Daily Tutorial Sheet-11	Numerical Value Type for JEE Main

126.(0.180)

	$2A(g)$	$\rightarrow$ $4B(g)$	+ $C(g)$
Initial	P_0	0	0
At time t	$P_0 - P'$	$2P'$	$P'/2$

$$P_{total} = P_o - P' + 2P' + P'/2 = P_o + \frac{3P'}{2}$$

$$P' = \frac{2}{3}(0.145 - 0.1) = 0.03\,atm$$

$$k = \frac{2.303}{t}\log\frac{P_o}{P_o - P'}$$

$$t = \frac{2.303}{7.48\times10^{-3}}\log\left(\frac{0.1}{0.07}\right) = 47.7\,sec$$

Also, $k = \dfrac{2.303}{t}\log\left(\dfrac{0.1}{P_o - P'}\right)$

$$7.48\times10^{-3} = \frac{2.303}{100}\log\left(\frac{0.1}{0.1 - P'}\right)$$

$0.1 - P' = 0.047$

$P' = 0.053$

$$P_{total} = 0.1 + \frac{3}{2}(0.053) \approx 0.180\ atm.$$

27.(0.246) $k_1 = \dfrac{2.303}{t_1}\log\dfrac{100}{6}$ for 94% of (C) reacted

$k_2 = \dfrac{2.303}{t_2}\log\dfrac{100}{50}$ for 50% of (A) reacted

$$\therefore \frac{k_2}{k_1} = \frac{t_1}{t_2}\times\frac{0.3010}{1.2218}$$

Since $t_2 = t_1$

$$\therefore \quad \frac{k_2}{k_1} = \frac{0.3010}{1.2218} = 0.246$$

128.(0.8) $r = k[N_2O_5]$ $\quad\therefore\quad [N_2O_5] = \dfrac{r}{k} = \dfrac{2.40\times10^{-5}}{3.0\times10^{-5}} = 0.8\ molL^{-1}$

129.(4) ${}^{235}_{92}U \longrightarrow {}^{207}_{82}Pb + x\,{}^{4}_{2}\alpha + y\,{}^{0}_{-1}\beta$

$235 = 207 + 4x \Rightarrow x = 7 \quad ; \quad 92 = 82 + 2x - y$ or $y = 4$

130.(20) $-\dfrac{1}{2}\dfrac{d[SO_2]}{dt} = \dfrac{-d[O_2]}{dt} = +\dfrac{1}{2}\dfrac{d[SO_3]}{dt}$ $\quad\therefore\quad$ given $\dfrac{d[SO_3]}{dt} = 100\ g\ min^{-1} = 1.25\,mol\ min^{-1}$

$$\therefore \quad \frac{-d[O_2]}{dt} = \frac{1}{2}\frac{d[SO_3]}{dt} = \frac{1.25}{2}mol\ min^{-1} = \frac{1.25}{2}\times32g\ min^{-1} = 20\ g\ min^{-1}$$

131.(0.4) $\dfrac{dx}{dt} = k$

Rate is constant but concentration of the reactant decreases linearly.

At $20\,min[A] = 12\,M$ $\qquad$ Thus, $\Delta x = 20 - 12 = 8\ M$

$\Delta t = 20 - 0 = 20\ min$ $\qquad\therefore\quad \dfrac{\Delta x}{\Delta t} = \dfrac{8}{20} = 0.4\ M\ min^{-1}$

132.(27) $k = \frac{2.303}{t_{90}} \log\left(\frac{a}{a-x}\right)$

$k = \frac{2.303}{90} \log\left(\frac{100}{100-90}\right) = \frac{2.303}{90} \log\ 10 = \frac{2.303}{90} \min^{-1}$

Also, $k = \frac{2.303}{t_{50}} \log \frac{100}{100-50} = \frac{2.303}{t_{50}} \log 2$

$\frac{2.303}{90} = \frac{2.303}{t_{50}} \log 2 \quad \Rightarrow \quad t_{50} = 90 \log 2 = 27\,\text{min}$

