

PYQSide

NEET CHEMICAL KINETICS — TEMPERATURE DEPENDENCE OF THE RATE OF A REACTION AND ARRHENIUS EQUATION — PYQS

Max. Marks: 60

Questions: 15

Section A (MCQ)

- Q.1** Given below is an expression for the rate constant of a first-order reaction occurring at a certain temperature, T (K).

$$\ln k = 14.34 - \frac{1.25 \times 10^4}{T}$$

The energy of activation in kcal mol^{-1} for the reaction is :

(Given : k in s^{-1} , $R = 1.987 \text{ cal mol}^{-1} \text{ K}^{-1}$)

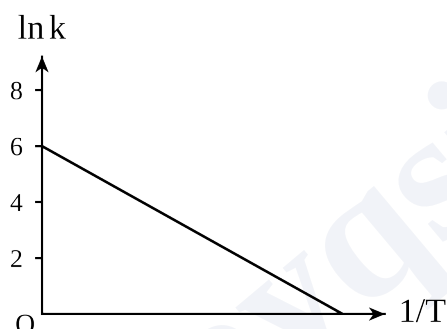
[NEET (UG) 2026]

- (1) 12.42 (2) 18.63 (3) 14.34 (4) 24.84

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- Q.2** For an elementary chemical reaction, the Arrhenius plot is given below.



If the energy of activation is 6.64 kJ mol^{-1} and $R = 8.3 \text{ J K}^{-1} \text{ mol}^{-1}$, the temperature at which the rate constant becomes $\text{e}^2 \text{ min}^{-1}$, is

[RE-NEET (UG) 2026]

- (1) 250 K (2) 125 K (3) 150 K (4) 200 K

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- Q.3** Activation energy of any chemical reaction can be calculated if one knows the value of

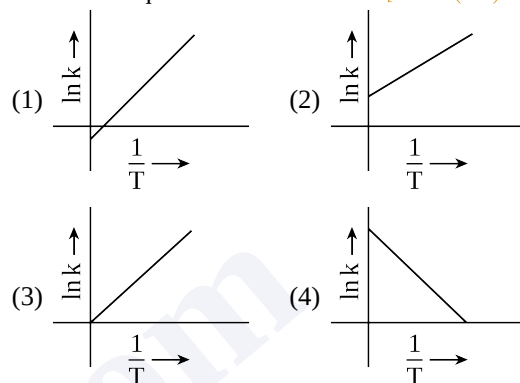
[NEET (UG) 2024]

- (1) rate constant at standard temperature
(2) probability of collision
(3) orientation of reactant molecules during collision
(4) rate constant at two different temperatures

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- Q.4** Which plot of $\ln k$ vs $\frac{1}{T}$ is consistent with Arrhenius equation? [NEET (UG) 2024]



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- Q.5** The rate of a reaction quadruples when temperature changes from 27°C to 57°C . Calculate the energy of activation.

Given $R = 8.314 \text{ J K}^{-1} \text{ mol}^{-1}$, $\log 4 = 0.6021$

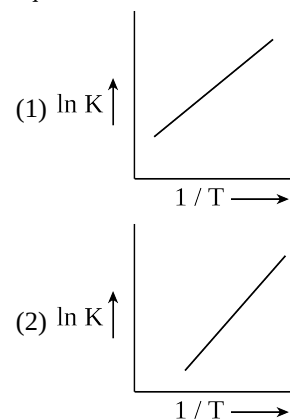
[NEET (UG) 2024]

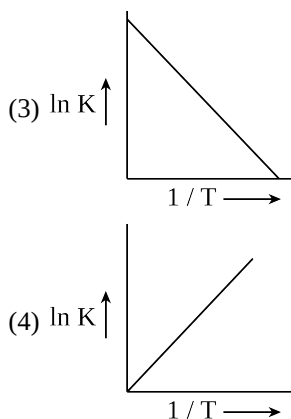
- (1) 38.04 kJ/mol (2) 380.4 kJ/mol
(3) 3.80 kJ/mol (4) 3804 kJ/mol

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- Q.6** Which of the following plot represents the variation of $\ln k$ versus $\frac{1}{T}$ in accordance with Arrhenius equation? [RE-NEET (UG) 2024]





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- Q.7** Rate constants of a reaction at 500 K and 700 K are 0.04 s^{-1} and 0.14 s^{-1} , respectively; then, activation energy of the reaction is :
(Given: $\log 3.5 = 0.5441$, $R = 8.31 \text{ J K}^{-1} \text{ mol}^{-1}$)

[RE-NEET (UG) 2024]

- (1) 182310 J (2) 18500 J
(3) 18219 J (4) 18030 J

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- Q.8** Given below are two statements: one is labelled as Assertion A and the other is labelled as Reason R.
Assertion (A): A reaction can have zero activation energy.
Reason (R): The minimum extra amount of energy absorbed by reactant molecules so that their energy becomes equal to threshold value, is called activation energy.

