

A-8. A reaction follows the given concentration (M)-time graph. Predict the order of the reaction



A-9. Which of the following statements is correct?

(1*) The rate of a reaction decreases with passage of time as the concentration of reactants dereases.

- (2) The rate of a reaction is same at any time during the reaction.
- (3) The rate of a reaction is independent of temperature change.
- (4) The rate of a reaction decreases with increase in concentration of reactant(s).
- A-10. Which of the following expressions is correct for the rate of reaction given below ?

$5Br^{-}(aq) + BrO_{3^{-}}(aq) + 6H^{+}(aq) \longrightarrow$	3Br2(aq) + 3H2O(l)
$\Delta[Br^{-}]$ $\Delta[H^{+}]$	$\Delta[Br^{-}]$ <u>6</u> $\Delta[H^{+}]$
(1) $\Delta t = 5 \Delta t$	(2) $\Delta t = 5 \Delta t$
$\Delta[Br^{-}]$ 5 $\Delta[H^{+}]$	$\Delta[Br^-] \qquad \Delta[H^+]$
$(3^*) \Delta t = 6 \Delta t$	(4) $\Delta t = 6 \Delta t$

Section (B) : Rate law

B-1. aA + bB \longrightarrow Product, dx/dt = k [A]^a [B]^b. If conc of A is doubled, rate is four times. If conc. of B is made four times, rate is doubled. What is relation between rate of disappearance of A and that of B? (1) {- d [A] / dt} = {- d [B] / dtK (2^{*}) - {d [A] / dt} = - 4 {d [B] / dt} (3) - 4 {d [A] / dt} = {- d [B] / dt} (4) None of these

aA + bB \longrightarrow mRikn] vfHkfØ;k esa dx/dt = k [A]^a [B]^bgSA ;fn A dh lkUnzrk dks nqxquh dj

- **B-2.** For a reaction $pA + qB \rightarrow products$, the rate law expression is $r = k[A]^1 [B]^m$, then : (1) (p+1) < (1+m) (2) (p+q) > (1+m)(3*) (p+q) may or may not be equal to (1+m) (4) (p+q) = (1+m)
- **B-3.** For the reaction $H_2 + Br_2 \rightarrow 2$ HBr overall order is found to be 3/2. The rate of reaction can be expressed as: (1) $[H_2][Br_2]^{1/2}$ (2) $[H_2]^{1/2}$ [Br₂] (3) $[H_2]^{3/2}$ [Br₂]⁰ (4*) All of these

 $[Br_2]^{1/2}$ (2) $[H_2]^{1/2} [Br_2]$ (3) $[H_2]^{3/2} [Br_2]^0$ (4*) All of these -d[A]

B-4. The rate of certain hypothetical reaction $A + B + C \rightarrow \text{products is given by } r = \frac{dt}{dt} = K [A]^{1/2} [B]^{1/3} [C]^{1/4}$ The order of the reaction :

	1		13
(1) 1	(2) 2	(3) 2	(4*) 12

- **B-5.** $2A \rightarrow B + C$ it would be a zero order reaction when :
 - (1) The rate of reaction is proportional to square of conc. of A
 - (2*) The rate of reaction remains same at any conc. of A
 - (3) The rate remains unchanged at any conc. of B and C
 - (4) The rate of reaction doubles if conc. of B is increased to double

- B-6. The rate equation for the reaction $2A + B \rightarrow C$ is found to be : rate=k[A][B]. The correct statement in relation to this reaction is that the
 - (1) Rate of formation of C is twice the rate of disappearance of A.
 - (2) Half life is a constant
 - (3) Unit of k must be s⁻¹
 - (4*) Value of k is independent of the initial concentration of A and B
- B-7. For the reaction, $2NO(q) + 2H_2(q) \longrightarrow N_2(q) + 2H_2O(q)$ the rate expression can be written in the following ways: $dt [N_2]/dt = k_1 [NO][H_2]; d[H_2O]/dt = k[NO][H_2]; - d[NO]/dt = k'_1 [NO][H_2]; -d[H_2]/dt = k''_1 [NO][H_2];$ The relationship between k, k_1 , k'_1 and k''_1 . is : (1) $\mathbf{k} = \mathbf{k}_1 = \mathbf{k}_1 = \mathbf{k}_1$ (2^*) k = 2k1 = k'1 = k''1 (3) k = 2k'1 = k1 = k''1 (4) k = k1 = k'1 = 2 k''1
- B-8. If a reaction gets completed in finite time then its order can be : (4*) Zero (1) 3(2) 2(3) 1
- B-9. For the reaction $A + B \rightarrow$ Products, it is found that the order of A is 2 and of B is 3 in the rate expression. When concentration of both is doubled the rate will increase by a factor of :
- For a reaction A + B \rightarrow products, the rate of the reaction was doubled when the concentration of. A was B-10. doubled, the rate was again doubled when the conc. of A & B were doubled, the order of the reaction with respect to A & B are :

Section (C) : The integrated rate laws

- The rate constant of reaction 2 A + B \longrightarrow C is 2.57 × 10⁻⁵ lt mole⁻¹ sec⁻¹ after 10 sec. 2.65 × 10⁻⁵ lt. C-1. mole⁻¹ sec⁻¹ after 20 sec. and 2.55×10^{-5} lt. mole⁻¹ sec⁻¹ after 30 sec. The order of the reaction is: (2) 1 (1) 0(3*) 2 (4) 3
- For a first order reaction, the plot of 't' against log C gives a straight line with slope equal to : C-2. (1) (k / 2.303) (2*) (– k / 2.303) (3) (ln k / 2.303) (4) – k.
- C-3. In a first order reaction the amount of reactant decayed in three half lives (let a be is initial amount) would be: (1*) 7a / 8

