ J\ mol^{-1}$$

52. **c) 10**

Conceptual

53. **b) 2.88 min**

54. **b)** **11 K cal / mole**

Conceptual

55. **a)** **6 sec**

$$C = \frac{1000 \times 2}{100} = 20$$

for zero order $\Delta T = \frac{C}{K} = \frac{20}{2 \times 10^2} = 0.1 \text{min}$ = 6 sec

56. **b)** **70 min**

$K = 3.3 \times 10^{-4}$

$$K = \frac{2.303}{t} \log \frac{100}{25}$$

$$t = \frac{2.303}{3.3 \times 10^{-4}} \log 4 = \frac{2.303 \times 10^4}{3.3} \times 2 \times 0.301 \text{sec} = 70 \text{min}$$

57. **b)** **All are correct**

Reaction is endothermic with $\Delta n$ = +ve not an elementary process,

so $r_f \neq K_f [A]^2 [B]^1$,

$r_f = K_f [A]^m [B]^n$, similarly for $r_b$.

58. **d)** **Rate = $k' \frac{[NO]^2 [H_2]^2}{[N_2]}$**

$2NO(g) + H_2(g) \rightleftharpoons N_2(g) + H_2O_2(g)$ (fast)

$H_2O_2(g) + H_2(g) \rightarrow 2H_2O$ (g) (slow)

Rate = $k[H_2O_2][H_2]$

$$K = \frac{[N_2][H_2O_2]}{[NO]^2[H_2]}$$

$$\text{Rate} = Kk \frac{[NO]^2[H_2]^2}{[N_2]}$$

59. **d)** **$NH_2OH$**

$$\overset{+5}{N}O_3^- \longrightarrow \overset{-1}{N}H_2OH$$

60. **b)** **$5 \times 10^{-3}$ L mol$^{-1}$ s$^{-1}$**

Conceptual