CHEMISTRY **Chemical Kinetics**



Calculate the energy of activation. Given $R = 8.314 \text{ J}K^{-1} \text{ mol}^{-1}, \log 4 = 0.6021$ (2024) (a) 380.4 kJ/mol (b) 3.80 kJ/mol (c) 3804 kJ/mol (d) 38.04 kJ/mol (d) 38.04 kJ/mol 4. For a reaction, $3A \rightarrow 2B$ The average rate of appearance of B is given by $\frac{\Delta[B]}{\Delta t}$. The correct relation between the average rate of appearance of B with the average rate of disappearance of A is given in option: (a) $\frac{-\Delta[A]}{\Delta t}$ (b) $\frac{-3\Delta[A]}{2\Delta t}$ (c) $\frac{-2\Delta[A]}{3\Delta t}$ (d) $\frac{\Delta[A]}{\Delta t}$
 5. The correct options for the rate law that corresponds to overall first order reaction is (2023) (a) Rate = k[A]⁰[B]² (b) Rate = k[A][B] (c) Rate = k[A]^{1/2}[B]² (d) Rate = k[A]^{-1/2}[B]^{3/2} 6. For a certain reaction, the rate = k[A]²[B], when the initial concentration of A is tripled keeping concentration of B constant, the initial rate would (2023) (a) increase by a factor of six (b) increase by a factor of nine
 (c) increase by a factor of three (d) decrease by a factor of nine 7. Given below are two statements: One is labelled as Assertion (A) and the other is labelled as Reason (R). Assertion: A reaction can have zero activation energy. Reason: 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: (2023)

- (a) Both A and R are true but R is NOT the correct explanation of A.
- (b) A is true but R is false.
- (c) A is false but R is true.
- (d) Both A and R are true and R is the correct explanation of A.
- **8.** For a chemical reaction,

$$4A + 3B \rightarrow 6C + 9D$$

Rate of formation of C is 6 × 10⁻² mol L⁻¹
s⁻¹ and rate of disappearance of A is 4 × 10⁻² mol L⁻¹ s⁻¹. The rate of reaction and amount of B consumed in interval of 10 seconds, respectively will be: (2022)
(a) 10 × 10⁻² mol L⁻¹ s⁻¹ & 30 × 10⁻² mol L⁻¹

- (b) $1 \times 10^{-2} \text{ mol } \text{L}^{-1} \text{ s}^{-1} \& 30 \times 10^{-2} \text{ mol } \text{L}^{-1}$
- (c) 10×10^{-2} mol L⁻¹ s⁻¹ & 10×10^{-2} mol L⁻¹
- (d) 1×10^{-2} mol L⁻¹ s⁻¹ & 10×10^{-2} mol L⁻¹
- **9.** The given graph is a representation of kinetic of a reaction (2022)

Constant temperature T

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The 'y' and 'x' axes for zero and first order reactions, respectively are

- (a) zero order (y = concentration & x = time), first order (y = $t_{1/2}$ & x = concentration)
- (b) zero order (y = concentration & x = time), first order (y = rate constant & x = concentration)
- (c) zero order (y = rate & x = concentration), first order (y = $t_{1/2}$ & x = concentration)
- (d) zero order (y = rate & x = concentration), first order (y = rate & $x = t_{1/2}$)

10. For a first order reaction A → Products, initial concentration of A is 0.1 M, which becomes 0.001 M after 5 minutes. Rate constant for the reaction in min⁻¹ is

(2022)

- (a) 1.3818 (b) 0.9212
- (c) 0.4606 (d) 0.2303
- **11.** For a reaction $A \rightarrow B$, enthalpy of reaction is -4.2 kJ mol⁻¹ and enthalpy of activation is 9.6 kJ mol⁻¹. The correct potential energy profile for the reaction is shown in option. (2021)



- The slope of Arrhenius Plot (ln K v/s 1/T) of first order reaction is -5 × 10³ K. The value of E_a of the reaction is. Choose the correct option for your answer. (2021) [Given R = 8.314 JK⁻¹ mol⁻¹]
 - (a) 83.0 kJ mol⁻¹
 - (b) 166 kJ mol⁻¹
 - (c) -83 kJ mol^{-1}
 - (d) 41.5 kJ mol⁻¹
- 13. An increase in the concentration of the reactants of a reaction leads to change in: (2020)
 - (a) Heat of reaction
 - (b) Threshold energy
 - (c) Collision frequency
 - (d) Activation energy