(3) a / 6 (2) a / 8 (4) 5a / 6

time Hence C-4. Graph between concentration of the product and time of the reaction $A \rightarrow B$ is of the type graph between - d[A]/dt and time will be of the type :



C-5. The reaction N₂O₅ (in CCl₄) \rightarrow 2NO₂ + 1/2O₂(g) is first order in N₂O₅ with rate constant 6.2 × 10⁻⁴ S⁻¹. What is the value of rate of reaction when $[N_2O_5] = 1.25$ mole L⁻¹ (1^*) 7.75 × 10⁻⁴ mol L⁻¹ S⁻¹ (2) 6.35 × 10⁻³ mol L⁻¹ S⁻¹ (3) 5.15 × 10⁻⁵ mol L⁻¹ S⁻¹ (4) 3,85 × 10⁻⁴ mol L⁻¹ S⁻¹

- C-6. K for a zero order reaction is 2 ×10⁻² mol L⁻¹ sec⁻¹. If the concentration of the reactant after 25 sec is 0.5 M. the initial concentration must have been. (1) 0.5 M (2) 1.25 M (3) 12.5 M (4*) 1.0 M C-7. Plot of log(a-x) vs time t is straight line. This indicates that the reaction is of (1) Second order (2*) First order (3) Zero order (4) Third order C-8. In a certain reaction, 10% of the reactant decomposes in one hour, 20% in two hours, 30% in three hours and so on the dimensions of the rate constant is : (1) hour⁻¹ (2^*) mole litre⁻¹ sec⁻¹ (3) litre mole⁻¹ sec⁻¹ (4) mole sec⁻¹ C-9. If a first order reaction is completed to the extent of 75% and 50% in time intervals, t1 and t2, what is the ratio. t_1 : t_2 ? $\ln (3/4)$ ln 2 (2) (1) ln 2 (3*) 2 (4) 1/2 ln2 The rate constant for a reaction is ¹⁰ min⁻¹. What will be the order of reaction and time taken to change C-10. concentration from 1 M to 0.25 M. (1) one, 10 min (2) zero, 10 min (3*) one, 20 min (4) two, 20 min In the case of zero order reaction, the ratio of time required for 75% completion to 50% completion is : C-11. (1) ln 2 (2) 2 (3*) 1.5 (4) None C-12. In a I order reaction A \rightarrow products, the concentration of the reactant decrases to 6.25% of its initial value in 80 minutes. What is (i) the rate constant and (ii) the rate of the reaction, 100 minutes after the start, if the initial concentration is 0.2 mole/litre? (1) 2.17 × 10⁻² min⁻¹, 3.47 × 10⁻⁴ mol.litre⁻¹ min⁻¹
 - (2*) 3.465 × 10⁻² min⁻¹, 2.166 × 10⁻⁴ mol.litre⁻¹ min⁻¹
 - (3) 3.465 × 10⁻³ min⁻¹, 2.17 × 10⁻³ mol.litre⁻¹ min⁻¹

(4) 2.166 × 10⁻³ min⁻¹, 2.667 × 10⁻⁴ mol.litre⁻¹ min⁻¹

Section (D) : Methods to determine the rate law

D-1.	The data for th	ne reaction	$A + B \rightarrow C$ is	5		
	Exp.	[A]o	[B] 0	initial rate		
	1	0.012	0.035	0.10		
	2	0.024	0.035	0.80		
	3	0.012	0.070	0.10		
	4	0.024	0.070	0.80		
	(1) r = k [B] ³	(2	*) r = k [A] ³	(3) r = k [A] [B] ⁴	(4) $r = k [A]^2 [B]^2$.	
		dx				
D-2.	$A + B \longrightarrow I$	Product, dt	=k [A] ^a [B] ^b			
	$\left(\frac{dx}{dt}\right)$	-)				
	lf (ut	= k, then of	order is :			
	(1) 4	(2) 2	(3) 1	(4*) 0	
		(dx)	((dx)		
		$\frac{dt}{dt}$				
D-3.	$A \rightarrow Product a$	ina =	K[A] [∠] . If log	is plotted against	log [A],then graph is of the ty	/pe :

CHEMISTRY FOR JEE Chemical Kinetics log(dx/dt) log(dx/dt) log(dx/dt) og(dx/dt) 0 0 Ő Ó log[A] log [A] log [A] log [A] (1) (2) (3*) (4) d[A] dt = k and at different time interval, [A] values are : D-4. For the reaction A Products. – 5 min 10 min 15 min Time 0 20 mol 18 mol 16 mol 14 mol [A] At 20 minute, rate will be : (1) 12 mol /min (2) 10 mol/min (3) 8 mol/min (4*) 0.4 mol/min

- **D-5.** The rate law for a reaction $A + B \rightarrow \text{product}$ is rate = K[A]¹[B]². Then which one of the following statement is false :
 - (1) If [B] is held constant while [A] is doubled, the reaction will proceed twice as fast
 - (2*) If [A] is held constant while [B] is reduced to one quater, the rate will be halved

(2) - 1

(4) 2

- (3) If [A] and [B] are both doubled, the reaction will proceed 8 times as fast
- (4) This is a third order reaction
- **D-6.** The conversion of vinyl allyl ether to pent-4-enol follows a certain kinetics. The following plot is obtained for such a reaction.

