DPP – 07

CLASS – 12th

TOPIC – NCERT QUES.

Q.1 The decomposition NH_3 gas on a heated tungsten surface gave the following results :

Initial pressure (mm of Hg) 65 105 y 185

Half-life (sec) 290 × 670 820

Calculate approximately the values of x and y.

(A) x = 410 sec, y = 115 mm of Hg

(B) x = 467 sec , y = 150 mm of Hg

(C) x = 490 sec, y = 120 mm of Hg

(D) x = 430 sec, y = 105 mm of Hg

Q.2 In the reaction NH_4NO_2 (aq.) gives N_2 (g) + 2 H_2O (l) the volume of N_2 after 20 min and after a long time is 40 ml and 70 ml respectively. The value of rate constant is :

(A) (1/20) log (7/4) min^{-1}

(B) (2.303 /1200) log (7/3) sec^{-1}

(C) (1/20) log (7/3) min^{-1}

(D) (2.303 / 20) log (11/7) min^{-1}

Q.3 The rate constant for two parallel reactions were found to be 1.0×10^{-2} dm^3 mol^{-1} s^{-1} and 3.0×10^{-2} dm^3 $mol^{-1}s^{-1}$. If the corresponding energies of activation of the parallel reactions are 60.0 kJ mol^{-1} and 70.0 kJ mol^{-1} respectively, what is the apparent overall energy of activation ?

(A) 130.0 kJ mol^{-1}

(B) 67.5 kJ mol^{-1}

(C) 100.0 kJ mol^{-1}

(D) 65.0 kJ mol^{-1}

Q.4 The rate constant, the activation energy and the frequency factor of a chemical reaction at 25°C are 3.0×10^{-4} s^{-1}, 104.4 KJ mol^{-1} and 6.0×10^{14} s^{-1} respectively. The value of the rate constant as T is :

(A) 2.0×10^{18} s^{-1}

(B) 6.0×10^{14} s^{-1}

(C) infinite

(D) 3.6×10^{30} s^{-1}

Q.5 The rate constant k1 of a reaction is found to be double that of rate constant k 2 of another reaction. The relationship between corresponding activation energies of the two reactions at same temperature

(E_1 and E_2) will be represented as :

(A) $E_1 > E_2$

(B) $E_1 < E_2$

(C) $E_1 = E_2$

(D) None of these

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Sol.1

Half life is given as:-

$$t_{1/2} = \frac{2^{n-1} - 1}{K[A_o]^{n-1}}$$

Thus, $t_{1/2} \propto \frac{1}{[A_o]^{n-1}} \longrightarrow (1)$

$$\Rightarrow \left[\frac{65}{185}\right] = \left[\frac{820}{290}\right]^{n-1} = \left[\frac{290}{820}\right]^{1-n}$$

$\Rightarrow 0.35 = [0.35]^{1-n}$

$1 - n = 1 \qquad n = 0$

Thus, the reaction is zero order.

$t_{1/2} \propto [A_o]^1$

So, by using equation 1

$$\Rightarrow \frac{65}{105} = \left[\frac{290}{x}\right] \Rightarrow x = 468.5$$

$$\Rightarrow \frac{65}{y} = \frac{290}{670} \Rightarrow y = 150$$

Sol.2

The correct option is **B**

$(\frac{2.303}{1200}) \log(\frac{7}{3}) \sec^{-1}$

Given,

$t = 20 \text{ min} = 20 \times 60 = 1200 \text{ sec}$

$NH_4NO_2(aq) \rightarrow N_2(g) + 2H_2O(l)$

$$K = \frac{2.303}{t} \log(\frac{V_\infty + V_0}{V_\infty - V_t})$$

$\rightarrow V_0 = 0$

$$\rightarrow K = \frac{2.303}{1200} \log(\frac{70 - 0}{70 - 40})$$

$$= \frac{2.303}{1200} \log(\frac{70}{30}) \sec^{-1}$$

$$\rightarrow K = \frac{2.303}{1200} \log \frac{7}{3} \sec^{-1}$$

Sol.3 Correct option is C)

Overall energy of activation $= \frac{k_1E_1 + k_2E_2}{k_1 + k_2}$

$$\Rightarrow \frac{60 \times 1 \times 10^{-2} + 70 \times 3 \times 10^{-2}}{4 \times 10^{-2}}$$

$$\rightarrow \frac{270}{4} = 67.5 \text{ KJmol}^{-1}$$

Sol.4

Correct option is B)

$k = A\ e^{-E_a/RT}$

At T = Infinity, $\frac{1}{T}$ becomes =0. So,

$k = A\ e^{0}$

$k = A\ = 6.0 \times 10^{14}\ s^{-1}$

Sol.5

Correct option is B)

Arrhenius equation,

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

Larger is rate constant, lesser is energy of activation so $E_1 < E_2$