



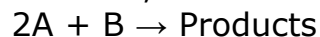
Chemical Kinetics

Q.No.1: At 518°C, the rate of decomposition of a sample of gaseous acetaldehyde, initially at a pressure of 363 Torr, was 1.00 Torr s^{-1} when 5% had reacted and 0.5 Torr s^{-1} when 33% had reacted. The order of the reaction is:

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- A. 1
- B. 0
- C. 2
- D. 3

Q.No.2: The following results were obtained during kinetic studies of the reaction;



Experiment	[A] (in mol L ⁻¹)	[B] (in mol L ⁻¹)	Initial Rate of reaction (in mol L ⁻¹ min ⁻¹)
I	0.10	0.20	6.93×10^{-3}
II	0.10	0.25	6.93×10^{-3}
III	0.20	0.30	1.386×10^{-2}

The time (in minutes) required to consume half of A is:

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- A. 5
- B. 10
- C. 1
- D. 100

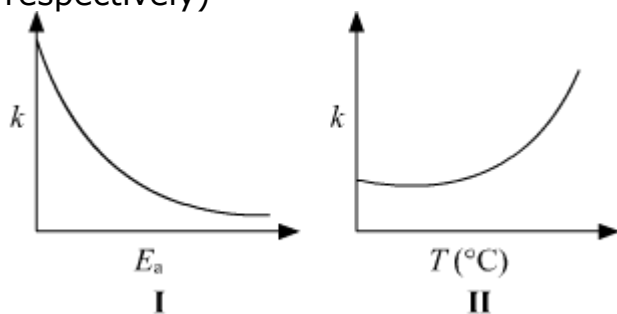
Q.No.3: For the reaction, $2A + B \rightarrow \text{products}$, when the concentrations of A and B both were doubled, the rate of the reaction increased from $0.3 \text{ mol L}^{-1}\text{s}^{-1}$ to $2.4 \text{ mol L}^{-1}\text{s}^{-1}$. When the concentration of A alone is doubled, the rate increased from $0.3 \text{ mol L}^{-1}\text{s}^{-1}$ to $0.6 \text{ mol L}^{-1}\text{s}^{-1}$.

Which one of the following statements is correct?

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- A. Total order of the reaction is 4
- B. Order of the reaction with respect to B is 2
- C. Order of the reaction with respect to B is 1
- D. Order of the reaction with respect to A is 2

Q.No.4: Consider the given plots for a reaction obeying Arrhenius equation ($0^\circ\text{C} < T < 300^\circ\text{C}$) : (k and E_a are rate constant and activation energy, respectively)



Choose the correct option:

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- A. I is right but II is wrong
- B. Both I and II are correct
- C. I is wrong but II is right
- D. Both I and II are wrong

Q.No.5: If a reaction follows the Arrhenius equation, the plot $\ln k$ vs $\frac{1}{(RT)}$ gives straight line with a gradient $(-y)$ unit. The energy required to activate the reactant is:

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- A. y/R unit
- B. y unit
- C. yR unit
- D. $-y$ unit

Q.No.6: The reaction $2X \rightarrow B$ is a zeroth order reaction. If the initial concentration of X is 0.2 M, the half-life is 6 h. When the initial concentration of X is 0.5 M, the time required to reach its final concentration of 0.2 M will be:

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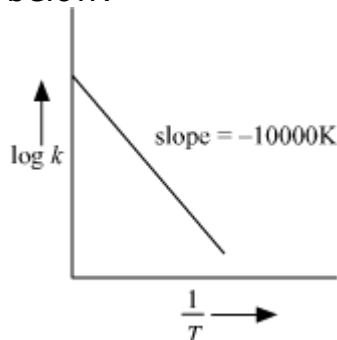
- A. 9.0 h
- B. 12.0 h
- C. 18.0 h
- D. 7.2 h

Q.No.7: Sucrose hydrolyses in acid solution into glucose and fructose following first order rate law with a half-life of 3.33 h at 25°C. After 9 h, the fraction of sucrose remaining is f. The value of $\log_{10} \left(\frac{1}{f} \right)$ is _____ $\times 10^{-2}$. (Rounded off to the nearest integer)

[Assume : $\ln 10 = 2.303$, $\ln 2 = 0.693$]

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Q.No.8: 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 500 K.]

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Q.No.9: Which of the following forms of hydrogen emits low energy β -particles?

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- A. Proton H^+
- B. Tritium ${}^3_1\text{H}$
- C. Protium ${}^1_1\text{H}$

D. Deuterium ${}^2_1\text{H}$

Q.No.10: If the activation energy of a reaction is 80.9 kJ mol^{-1} , the fraction of molecules at 700 K , having enough energy to react to form products is e^{-x} . The value of x is _____.

(Rounded off to the nearest integer)

[Use $R = 8.31 \text{ J K}^{-1} \text{ mol}^{-1}$]

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