The order for the reaction is (1) zero (3*) 1



D-7. The reaction A(s) → 2 B(g) + C(g) is first order. The pressure after 20 min. and after very long time are 150 mm Hg and 225 mm Hg. The value of rate constant and pressure after 40 min. are : (1) 0.05 In 1.5 min⁻¹,200 mm (2) 0.5 In 2 min⁻¹,300 mm (3) 0.05 In 3 min⁻¹, 300 mm (4*) 0.05 In 3 min⁻¹, 200 mm

Section (E) : Methods to monitor the progress of the reaction

- E-1. Consider the reaction 2A(g) → 3B(g) + C(g). Starting with pure A initially, the total pressure doubled in 3 hrs. The order of the reaction might possibly be (1*) zero (2) first (3) second (4) unpredictable from this data
- **E-2.** At 373 K, a gaseous reaction $A \rightarrow 2B + C$ is found to be of first order. Starting with pure A, the total pressure at the end of 10 min. was 176 mm and after a long time when A was completely dissociated, it was 270 mm. The pressure of A at the end of 10 minutes was : (1) 94 mm (2*) 47 mm (3) 43 mm (4) 90 mm
- **E-3.** Let there be as first-order reaction of the type, $A \longrightarrow B + C$. Let us assume that only A is geseous. We are required to calculate the value of rate constant based on the following data.

Tim e	0	Т	8
Partial pressure of A	Ρ.	P _t	-

Calculate the expression of rate constant.

$$(1^{*}) k = \frac{1}{t} \ln \left(\frac{P_{0}}{P_{t}} \right) \qquad (2) k = \frac{1}{t} \ln \left(\frac{P_{t}}{P_{0}} \right) \qquad (3) k = \frac{1}{t} \ln \left(\frac{2P_{0}}{P_{t}} \right) \qquad (4) k = \frac{1}{t} \ln \left(\frac{P_{t}}{2P_{0}} \right)$$

E-4. Which integrated equation is correct for the following Ist order reaction started with only A(g) in a closed rigid vessel.

 $\begin{array}{c} A (g) \longrightarrow B (g) + C (g) + D (g) \\ P_i = \text{initial pressure} \quad ; \qquad P_t = \text{total pressure at time t} \end{array}$

- E-5. The decompostion NH₃ gas on a heated tungsten surface gave the following results : Initial pressure (mm) 65 105 185 ٧ Half-life (sec) 290 670 820 х Calculate approximately the values of x and y. (3) x = 490 sec(1) $x = 410 \sec \theta$ $(2^*) x = 467 sec$ (4) x = 430 sec
- **E-6.** In the reaction NH₄NO₂ (aq.) → N₂ (g) + 2 H₂O (*I*) the volume of N₂ after 20 min and after a long time is 40 ml and 70 ml respectively. The value of rate constant is : (1) (1/20) ln (7/4) min⁻¹ (2*) (2.303 /1200) log (7/3) sec⁻¹ (3) (1/20) log (7/3) min⁻¹ (4) (2.303 / 20) log (11/7) min⁻¹
- E-7. If no catalyst (H⁺) is present in acid hydrolysis of ester then rate constant K is :

$\frac{2.303}{100}$	$\frac{2.303}{V_{\infty}}$
(1) t $(V_t - V_{\infty})$	$(2^*) t \log(V_{\infty} - V_t)$
$\frac{2.303}{100}$ log $\frac{V_0}{100}$	$\frac{2.303}{V_{\infty}}$
(3) t V_t	$(4) t (V_t - V_{\infty})$

Section (F) : Effect of Temperature

F-1. Rate of which reactions increases with temperature :

(1*) of any
(2) of exothermic reactions
(3) of endothermic
(4) of none.

F-2. For a zero order reaction. Which of the following statement is false :

- (1*) the rate is independent of the temperature of the reaction.
- (2) the rate is independent of the concentration of the reactants.
- (3) the half life depends as the concentration of the reactants.
- (4) the rate constant has the unit mole It^{-1} sec⁻¹.
- **F-3.** The rate constant, the activation energy and the frequency factor of a chemical reaction at 25°C are $3.0 \times 10^{-4} \text{ s}^{-1}$, 104.4 KJ mol⁻¹ and $6.0 \times 10^{14} \text{ s}^{-1}$ respectively. The value of the rate constant as T $\rightarrow \infty$ is

(1) $2.0 \times 10^{18} \text{ s}^{-1}$ (2*) $6.0 \times 10^{14} \text{ s}^{-1}$ (3) ∞ (4) $3.6 \times 10^{30} \text{ s}^{-1}$

- F-4. According to collision theory of reaction rates
 - (1) Every collision between reactant leads to chemical reaction
 - (2) Rate of reaction is proportional to velocity of molecules
 - (3) All reactions which occur in gaseous phase are zero order reaction
 - (4*) Rate of reaction is directly proportional to collision frequency.
- **F-5.** The minimum energy for molecules to enter into chemical reaction is called. (1) Kinetic energy (2) Potential energy (3*) Threshold energy (4) Activation energy
- **F-6.** The activation energy for the forward reaction X Y is 60 KJ mol⁻¹ and Δ H is –20 KJ mol⁻¹. The activation energy for the backard reaction Y X is : (1*) 80 KJ mol⁻¹ (2) 40 KJ mol⁻¹ (3) 60 KJ mol⁻¹ (4) 20 KJ mol⁻¹