133.(30) $\ell n \frac{A_o}{A_t} = kt$

$t = \frac{1}{k} \ell n \frac{A_o}{A_t} = \frac{1}{0.0693} \ell n \frac{20}{2.5} \quad \Rightarrow t = \frac{1}{0.0693} \times 2.08 \quad \Rightarrow \quad t = 30$ min

134.(2) $\log_{10} K = \log_{10} A - \frac{E_a}{2.303RT}$ Slope $= -\frac{E_a}{2.303R} = \frac{-1}{2.303}$ $\therefore$ $E_a = R = 2\,\text{cal}$

135.(70) $k = 3.3 \times 10^{-4} s^{-1}$

Unit indicates first order reaction $\ell n \frac{A}{A_t} = kt$

$t = \frac{1}{k} \ell n \frac{A}{A_t} = \frac{1}{3.3 \times 10^{-4}} \ell n \frac{100}{25} \quad \Rightarrow t = \frac{10^4}{3.3} \ell n 4 = 4200.89\,\text{sec}$ Time $= \frac{4200.89}{60} = 70$ min

136.(4.51) Case I

$\Rightarrow \quad \ell n \frac{A}{A_t} = kt$

Case II

$\ell n \frac{A_o}{A_t} = kt \quad \Rightarrow \quad \ell n \frac{1}{1 - 1/4} = kt \quad \Rightarrow \quad \ell n \frac{4}{3} = kt \quad \Rightarrow \quad k = \frac{1}{20} \ell n \frac{4}{3} = 0.0143$

$t = \frac{1}{0.0143} \ell n \frac{1}{1 - 1/16} = \frac{1}{0.0143} \ell n \frac{16}{15} = 4.51\,\text{min}$

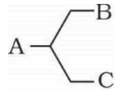
137.(610) $t = \frac{2.303}{\lambda} \log \frac{\text{initial mass}}{\text{remaining mass}}$

$20 = \frac{2.303}{0.693} \times 28.1 \log\left(\frac{1}{x}\right) \quad \Rightarrow \quad x = 0.61\ \mu g \quad \Rightarrow \quad 610 \times 10^{-9} g = 610$ nanograms.

138.(2) We know, $\frac{(t_{1/2})_1}{(t_{1/2})_2} = \left(\frac{a_2}{a_1}\right)^{n-1} \quad \Rightarrow \frac{3.64}{1.82} = \left(\frac{100}{50}\right)^{n-1} \quad \Rightarrow \quad 2 = 2^{n-1}$

$\Rightarrow \quad n - 1 = 1 \quad \Rightarrow \quad n = 2$

$\therefore$ Order of the reaction = 2.

139.(43) 

$\frac{k_1}{k_2} = 1.303 \;\; k_2 = 2hr^{-1}$

sol. $\frac{[B]}{[C]} = \frac{k_1}{k_2} = 1.303$ where $A_t =$ concentration after 1hr.

$\frac{-d[A]}{dt} = [k_1 + k_2]\,[A]$

$$(k_1 + k_2) = \frac{2.303}{t}\log_{10}\left[\frac{[A_t]+[B]+[C]}{[A_t]}\right]$$

$$2.303\ k_2 = \frac{2.303}{1}\log_{10}\left[1+\frac{2.303[C]}{[A_t]}\right]$$

$$k_2 = \log_{10}\left[1+\frac{2.303\ [C]}{A_t}\right]$$

$$10^2 = 1+\frac{2.303[C]}{A_t}$$

So $\dfrac{2.303[C]}{[A_t]} = 99; \quad \dfrac{[C]}{[A_t]} = \dfrac{99}{2.303}$

So $\dfrac{[C]}{[A_t]} = 42.987 \simeq 43.$

140.(13.4) $\begin{array}{l} COOH \\ | \\ COOH \end{array} \longrightarrow 2CO_2 + H_2O$

$t = 0 \qquad a_0$

$t - t_1 \qquad a_0 - x \qquad\qquad 2x$

$V_t \propto \quad a_0 - x, \qquad V_0 \propto a_0 \qquad \Rightarrow \qquad \ln\dfrac{V_t}{V_0} = -kt$

$\Rightarrow \qquad t_{1/2} = 802.98\,\text{sec} = 13.4\ \text{min}.$