

- 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) $(1/20) \log (7/4) \text{ min}^{-1}$
(B) $(2.303 / 1200) \log (7/3) \text{ sec}^{-1}$
(C) $(1/20) \log (7/3) \text{ min}^{-1}$
(D) $(2.303 / 20) \log (11/7) \text{ min}^{-1}$
- Q.3** The rate constant for two parallel reactions were found to be $1.0 \times 10^{-2} \text{ dm}^3 \text{ mol}^{-1} \text{ s}^{-1}$ and $3.0 \times 10^{-2} \text{ dm}^3 \text{ mol}^{-1} \text{ s}^{-1}$. 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 $3.0 \times 10^{-4} \text{ s}^{-1}$, 104.4 KJ mol^{-1} and $6.0 \times 10^{14} \text{ s}^{-1}$ respectively. The value of the rate constant as T is :
- (A) $2.0 \times 10^{18} \text{ s}^{-1}$
(B) $6.0 \times 10^{14} \text{ s}^{-1}$
(C) infinite
(D) $3.6 \times 10^{30} \text{ s}^{-1}$

Q.5 The rate constant k_1 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

SOLUTION

(CHEMISTRY)

KINETICS

DPP - 07

CLASS - 12th

TOPIC - NCERT QUES.

Sol.1

Half life is given as:-

$$t_{1/2} = \frac{2^{n-1} - 1}{K[A_0]^{n-1}}$$

$$\text{Thus, } t_{1/2} \propto \frac{1}{[A_0]^{n-1}} \rightarrow (1)$$

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

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

$$1 - n = 1 \quad n = 0$$

Thus, the reaction is zero order.

$$t_{1/2} \propto [A_0]^1$$

So, by using equation 1

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

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

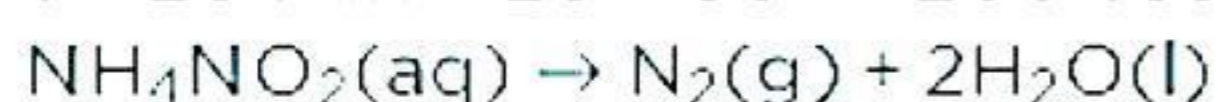
Sol.2

The correct option is **B**

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

Given,

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



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

$$\Rightarrow V_0 = 0$$

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

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

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

Sol.3

Correct option is C)

$$\text{Overall energy of activation} = \frac{k_1 E_1 + k_2 E_2}{k_1 + k_2}$$

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

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

Sol.4

Correct option is B)

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

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

$$k = A e^0$$

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

Sol.5

Correct option is B)

Arrhenius equation,

$$K = A e^{-E_a/RT}$$

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