- F-7. For producing the effective collisions, the colloiding molecules must posses :
 - (1) A certain minimum amount of energy
 - (2) Energy equal to or greater than threshold energy
 - (3) Proper orientation
 - (4*) Threshold energy as well as proper orientation of collision.
- F-8. For the first order reaction, $X_{(s)} \longrightarrow X_{(g)}$ the monitoring is done by observing the volume : $\underbrace{\frac{\text{time} \quad t \quad \infty}{\text{volume} \quad V_t \quad V_{\infty}}}_{\text{Volume} \quad V_t \quad V_{\infty}}$ The rate constant is given by : $\underbrace{\frac{1}{t} \quad \left(\frac{V_{\infty}}{V_t}\right)}_{(1) \quad t \quad ln} \left(\frac{V_{\infty}}{V_t}\right) \qquad \underbrace{\frac{1}{t} \quad \left(\frac{V_{\infty}}{V_{\infty} - V_t}\right)}_{(2^*) \quad t \quad ln} \left(\frac{V_{\infty}}{V_{\infty} - V_t}\right) \qquad \underbrace{\frac{1}{t} \quad \left(\frac{V_{\infty} + V_t}{V_{\infty}}\right)}_{(3) \quad t \quad ln} \left(\frac{V_{\infty} + V_t}{V_{\infty}}\right) \qquad \underbrace{\frac{1}{t} \quad \left(\frac{V_{\infty} + V_t}{V_{\infty} - V_t}\right)}_{(4) \quad t \quad ln} \left(\frac{V_{\infty} + V_t}{V_{\infty} - V_t}\right)$
- **F-9.** The first order rate constant k is related to temp. as $\log k = 15.0 (10^6/T)$ Which of the following pair of value is correct ?
 - $\begin{array}{ll} (1^{*}) \ A = 10^{15} \ \text{and} \ E = 1.9 \times 10^{4} \ \text{KJ} \\ (3) \ A = 10^{15} \ \text{and} \ E = 40 \ \text{KJ} \\ (4) \ A = 10^{-15} \ \text{and} \ E = 40 \ \text{KJ}. \end{array}$
- **F-10.** For a given reaction, energy of activation for forward reaction (E_{af}) is 80kJ.mol⁻¹. $\Delta H = -40$ kJ.mol⁻¹ for the reaction. A catalyst lowers E_{af} to 20 kJ.mol⁻¹. The ratio of energy of activation for reverse reaction before and after addition of catalyst is : (1) 1.0 (2) 0.5 (3) 1.2 (4*) 2.0

Section (G) : Mechanism of reactions

For the reaction H₂(g) + Br₂(g) \rightarrow 2HBr (g) the experiment data suggested that r = k[H₂][Br₂]^{1/2} G-1. The molecularity and order of the reaction are respectively : (1) 2, 3/2 (2) 3/2, 3/2 (3*) Not defined, 3/2 (4) 1, 1/2G-2. The reaction of hydrogen, and iodine monochloride is represented by the equation : $H_2(g) + 2ICI(g) \longrightarrow 2HCI(g) + I_2(g)$ This reaction is first-order in H₂(g) and also first-order in ICI(g). Which of these proposed mechanism can be consistent with the given information about this reaction ? Mechanism I : $H_2(g) + 2ICI(g) \longrightarrow 2HCI(g) + I_2(g)$ Mechanism II : $H_2(g) + ICI(g) \xrightarrow{Slow} HCI(g) + HI(g)$ $\xrightarrow{\text{fast}} \text{HCI}(g) + \text{I}_2(g)$ HI(g) + ICI(g) =(1) I only (3) both I and II (4) neither I nor II (2*) II only G-3. The slowest step of a particual reaction is found to be $1/2X_2 + Y_2 \rightarrow XY_2$. The order of the reaction is $1/2X_2 + Y_2 \rightarrow XY_2$ (1) 2 (2) 3 (3) 3.5 (4*) 1.5 For an elementary process $2X + Y \rightarrow Z + W$, the molecularity is : G-4. (4) Unpredictable (2) 1 (3*) 3 (1) 2For the reaction 2NO + Cl₂ \rightarrow 2NOCI the following mechanism has been proposed G-5. NO + Cl₂ NOCl₂ (fast) NOCl₂ + NO \rightarrow 2NOCl (slow) the rate low for the reaction is : (1*) Rate = $K[NO]^2[Cl_2]$ (2) Rate = $K[NO][Cl_2]^2$ (3) Rate = $K[NOCl_2]$ (4) Rate = $K[NOCI]^2$

