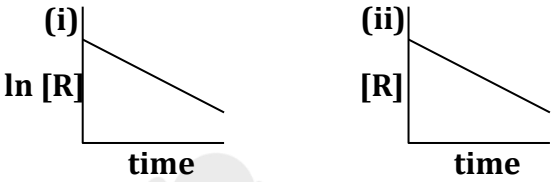
Chemical Kinetics

1. Decomposition of X exhibits a rate constant of 0.05 μg/year. How many years are required for the decomposition of 5 μg of X into 2.5 μg ? **[Jee Main, Jan 2019]**

(1) 25 (2) 40 (3) 50 (4) 20

2. The given plots represent the variation of the concentration of a reactant R with time for two different reactions (i) and (ii). The respective orders of the reactions are : (Chemical Kinetics)

[Jee Main, April 2019]



(1) 0, 1 (2) 1, 1 (3) 0, 2 (4) 1, 0

3. For an elementary chemical reaction, $A_2 \longrightarrow 2A$, the expression for $\frac{d[A]}{dt}$ is: [Chemical Kinetics]

(1) $2k_1[A_2]-2k_{-1}[A]^2$ (2) $k_1[A_2]-k_{-1}[A]^2$

(3) $2k_1[A_2]-k_{-1}[A]^2$ (4) $k_1[A_2]+k_{-1}[A]^2$ **[Jee Main, Jan 2019]**

4. If a reaction follows the Arrhenius equation, the plot lnk vs $\frac{1}{(RT)}$ gives straight line with a gradient (–y) unit. The energy required to activate the reactant is : [Kinetics]

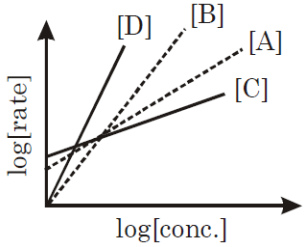
(1) $\frac{y}{R}$ unit (2) yR unit (3) y unit (4) –y unit

[Jee Main, Jan 2019]

5. Consider the following reactions

$A \rightarrow P1$; $B \rightarrow P2$; $C \rightarrow P3$; $D \rightarrow P4$,

The order of the above reactions are a, b, c and d, respectively. The following graph is obtained when log[rate] vs. log[conc.] are plotted : **[Jee Main, 2020]**



Among the following, the correct sequence for the order of the reactions is :

(1) d > b > a > c (2) a > b > c > d

(3) c > a > b > d (4) d > a > b > c

6. The rate of a certain biochemical reaction at physiological temperature (T) occurs 10^6 times faster with enzyme than without. The change in the activation energy upon adding enzyme is :

(1) + 6RT (2) –6(2.303)RT

(3) +6(2.303)RT (4) –6RT

[Jee Main, 2020]

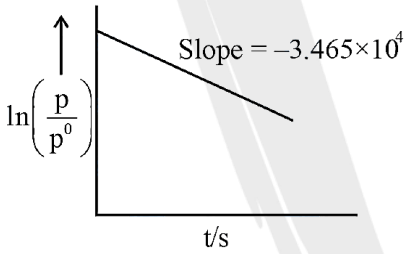
7. Gaseous cyclobutene isomerizes to butadiene in a first order process which has a 'k' value of $3.3 \times 10^{-4} s^{-1}$ at 153°C. The time in minutes it takes for the isomerization to proceed 40% to completion at this temperature is_____ (Rounded off to the nearest integer)

[JEE Main, Feb 2021]

8. The inactivation rate of a viral preparation is proportional to the amount of virus. In the first minute after preparation, 10% of the virus is inactivated. The rate constant for viral inactivation is _____$\times 10^{-3}$ min^{-1}. (Nearest integer) **[JEE Main, July 2021]**

[Use : ln 10 = 2.303 ; $\log_{10} 3 = 0.477$; property of logarithm : $\log x^y = y \log x$]

9. For the decomposition of azomethane. $CH_3N_2CH_3(g) \rightarrow CH_3CH_3(g) + N_2(g)$ a first order reaction, the variation in partial pressure with time at 600 K is given as



The half life of the reaction is____$\times 10^{-5}$ s. [Nearest integer] **[JEE Main, July 2022]**

10. $2\ NO(g) + Cl_2(g) \rightleftharpoons 2\ NOCl(s)$

This reaction was studied at –10°C and the following data was obtained

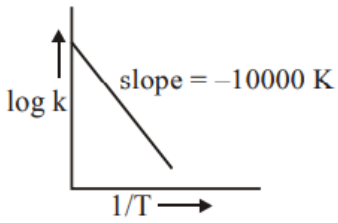
run	$[NO]_0$	$[Cl_2]_0$	r_0
1	0.10	0.10	0.18
2	0.10	0.20	0.35
3	0.20	0.20	1.40

$[NO]_0$ and $[Cl_2]_0$ are the initial concentrations and r_0 is the initial reaction rate.

The overall order of the reaction is _____. **[JEE Main, March 2021]**

(Round off to the Nearest Integer).

11. For the reaction, aA + bB $\rightarrow$cC + dD, the plot of log k vs $\frac{1}{T}$ is given below:



The temperature at which the rate constant of the reaction is 10^{-4} s^{-1} is ___ K.

(Rounded-off to the nearest integer)

[Given : The rate constant of the reaction is 10^{-5} s^{-1} at 500K.] **[JEE Main, Feb 2021]**

12. The activation energy of one of the reactions in a biochemical process is 532611 J $mo1^{-1}$. When the temperature falls from 310 K to 300 K, the change in rate constant observed is $k_{300} = x \times 10^{-3} k_{310}$. The value of x is _____. [Given: 1n10 = 2.3 R=8.3 J K^{-1} $mo1^{-1}$]

[JEE Main, June 2022]

ANSWERS KEY

1.	(3)	**2.**	(4)	**3.**	(1)	**4.**	(3)	**5.**	(1)	**6.**	(2)
7.	(26)	**8.**	(106)	**9.**	(02.00)	**10.**	(3)	**11.**	(256)	**12.**	(1)