Daily Tutorial Sheet 10	Level – 2 | JEE Advanced Pattern

116.(B) $k_B = Ae^{-E_a/RT} = 10^{12} \times 4.35 \times 10^{-8} = 4.35 \times 10^4 s^{-1}$

Also, equilibrium constant $= \frac{k_A}{k_B} = 10^4 \quad \therefore \quad k_A = k_B \times 10^4 = 4.35 \times 10^8 s^{-1}$

117.(C) $-\left(\frac{dN}{dt}\right)_o = kN_o$

$-\left(\frac{dN}{dt}\right) = kN$ and $N = N_o e^{-kt} \quad \therefore \quad -\left(\frac{dN}{dt}\right) = kN_o e^{-kT} = -\left(\frac{dN}{dt}\right)_o e^{-kT}$

118.(A) $k = \frac{1}{t}\left[\frac{1}{a-x} - \frac{1}{a}\right] = \frac{1}{t}\frac{x}{(a-x)(a)}$

$k = \frac{1}{t}\frac{x}{[A]\,[A_o]} \quad \therefore \quad x = kt[A]\,[A_o]$

Also, $k = \frac{1}{t}\left[\frac{1}{[A]} - \frac{1}{[A_o]}\right] \quad \Rightarrow \quad kt = \frac{1}{[A]} - \frac{1}{[A_o]} \quad \Rightarrow \quad kt + \frac{1}{[A_o]} = \frac{1}{[A]}$

$\therefore \quad \frac{kt[A]_o + 1}{[A_o]} = \frac{1}{[A]} \quad \therefore \quad [A] = \frac{[A_o]}{kt[A_o]+1} \quad \therefore \quad x = \frac{kt[A_o]^2}{kt[A_o]+1}$ (As $[A] = [A_o] - x$)

119.(A) $k_1 = \frac{2.303}{t}\log\cdot\frac{100}{50}; \quad k_2 = \frac{2.303}{t}\log\frac{100}{4}; \quad \frac{k_2}{k_1} = \frac{\log 25}{\log 2} = 4.6$

120.(B) In a Pseudo-unimolecular reaction we have two different reactants, out of which one is in excess amount.

121.(6) as $2t_{1/2} = 12\,\text{min} \quad \therefore \quad t_{1/2} = 6\,\text{min}$.

122.(B) $k_{500} = Ae^{-Ea/500R}; \quad k_{400} = Ae^{-(E_a - 20)/400R}$

Since $k_{500} = k_{400} \left(\because \left.\frac{d[A]}{dt}\right|_{500K} = \left.\frac{d[A]}{dt}\right|_{400K}\right)$

$\therefore \quad e^{-E_a/500R} = e^{-(E_a - 20)/400R} \quad \Rightarrow \quad \frac{Ea}{500R} = \frac{E_a - 20}{400R} \quad \Rightarrow \quad E_a = 100\,\text{kJ/mol}$

123.(B) Based on (A), rate is independent of (A) and when (B) is doubled, rate is also doubled.
Thus, for forward reaction rate law $= k_1[A]^\circ = k_1$ and for backward reaction rate law $= k_2[B]$

Thus, net rate $= k_1 - k_2[B]$

124.(A) $k = 8.0 \times 10^{-15}\ cm^3\ molecule^{-1}\ s^{-1}$

$= \frac{8.0 \times 10^{-15}}{1000} dm^3\ molecule^{-1}\ s^{-1} = \frac{8.0 \times 10^{-15}}{1000} dm^3\ molecule^{-1}\ s^{-1} = 4.8 \times 10^6\ cm^3\ mol^{-1}\ s^{-1}$

$$\left(\begin{array}{l} 1\,cm = \frac{1}{10}\,cm \\ 1\,molecule = \frac{1}{N_0}\,mol = \frac{1}{6.0 \times 10^{23}}\,mol \\ \therefore \frac{1}{molecule} = \frac{6.0 \times 10^{23}}{mol} \end{array}\right)$$

125.(C) Rate $= k[\text{conc.}]^n, \quad n = \text{order}$