Exercise-2 PART - I: OBJECTIVE QUESTIONS 1. A drop of solution (volume 0.05 mL) contains 3.0×10^{-6} moles of H⁺. If the rate contant of disappearance of H⁺ is 1.0×10^7 mole litre⁻¹ sec⁻¹. How long would it take for H⁺ in drop to disappear : (3*) 6 × 10⁻⁹ sec (1) 6×10^{-8} sec (2) 6×10^{-7} sec (4) 6×10^{-10} sec \rangle_{-N_2Cl} Δ/Cu \bigcirc -Cl + N₂ Half-life is independent of concentration of reactant. After 10 2. minutes volume of N₂ gas is 10 L and after complete reaction it is 50 L. Hence rate constant is: (2*) (2.303 /10) log 1.25 min⁻¹ (1) (2.303 /10) log 5 min⁻¹ (3) (2.303 /10) log 2 min⁻¹ (4) (2.303 /10) log 4 min⁻¹ If concentration of reactants is increased by a factor x then the rate constant k becomes : 3. k k (1) In X (2) X (3) k + x (4*) k The rate constant for a reaction is 10.8×10^{-5} mol L⁻¹ S⁻¹ The reaction obeys : 4. (1) First order (2*) Zero order (3) Second order (4) All are wrong For the irreversible process, A + B ----- products, the rate is first-order w.r.t. A and second-order 5. w.r.t. B.lf 1.0 mol each of A and B introduced into a 1.0 L vessel, and the initial rate was 1.0 × 10⁻² mol L⁻¹ s⁻¹, rate when half reactants have been turned into products is : (2) 1.0 × 10⁻² mol L⁻¹ s⁻¹ (1*) 1.25 x 10⁻³ mol L⁻¹ s⁻¹ (3) 2.50×10^{-3} mol L⁻¹ s⁻¹ (4) $2.0 \times 10^{-2} \text{ mol } \text{L}^{-1} \text{ s}^{-1}$ A certain zero order reaction has k = 0.025 M s⁻¹ for the disappearance of A. What will be the 6. concentration of A after 15 seconds if the initial concentration is 0.50 M ? (4) 0.060 M (1) 0.50 M (2) 0.375 M (3*) 0.125 M The rate law for the single step reaction $2A + B \rightarrow 2C$, is given by 7. (1) Rate = K [A][B] (2^*) Rate = K [A]²[B] (3) Rate = K [2A][B](4) Rate = $K[A]^2[B]^0$ A graph plotted between log t50% vs. log concentration is a straight line. What conclusion can you draw 8. from this graph. loa t log a (2) n = 2, $t_{1/2} \propto 1/a$ (1) n = 1; $t_{1/2} \propto a$ (3^*) n = 1; t_{1/2} = (0.693 / k)(4) None of these 9. In a first order reaction the concentration of the reactant is decreased from 1.0 M to 0.25 M in 20 min. The rate constant of the reaction would be -(1) 10 min⁻¹ (2) 6.931 min⁻¹ (3) 0.6931 min^{-`1} (4*) 0.06931 min⁻¹ 10. What will be the order of reaction and rate constant for a chemical change having log t50% vs log concentration of (A) curves as : log t $(1^*) 0, 1/2$ (2) 1, 1 (3) 2, 2(4) 3, 1 11. In the first order reaction 75% of the reactant disappeared in 1.388 hrs. Calculate the rate constant of the reaction : (1) 1 s⁻¹ (2*) 2.8 × 10⁻⁴ s⁻¹ (3) $17.2 \times 10^{-3} \text{ s}^{-1}$ (4) $1.8 \times 10^{-3} \text{ s}^{-1}$

12. The kinetic data for the given reaction $A(g) + 2B(g) \longrightarrow C(g)$ is provided in the following table for three experiments at 300 K.

Ex.	No.	[A/M]	[B/M]	[Initial rate (M sec⁻¹)]
1		0.01	0.01	6.930 × 10⁻ ⁶
2		0.02	0.01	1.386 ×10⁻⁵
3		0.02	0.02	1.386 ×10⁻⁵

In another experiment starting with initial concentration of 0.5 and 1 M respectively for A and B at 300 K. Find the rate of reaction after 50 minutes from start of experiment (in m/sec)? (1) 6.93×10^{-4} (2) 0.25×10^{-7} (3*) 4.33×10^{-5} (4) 3.46×10^{-9}

(1) 15	(2) 0	(3) 20	(4*) 10

14. Formation of NO₂F from NO₂ and F₂ as per the reaction 2NO₂(g) + F₂(g) → 2NO₂F(g) is a second order reaction, first order with respect to NO₂ and first order with respect to F₂. If NO₂ and F₂ are present in a closed vessel in ratio 2 :1 maintained at a constant temperature with an initial total pressure of 3 atm, what will be the total pressure in the vessel after the reaction is complete?
(1) 1atm
(2*) 2 atm
(3) 2.5 atm
(4) 3 atm

15.	Catalyst increases the rate of reaction because :				
	 it decreases ∆H 	(2) it increases ∆H			
	(3*) it decreases activation energy	(4) it increases activation energy			

- **16.** The rate constant K₁ of a reaction is found to be double that of rate constant K₂ of another reaction. The relationship between corresponding activation energies of the two reactions at same temperature (E₁ and E₂) can be represented as : (1) $E_1 > E_2$ (2) $E_1 < E_2$ (3) $E_1 = E_2$ (4*) None of these
- 17. When a graph between log K and 1/T is drawn a straight line is obtained. The point at which line cuts y axis and x -axis respectively correspond to the temp :
 (1) 0, Ea / 2.303 R log A
 (2*) ∞, Ea / (R ln A)
 (3) 0, log A
 (4) None of these.buesa ls dksbZ ugha
- **18.** For a reaction $A \rightarrow B$, $E_a = 10 \text{ kJ mol}^{-1}$, $\Delta H = 5 \text{ kJ mol}^{-1}$. Thus, potential energy profile for this reaction is :



- **19.** For a reaction following nth order kinetics, the half life (t_{1/2}) would depend upon the initial concentration (1) as: (1*) $t_{1/2} \propto a^{1-n}$ (2) $t_{1/2} \propto a^{n-1}$ (3) $t_{1/2} \propto a^n$ (4) $t_{1/2} \propto a^{-n}$
- **20.** The E_a of a reaction in presence of a catalyst is 4.15 kJ mol⁻¹ and in absence of a catalyst is 8.3 kJ mol⁻¹

¹. What is slope of the plot of lnk vs $\overline{\mathsf{T}}$ in the absence of catalyst (1) + 1 (2) -1 (3) + 1000 (4*) -1000

