D.B-College (Jaynagar) Lect-23
Akhilesh kumar Singh
Chemistry department B.Sc (Hons) part-I
Mob:- 8750390927

Ex.14. Fill in the blank:

$^{235}_{92}U + ^{1}_{0}n \longrightarrow ? + ^{92}_{36}Kr + 3^{1}_{0}n$

(A) $^{141}_{56}Ba$ (B) $^{139}_{56}Ba$ (C) $^{139}_{54}Ba$ (D) $^{141}_{54}Ba$

Solⁿ: $92 + 0 = Z + 36 + 0 \Rightarrow Z = 56$

$235 + 1 = A + 92 + 3$

$\therefore A = 141$

Missing nucleide is $^{141}_{56}Ba$

Hence, (A) is the correct answer.

Ex.15. In the nuclear reaction, $^{234}_{92}U \rightarrow ^{222}_{86}Rn$, the number of α and β - particles lost would

(A) 1, 3 (B) 2, 3 (C) 3, 0 (D) 0, 3

Solⁿ: $^{234}_{92}U \longrightarrow ^{222}_{86}Rn + x\,^{4}_{2}\alpha + y\,^{0}_{-1}\beta$

$234 = 222 + 4x \Rightarrow x = 3$

$92 = 86 + 2x - y$ or $y = 0$

Hence, (C) is the correct answer.

Ex. 12 The reactions, $CH_3COOC_2H_5 + NaOH \longrightarrow CH_3COONa + C_2H_5OH$, is

(A) biomolecular reaction (B) second order reaction
(C) third order reaction (D) none of the above

Solⁿ: (A) and (B)

Ex. 13 The activation energies of two reactions are E_a and E_a' with $E_a > E_a'$. If the temperature of the reacting systems is increased from T_1 and T_2 predict which alternative is correct k_1' and k_2' are rate constants at higher temperature. Assume A being the same for both the reactions.

(A) $\frac{k_1'}{k_1} = \frac{k_2'}{k_2}$ (B) $k_1 < k_2$ and $k_1' < k_2'$ (C) $k_1 > k_2$ and $k_1' >$

(D) $\frac{k_1'}{k_1} < \frac{2k_2'}{k_2}$

Solⁿ: More is energy of activation lesser is rate constant.

$k = Ae^{-E_a/RT}$

$k_1 < k_2$ and $k_1' < k_2'$

Hence, (B) is the correct answer.

Ex. 16 The rate constant of a reaction is given by $k = 3.2 \; 10^{10} e^{-\frac{2700}{2.303R}}$
It means that

(A) log k vs 1/T will be straight line with
$$\text{Slope} = \frac{-2700}{2.303R}$$

(B) Log k vs 1/T will be straight line with intercept on log k axis = log 3.2 10^{10}

(C) the number of effective collisions are 3.2 10^{10} cm^{-3} sec^{-1}

(D) half life of the reaction increases with increase in temperature

Sol^n: (A) and (B) are correct, (C) is wrong because frequency factor gives total number of collisions and not the effective collision cm^{-3} sec^{-1}, (D) is wrong because half-life of the reaction decreases with increase.
Hence, (A) and (B) are correct answer.

Ex. 17 Two substances X and Y are present such that $[X_0] = 2[Y_0]$ and half-life of X is 6 minutes and that of Y is 18 minutes. If they start decaying at the same time following first order

Scanned with CamScanner

kinetics how much time later will the concentration of both of them would be same?

(A) 15 minutes (B) 9 minutes (C) 5 minutes
(D) 12 minutes

Sol^n Amount of x left in n_1 half-lives $= \left(\frac{1}{2}\right)^{n_1}[X_0]$

Amount of y left in n_2 half-lives $= \left(\frac{1}{2}\right)^{n_2}[Y_0]$

At the end, $\frac{[X_0]}{2^{n_1}} = \frac{[X_0]}{2^{n_2}}$

$\frac{2}{2^{n_1}} = \frac{1}{2^{n_2}}, \{[X_0] = 2[Y_0]\}$

$\therefore \frac{2^n}{2^n} = 2 \Rightarrow 2^{n_1 - n_2} = (2)^1$

$\therefore n_1 - n_2 = 1$

$n_2 = (n_1 - 1)$ ---------- (1)

(Let, concentration of both become equal after time t)

$\therefore \frac{n_1 \times t_{1/2(x)}}{n_2 \times t_{1/2(y)}} = 1 \Rightarrow \frac{n_1 \times 6}{n_2 \times 18} = 1 \Rightarrow \frac{n_1}{n_2} = 3$ — (2)

From Eqs. (1) and (2), we get

$n_2 = 0.5,\ n' = x^{1.5}$ | $t = 0.5\ 18 = 9$ minutes
Hence (B) is the correct answer.