Q1. 21 January Shift 1

Pre-exponential factors of two different reactions of same order are identical. Let activation energy of first reaction exceeds the activation energy of second reaction by 20 kJ mol^{-1}. If k_1 and k_2 are the rate constants of first and second reaction respectively at 300 K, then $\ln \frac{k_2}{k_1}$ will be ____. (nearest integer) $\left[R = 8.3\ J\ K^{-1}\ mol^{-1}\right]$

Q2. 21 January Shift 2

Decomposition of A is a first order reaction at T(K) and is given by $A(g) \longrightarrow B(g) + C(g)$. In a closed 1 L vessel, 1 bar A(g) is allowed to decompose at T(K). After 100 minutes, the total pressure was 1.5 bar. What is the rate constant $\left(in min^{-1}\right)$ of the reaction ? $(\log 2 = 0.3)$

(1) 6.9×10^{-3} (2) 6.9×10^{-4} (3) 6.9×10^{-1} (4) 6.9×10^{-2}

Q3. 22 January Shift 1

A $\rightarrow$ product (First order reaction). Three sets of experiment were performed for a reaction under similar experimental conditions:

Run 1 $\Rightarrow$ 100 mL of 10 M solution of reactant A

Run 2 $\Rightarrow$ 200 mL of 10 M solution of reactant A

Run 3 $\Rightarrow$ 100 mL of 10 M solution of reactant A + 100 mL of H_2O added.

The correct variation of rate of reaction is

(1) Run 1 < Run 2 < Run 3 (2) Run 3 < Run 1 < Run 2

(3) Run 3 < Run 1 = Run 2 (4) Run 1 = Run 2 = Run 3

Q4. 22 January Shift 1

The temperature at which the rate constants of the given below two gaseous reactions become equal is ____ K. (Nearest integer)

$X \longrightarrow Y \quad k_1 = 10^6 e^{\frac{-30000}{T}}$

$P \longrightarrow Q \quad k_2 = 10^4 e^{\frac{-24000}{T}}$

Given: $\ln 10 = 2.303$

Q5. 22 January Shift 2

Correct statements regarding Arrhenius equation among the following are :

A. Factor $e^{-Ea/RT}$ corresponds to fraction of molecules having kinetic energy less than Ea.

B. At a given temperature, lower the Ea, faster is the reaction.

C. Increase in temperature by about 10°C doubles the rate of reaction.

D. Plot of log k vs $\frac{1}{T}$ gives a straight line with slope $= -\frac{Ea}{R}$.

Choose the correct answer from the options given below :

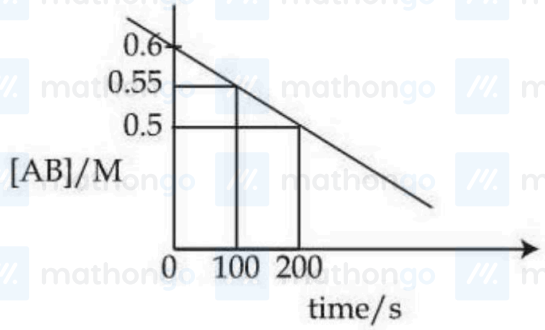
(1) B and D Only (2) A and B Only (3) B and C Only (4) A and C Only

Q6. 22 January Shift 2

Consider $A \xrightarrow{k_1} B$ and $C \xrightarrow{k_2} D$ are two reactions. If the rate constant (k_1) of the $A \longrightarrow B$ reaction can be expressed by the following equation $\log_{10} k = 14.34 - \frac{1.5\times10^4}{T/K}$ and activation energy of $C \longrightarrow D$ reaction (Ea_2) is $\frac{1}{5}$ th of the $A \longrightarrow B$ reaction (Ea_1), then the value of (Ea_2) is ____ $kJmol^{-1}$. (Nearest Integer)

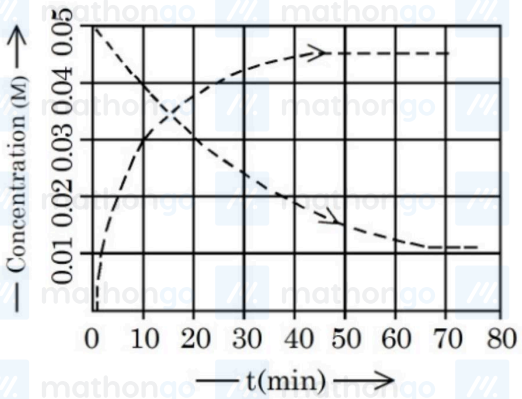
Q7. 23 January Shift 1

For the thermal decomposition of reactant AB(g), the following plot is constructed.



The half life of the reaction is ' x' min. x = ____ min. (Nearest integer)

Q8. 23 January Shift 2



Given above is the concentration vs time plot for a dissociation reaction : A → nB. Based on the data of the initial phase of the reaction (initial 10 min), the value of n is ____.

(1) 3 (2) 2 (3) 4 (4) 5

Q9. 23 January Shift 2

Observe the following reactions at $T(K)$.

I. $A \rightarrow$ products.

II. $5Br^-(aq) + BrO_3^-(aq) + 6H^+(aq) \rightarrow 3Br_2(aq) + 3H_2O(l)$

Both the reactions are started at 10.00 am. The rates of these reactions at 10.10 am are same. The value of $-\frac{\Delta[Br^-]}{\Delta t}$ at 10.10 am is 2×10^{-4} mol L^{-1} min^{-1}. The concentration of A at 10.10 am is 10^{-2} mol L^{-1}. What is the first order rate constant (in min^{-1}) of reaction I ?

(1) 10^{-2} (2) 10^{-3} (3) 2×10^{-3} (4) 4×10^{-3}

Q10. 24 January Shift 1

At 27°C in presence of a catalyst, activation energy of a reaction is lowered by 10 kJ mol^{-1}. The logarithm of ratio of $\frac{k\ (catalysed)}{k\ (uncatalysed)}$ is....

(Consider that the frequency factor for both the reactions is same)

(1) 1.741 (2) 17.41 (3) 3.482 (4) 0.1741

Q11. 24 January Shift 2

The half-life of ^{65}Zn is 245 days. After x days, 75% of original activity remained. The value of x in days is ____.

(Nearest integer)

(Given: $\log 3 = 0.4771$ and $\log 2 = 0.3010$)

Q12. 28 January Shift 1

An organic compound undergoes first order decomposition. The time taken for decomposition to $\left(\frac{1}{8}\right)^{th}$ and $\left(\frac{1}{10}\right)^{th}$ of its initial concentration are $t_{1/8}$ and $t_{1/10}$ respectively. What is the value of $\frac{t_{1/8}}{t_{1/10}} \times 10$? ($\log 2 = 0.3$)

(1) 3 (2) 9 (3) 0.9 (4) 30

Q13. 28 January Shift 2

$A \longrightarrow B$ (first reaction)

$C \longrightarrow D$ (second reaction)

Consider the above two first-order reactions. The rate constant for first reaction at 500 K is double of the same at 300 K. At 500 K, 50% of the reaction becomes complete in 2 hour. The activation energy of the second reaction is half of that of first reaction. If the rate constant at 500 K of the second reaction becomes double of the rate constant of first reaction at the same temperature; then rate constant for the second reaction at 300 K is ____ $\times 10^{-1}$ hour $^{-1}$ (nearest integer).

ANSWER KEYS

1. 8 **2.** (1) **3.** (3) **4.** 1303 **5.** (3) **6.** 57 **7.** 10 **8.** (1)

9. (4) **10.** (1) **11.** 102 **12.** (2) **13.** 5