21. For the decomposition of HI the following logarithmic plot is shown : [R = 1.98 cal/mol-K]



The activation energy of the reaction is about

- **22.** Trimolecular reactions are uncommon because
 - (1*) the probability of three molecules colliding at an instant is very low.
 - (2) the probability of three molecules colliding at an instant is high.
 - (3) the probability of three molecules colliding at an instant is zero.
 - (4) the probability of many molecules colliding at an instant is high.
- A hypothetical reaction $X_2 + Y_2 \longrightarrow 2XY$ follows the mechanism given below. 23. $X_2 \rightleftharpoons X + X$ [Fast] $X + Y_2 \longrightarrow XY + Y$ [Slow] $X + Y \longrightarrow XY$ [Fast] The order of overall reaction is (1) 2(3*) 1.5 (4) Zero 'kwU; (2) 1 24. Radioactivity is affected by : (1) temperature (2) Pressure (3) electric and magnetic field (4^{*}) none of these 25. Half life period of 10 gm radioactive element is 20 days. Then half life period of 100 gm of this element is (1*) 20 days (2) 200 days (3) 100 days (4) 10 days 26. A radioactive element has a half life of one day. After three days the amount of the element left will be : (1) 1/2 of the original amount (2) 1/4 of the original amount (3*) 1/8 of the original amount (4) 1/16 of the original amount 27. The activity per ml of a solution of radioactive substance is x. How much water be added to 200 ml of this solution so that the acitivity falls to x/20 per ml after 4 half-lives ? (1) 100 ml (2) 150 ml (3) 80 ml (4*) 50 ml. 28. Assertion : The rate of reaction whether exotherimic or endothermic, increase with temperature. **Reason :** The rate reaction = K [reactant]ⁿ and K increases with temperature. (1*) Both assertion and reason are correct, and the reason is the correct explanation for the assertion (2) Both assertion and reason are correct, but the reason is not the correct explanation for the assertion

- (3) The assertion is incorrect, but the reason is correct
- (4) Both are assertion and reason are incorrect
- **29. Assertion :** A catalyst always lower the energy of activation.

Reason : The catalyst-reactant interaction forms activated adsorbed complex and adsorption is always exothermic.

(1*) Both assertion and reason are correct, and the reason is the correct explanation for the assertion

- (2) Both assertion and reason are correct, but the reason is not the correct explanation for the assertion
- (3) The assertion is incorrect, but the reason is correct
- (4) Both are assertion and reason are incorrect
- **30. Assertion :** The elementary reaction is single step reaction and does not possess mechanism. **Reason :** An elementary reaction has order of reaction and molecularity same.
 - (1) Both assertion and reason are correct, and the reason is the correct explanation for the assertion
 - (2*) Both assertion and reason are correct, but the reason is not the correct explanation for the assertion
 - (3) The assertion is incorrect, but the reason is correct
 - (4) Both are assertion and reason are incorrect

PART - I : JEE (MAIN) / AIEEE PROBLEMS (PREVIOUS YEARS)

OFFLINE JEE-MAIN

Units of rate constant of first and zero order reactions in terms of molarity M unit are respectively 1. [AIEEE-2002, 3/225] (3) M.sec⁻¹, sec⁻¹ (1^*) sec⁻¹, M sec⁻¹ (2) sec⁻¹, M (4) M, sec⁻¹ For the reaction A + 2B \rightarrow C, rate is given by R = [A] [B]² then the order of the reaction is : 2. [AIEEE-2002, 3/225] A + 2B \rightarrow C vfHkfØ;k ds fy;s nj fu;rkad R = [A] [B]² }kjk fn;k tkrk gS rc vfHkfØ;k dh dksfV gksxh % [AIEEE-2002, 3/225] (2) 6(3)5(4) 7 (1^*) 3 3. The differential rate law for the reaction $H_2 + I_2 \rightarrow 2HI$ is : [AIEEE-2002, 3/225] $-\frac{d[H_2]}{dt} = -\frac{d[I_2]}{dt} = -\frac{d[HI]}{dt}$ (2) $\frac{d[H_2]}{dt} = \frac{d[I_2]}{dt} = \frac{1}{2}\frac{d[H]}{dt}$ (3) $\frac{1}{2} \frac{d[H_2]}{dt} = \frac{1}{2} \frac{d[I_2]}{dt} = -\frac{d[HI]}{dt}$ $(4^*) -2\frac{d[H_2]}{dt} = -2\frac{d[I_2]}{dt} = +\frac{d[HI]}{dt}$ The rate law for a reaction between the substances A and B is given by rate = $k [A]^n [B]^m$. On doubling 4. the concentration of A and halving the concentration of B, the ratio of the new rate to the earlier rate of the reaction will be as [AIEEE-2003, 3/225] 1 (1) 2^{m + n} (2) (m + n)(3) (n – m) $(4^*) 2^{(n-m)}$ For the reaction system: $2NO_{(g)} + O_{2(g)} \longrightarrow 2NO_{2(g)}$, volume is suddenly reduced to half its value by 5. increasing the pressure on it. If the reaction is of first order with respect to O2 and second order with respect to NO, the rate of reaction will :

[AIEEE-2003, 3/225] (2) diminish to one-eighth of its initial value

(1) diminish to one-fourth of its initial value(3*) increase to eight times of its initial value

(4) increase to four times of its initial value.