14. The rate contant for a first order reaction concentrations; the rate of a secondis 4.606×10^{-3} s⁻¹. The time required to order reaction does depend on reduce 2.0 g of the reactant to 0.2 g is: reactant concentrations (2020)(b) The half-life of a first-order reaction does not depend on [A]₀; the half-life (a) 200 s (b) 500 s of a second-order reaction does (c) 1000 s depend on $[A]_0$ (d) 100 s (c) The rate of a first-order reaction does 15. In collision theory of chemical reaction, depend on reactant concentrations; Z_{AB} represents (2020 Covid Re-NEET) the rate of a second-order reaction (a) The collision frequency of reactants, does not depend on reactant A and B concentrations (b) Steric factor (d) A first-order reaction can catalysed; a (c) The fraction of molecules with second-order reaction cannot be energies equal to E_a catalyzed (d) The fraction of molecules with 21. Mechanism of a hypothetical reaction energies greater than E_a $X_2 + Y_2 \rightarrow 2XY$ is given below: 16. The half-life for a zero order reaction (2017-Delhi) having 0.02 M initial concentration of $X_2 \rightarrow X + X$ (fast) (i) reactant is 100 s. The rate constant (in (ii) $X + Y_2 \rightleftharpoons XY + Y$ (slow) mol L^{-1} S^{-1}) for the reaction is (iii) $X + Y \rightarrow XY$ (fast) (2020 Covid Re-NEET) The overall order of the reaction will be (b) 2.0×10^{-3} (a) 2.0×10^{-4} (a) 1.5 (b) 1 (c) 1.0×10^{-2} (d) 1.0×10^{-4} (c) 2 (d) 0 17. If the rate constant for a first order 22. A first order reaction has a specific reaction rate of 10⁻² s⁻¹. How much time reaction is k, the time (t) required for the completion of 99% of the reaction is given will it take for 20 g of the reactant to (2019) reduce to 5 g? by: (2017-Delhi) (a) t = 0.693/k(b) t = 6.909/k(a) 693.0 second (b) 238.6 second (d) t = 2.303/k(c) t = 4.606/k(c) 138.6 second (d) 346.5 second 18. For the chemical reaction 23. Consider the reaction between chlorine $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$ and nitric oxide (2019)The correct option is: $Cl_2(g) + 2NO(g) \rightarrow 2NOCl(g)$ (a) $-\frac{1}{d}\frac{d[H_2]}{d[H_2]} = -\frac{1}{d}\frac{d[NH_3]}{d[NH_3]}$ On doubling the concentration of both 3 dt 2 dt reactants the rate of the reaction (b) $-\frac{d[N_2]}{dt} = 2\frac{d[NH_3]}{dt}$ increases by a factor of 8. However, if dt dt (c) $-\frac{d[N_2]}{d[N_2]}$ $=\frac{1}{2}\frac{d[NH_3]}{dt}$ only the concentration of Cl_2 id doubled, dt the rate is increased by a factor of 2. The (d) $3\frac{d[H_2]}{dt} = 2\frac{d[NH_3]}{dt}$ order of this reaction with respect to NO dt dt When initial concentration 19. of the is: (2017-Gujarat) reactant is doubled, the half-life period of (a) 3 (b) 0 a zero order reaction (2018) (c) 1 (d) 2 (a) Is halved 24. For the reaction, $XA + YB \rightarrow ZC$, if $\frac{-d[A]}{dt} = \frac{-d[B]}{dt} = \frac{1.5d[C]}{dt}$, then the correct (b) Is doubled (c) Is tripled statement among the following is: (d) Remains unchanged (2017-Gujarat)20. The correct difference between first and (a) The value of Y = 2second order reactions is that: (2018)(b) The value of X = Y = Z = 3(a) The rate of a first-order reaction does (c) The value of X = Y = 3not depend reactant on (d) The value of X = 2

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25.	The decomposition of phosphine (PH ₃) on	30.	The acti
	tungsten at low pressure is a first-order		determi
	reaction. It is because the: (2016-II)		followin
	(a) Rate is proportional to the surface		(a) $\frac{\ln k}{T}v$
	coverage		(a) T
	(b) Rate is inversely proportional to the		(c) $\frac{1}{\ln k}$
	surface coverage	31.	For a g
	(c) Rate is independent of the surface		k'_p are
	coverage		tempera
	(d) Rate of decomposition is very low		Assumi
26.	The rate of a first-order reaction is 0.04		constan
	mol L^{-1} s ⁻¹ at 10 seconds and 0.03 mol L^{-1}		T_1 and T_2
	¹ s ⁻¹ at 20 seconds after initiation of the		
	reaction. The half-life period of the		(a) $k_p <$
	reaction is: (2016-I)		(c) $k_n <$
	(a) 54.1 s (b) 24.1 s		(-, -p
	(c) 34.1 s (d) 44.1 s	32.	A reac
27.	The addition of a catalyst during a		activatio
	chemical reaction alters which of the	×.	reaction
	following quantities? (2016-I)		(a) ∆S =
	(a) Activation energy		(b) ∆G =
	(b) Entropy		(c) ∆H =
	(c) Internal energy		(d) ∆H =
	(d) Enthalpy	33.	What i
28.	The rate constant of the reaction $A \rightarrow B$ is		reaction
	0.6×10^{-3} mole/second. If the		tempera
	concentration of A is 5 M, then		(R = 8.3
	concentration of B after 20 minutes is:		(a) 342
	(2015 Re)		(c) 34.7
	(a) 0.72 M (b) 1.08 M		
	(c) 3.60 M (d) 0.36 M		
29.	When initial concentration of a reactant		
	is doubled in a reaction, its half-life	1	
	period is not affected. The order of the		
	reaction is: (2015)		
	(a) First	1.	
	(b) Second		
	(c) More than zero but less than first		
	(d) Zero		

vation energy of a reaction can be ned from the slope of which of the graphs? (2015)(b) $\ln k \, vs. \frac{1}{T}$

(a)
$$\frac{m \kappa}{T} vs. T$$

(c) $\frac{T}{m \kappa} vs. \frac{1}{T}$

(d) ln *k vs*.*T* Т

iven exothermic reaction, k_p and the equilibrium constants at atures T_1 and T_2 , respectively. ng that heat of reaction is t in temperature range between Γ_2 , it is readily observed that:

(2014)

(a)
$$k_p < k'_p$$
 (b) $k_p = k'_p$
(c) $k_p < \frac{1}{k'_p}$ (d) $k_p > k'_p$

tion having equal energies of on for forward and reverse is has: (2013)

- = 0
- = 0
- = 0

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 $= \Delta G = \Delta S = 0$

s the activation energy for a i if its rate doubles when the ature is raised from 20°C to 35°C? 14 J mol⁻¹ K⁻¹) (2013) kJ mol⁻¹ (b) 269 kJ mol-1 kJ mol-1 (d) 15.1 kJ mol-1