In the light of the above statements, choose the correct answer from the options given below:

[NEET (UG) 2023]

- (1) Both A and R are true but R is NOT the correct explanation of A.
(2) A is true but R is false.
(3) A is false but R is true.
(4) Both A and R are true and R is the correct explanation of A.

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- Q.9** The slope of Arrhenius plot $\left(\ln k \text{ v/s } \frac{1}{T}\right)$ of first order reaction is $-5 \times 10^3 \text{ K}$. The value of E_a of the reaction is. Choose the correct option for your answer.

[Given $R = 8.314 \text{ J K}^{-1} \text{ mol}^{-1}$] [NEET (UG) 2021]

- (1) -83 kJ mol^{-1} (2) 41.5 kJ mol^{-1}
(3) 83.0 kJ mol^{-1} (4) 166 kJ mol^{-1}

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- Q.10** The activation energy of a reaction can be determined from the slope of which of the following graphs? [AIPMT 2015 (Cancelled)]

- (1) $\ln k$ vs. $\frac{1}{T}$ (2) $\frac{T}{\ln k}$ vs. $\frac{1}{T}$
(3) $\ln k$ vs. T (4) $\frac{\ln k}{T}$ vs. T

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- Q.11** What is the activation energy for a reaction if its rate doubles when the temperature is raised from 20°C to 35°C ?

($R = 8.314 \text{ J mol}^{-1} \text{ K}^{-1}$) [NEET 2013]

- (1) 34.7 kJ mol^{-1} (2) 15.1 kJ mol^{-1}
(3) 342 kJ mol^{-1} (4) 269 kJ mol^{-1}

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- Q.12** Activation energy (E_a) and rate constants (k_1 and k_2) of a chemical reaction at two different temperatures (T_1 and T_2) are related by

[AIPMT 2012 (Mains)]

- (1) $\ln \frac{k_2}{k_1} = -\frac{E_a}{R} \left(\frac{1}{T_1} - \frac{1}{T_2} \right)$
(2) $\ln \frac{k_2}{k_1} = -\frac{E_a}{R} \left(\frac{1}{T_2} - \frac{1}{T_1} \right)$
(3) $\ln \frac{k_2}{k_1} = -\frac{E_a}{R} \left(\frac{1}{T_2} + \frac{1}{T_1} \right)$
(4) $\ln \frac{k_2}{k_1} = \frac{E_a}{R} \left(\frac{1}{T_1} - \frac{1}{T_2} \right)$

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- Q.13** The rate of the reaction, $2\text{NO} + \text{Cl}_2 \longrightarrow 2\text{NOCl}$ is given by the rate equation $\text{rate} = k[\text{NO}]^2[\text{Cl}_2]$. The value of the rate constant can be increased by

[AIPMT 2010 (Mains)]

- (1) increasing the temperature
(2) increasing the concentration of NO
(3) increasing the concentration of the Cl_2
(4) doing all of these.

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- Q.14** The rate constants k_1 and k_2 for two different reactions are $10^{16} \cdot e^{-2000/T}$ and $10^{15} \cdot e^{-1000/T}$, respectively.

The temperature at which $k_1 = k_2$ is [AIPMT 2008]

- (1) 2000 K (2) $\frac{1000}{2.303} \text{ K}$
(3) 1000 K (4) $\frac{2000}{2.303} \text{ K}$

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Q.15 The temperature dependence of rate constant (k) of a chemical reaction is written in terms of Arrhenius equation, $k = A \cdot e^{-E^*/RT}$. Activation energy (E^*) of the reaction can be calculated by plotting

[AIPMT 2003]

(1) k vs T

(2) k vs $\frac{1}{\log T}$

(3) $\log k$ vs $\frac{1}{T}$

(4) $\log k$ vs $\frac{1}{\log T}$

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full solution



ANSWER KEY

Ques.	1	2	3	4	5	6	7
Ans.	4	4	4	4	1	3	3
Ques.	8	9	10	11	12	13	14
Ans.	3	2	1	1	2, 4	1	2
Ques.	15						
Ans.	3						