6.	In the respect of the equipart correct :	uation $k = Ae^{-Ea/RT}$ in ch	emical kinetics, which on	e of the following statements is [AIEEE-2003, 3/225]
	 (1) k is equilibrium cons (3*) E₁ is energy of activ 	tant vation	(2) A is adsorption facto (4) R is Rydberg consta	nr.
7.	In a first order reaction, The time taken for the c (1*) 30 minutes	the concentration of the concentration to change f (2) 15 minutes	reactant, decreases fror from 0.1 M to 0.025 M is (3) 7.5 minutes	n 0.8 M to 0.4 M in 15 minutes. : [AIEEE-2004, 3/225] (4) 60 minutes
8.	The rate equation for th in relation to this reaction (1) unit of k must be see (2) $t_{1/2}$ is a constant (3) rate of formation of ((4*) value of k is independent)	e reaction 2A + B → on is that the : c is twice the rate of disandent of initial concentra	C is found to be : rate = appearance of A tions of A and B.	k[A] [B]. The correct statement [AIEEE-2004, 3/225]
9.	The half - life of a radi remaining after 24 hours (1) 1.042 g	oisotope is four hours. s undecayed is : (2) 2.084 g	If the initial mass of the (3*) 3.125 g	isotope was 200 g, the mass [AIEEE-2004, 3/225] (4) 4.167 g.
10.	Consider an endotherm forward reaction, respect $(1^*) E_b < E_f$	ic reaction $X \longrightarrow Y$ wi ctively. In general (2) $\Delta H = \Delta U$	th the activation energies (3) $\Delta H < \Delta U$	S E _b and E _f for the backward and [AIEEE-2005, 3/225] (4) ΔH > ΔU
11.	A reaction involving two (1*) unimolecular reaction (3) second order reaction	o different reactants can r on on	never be : (2) first order reaction (4) bimolecular reaction	[AIEEE-2005, 3/225]
12.	A reaction was found to concentration of carbon be :	b be second order with i monoxide is doubled, wi	respect to the concentra th everything else kept th	tion of carbon monoxide. If the ne same, the rate of reaction will [AIEEE-2006, 3/165]
	(1) remain unchanged(3*) increased by a factor	or of 4	(2) tripled (4) doubled	
13.	The following mechanis	m has been proposed fo	r the reaction of NO with	Br2 to form NOBr.
	NO (g) + $Br_2(g)$ If the second step is the	NOBr2(g); NOB e rate determining step, t	$Br_2(g) + NO(g) \longrightarrow 2l$ he order of the reaction v	NOBr (g) (slow step) vith respect to NO(g) is [AIEEE- 2007, 3/120]
	(1) 1	(2) 0	(3) 3	(4*) 2
14.	The energies of activation 200 kJ mol ⁻¹ respective reverse) reactions by 10 of catalyst will be (in kJ (1) 280	on for forward and revers ly. The presence of a ca 00 kJ mol ⁻¹ . The enthalpy mol ⁻¹). (2*) 20	se reactions for $A_2 + B_2 =$ atalyst lowers the activati change of the reaction ((3) 300	2AB are 180 kJ mol ⁻¹ and on energy of both (forward and ($A_2 + B_2 \rightarrow 2AB$) in the presence [AIEEE- 2007, 3/120] (4) 120
15.	A radioactive element ge is ten times the permiss	ets spilled over the floor of ible value, after how ma	of a room. Its half-life perion ny days will it be safe to	od is 30days. If the initial activity enter the room :
	(1) 10 days	(2*) 100 days	(3) 1000 days	[AIEEE- 2007, 3/120] (4) 300 days
16.	For a reaction $\frac{1}{2}$ A	ightarrow 2B, rate of disappeara	ance of 'A' related to the	rate of appearance of 'B' by the [AIEEE- 2008, 3/105]

Chemical Kinetics

	$(1^*) - \frac{d [A]}{dt} = \frac{1}{4} \frac{d [B]}{dt}$	(2) $-\frac{d [A]}{dt} = \frac{d [B]}{dt}$	$\frac{d [A]}{dt} = 4 \frac{d [B]}{dt}$	$(4) - \frac{d [A]}{dt} = \frac{1}{2} \frac{d [B]}{dt}$		
17.	The half life period of a 99% of the chemical rea (1) 23.03 minutes	first order chemical reac action will be (log 2 = 0.3 (2*) 46.06 minutes	tion is 6.93 minutes. Time 01) : (3) 460.6 minutes	e required for the completion of [AIEEE - 2009, 8/144] (4) 230.3 minutes		
18.	The time for half life peri of the reactant 'A', is 2.0 0.25 mol L ⁻¹ . If it is a ze (1) 4 h	od of a certain reaction A) mol L^{-1} , how much tim ro order reaction? (2) 0.5 h	A → Products is 1 hour ne does it take for its conc [AIEEE (3*) 0.25 h	 When the initial concentration contration to come from 0.50 to 2010, 8/144] (4) 1 h 		
19.	Consider the reaction, The rate equation for the rate = k [Cl ₂][H ₂ :	Cl₂ (aq) + H₂S(aq) s reaction is S]	→ $S(s) + 2H^+$ (aq) + 2CF	(aq)		
	A $Cl_2 + H_2S \xrightarrow{2}$	$H^{+} + CI^{-} + CI^{+} + HS^{-}$	slow)	[AIEEE - 2010, 4/144]		
	$CI^{+} + HS^{-} \longrightarrow$ B. $H_2S \Leftrightarrow H^{+} + HS$	H + Cl⁻ + S (fast) F (fast equilibrium)				
	Cl ₂ + HS ⁻ (1) B only	2CI ⁻ + H ⁺ + S (slow) (2) Both A and B	(3) Neither A nor B	(4*) A only		
20.	The rate of a chemical in by 50°C, the rate of the (1) 10 times	eaction doubles for eve reaction increases by at (2) 24 times	ry 10°C rise of temperatu oout : (3*) 32 times	re. If the temperature is raised [AIEEE - 2011, 4/120] (4) 64 times		
21.	A reactant (A) forms two	products :				
	A $\xrightarrow{k_1}$ B, Ac	tivation Energy Ea₁				
	$A \xrightarrow{k_2} C, Ac$ If Ea ₂ = 2 Ea ₁ , then k ₁ ar (1) $k_2 = k_1 e^{Ea_1/RT}$	tivation Energy Ea ₂ and k ₂ are related as : (2) $k_2 = k_1 e^{Ea_2/RT}$	$(3^*)^{k_1} = Ak_2 e^{Ea_1/RT}$	[AIEEE - 2011, 4/120] (4) $k_1 = 2k_2 e^{Ea_2/RT}$		
22.	For a first order reactio minutes. The rate of rea (1) 1.73×10^{-5} M/min (3) 3.47×10^{-5} M/min	n (A) \rightarrow products the concent action when the concent	pncentration of A changes ration of A is 0.01 M is : $(2^*) 3.47 \times 10^{-4}$ M/min $(4) 1.73 \times 10^{-4}$ M/min	s from 0.1 M to 0.025 M in 40 [AIEEE - 2012, 4/120]		
23.	The rate of a reaction of such a reaction will be : (1*) 53.6 kJ mol ⁻¹	loubles when its tempera (R = 8.314 JK ^{−1} mol ^{−1} ai (2) 48.6 kJ mol ^{−1}	ature changes from 300 K nd log 2 = 0.301) (3) 58.5 kJ mol ⁻¹	to 310 K. Activation energy of [JEE(Main) - 2013, 4/120] (4) 60.5 kJ mol ⁻¹		
24.	24. For the non-stoichiometre reaction $2A + B \rightarrow C + D$, the following kinetic data were obtained in three separate experiments, all at 298 K.					
	Initial Concentration	Initial Concentration	Initial rate of formation	of C		
	(A)	(B)	(mol L ⁻ S ⁻)			
	0.1 M	0.1 M	1.2×10^{-3}			
	0.1 M	0.2 M	1.2×10^{-3}			
	0.2 M	0.1 M	2.4×10 ⁻³			

The rate law for the formation of C is :

[JEE(Main) 2014, 4/120]

Chemical Kinetics

	dc	dc	dc	dc
	(1) dt = k[A] [B]	(2) $dt = k[A]^2[B]$	(3) $dt = k[A] [B]^2$	(4^{*}) dt = k[A]
25.	Higher order (>3) reaction (1*) low probability of sir (2) increase in entropy a (3) shifting of equilibrium (4) loss of active species	ons are rare due to : nultaneous collision of a nd activation energy as towards reactants due s on collision	all the reacting species s more molecules are inv e to elastic collisions	[JEE(Main)-2015, 4/120] olved
26.	Decomposition of H_2O_2 f from 0.5 to 0.125 M in or of formation of O_2 will be (1*) 6.93 × 10 ⁻⁴ mol min- (3) 1.34 × 10 ⁻² mol min-	ollows a first order readule such decomposition.	tion. In fifty minutes the When the concentration (2) 2.66 L min ⁻¹ at STP (4) 6.93 × 10 ⁻²	concentration of H ₂ O ₂ decreases of H ₂ O ₂ reaches 0.05 M, the rate [JEE(Main)-2016, 4/120] (STP ij) mol min ⁻¹
27.	Two reactions R_1 and R_2 R_2 by 10kJ mol ⁻¹ . If k_1 $ln(k_2/k_1)$ is equal to : (R =	 have identical pre-exp and k² are rate consta 8.314 J mol⁻¹ K⁻¹) 	oonential factors. Activat nts for reactions R_1 and	ion energy of R₁ exceeds that of R₂ respectively at 300 K, then [JEE(Main)-2017, 4/120]
		ONLINE	JEE-MAIN	
1.	The half-life period of a f be : (1) 1/4 of the original am (3*) 1/16 of the original a	irst order reaction is 15 ount amount	minutes. The amount of [JEE(Main) 2014 Onl (2) 1/8 of the original a (4) 1/32 of the original	substance left after one hour will l ine (09-04-14), 4/120] mount amount
2.	In the reaction of formative reaction was measured mol $L^{-1} s^{-1}$ will be : (1) -1.25 × 10 ⁻⁴	tion of sulphur trioxide $\frac{d[O_2]}{dt} = -2.5 \times 10^{-4}$ (2) -2.50 × 10 ⁻⁴	by contact process 2S6 mol L ⁻¹ s ⁻¹ . The rate [JEE(Main) 2014 ((3) -3.75 × 10 ⁻⁴	$O_2 + O_2 \implies 2SO_3$ the rate of e of reaction in terms of [SO ₂] in Online (11-04-14), 4/120] (4*) -5.00 × 10 ⁻⁴
3.	For the reaction, $2N_2$ $-\frac{d [N_2O_5]}{dt} = k[N_2O_5]$ (1) k = k'	$D_5 \xrightarrow{} 4NO_2 + O_2,$ and $+ \frac{d [NO_2]}{dt} = k'[N_2]$ $(2^*) 2k = k'$	the rate equation car O ₅] k and k' related as F [JEE(Main) 20 (3) k = 2k'	n be expressed in two ways 2: 14 Online (11-04-14), 4/120] (4) k = 4k'
4.	The rate coefficient (k) f 150°C. What is the ener (R = molar gas constant (1) 16	or a particular reaction gy of activation (E_A) (in = 8.314 JK ⁻¹ mol ⁻¹) (2*) 60	s is 1.3 × 10 ⁻⁴ M ⁻¹ s ⁻¹ at kJ) for this reaction ? [JEE(Main) 20 (3) 99	100°C, and 1.3 × 10 ⁻³ M ⁻¹ s ⁻¹ at 14 Online (12-04-14), 4/120] (4) 132
5.	For the reaction, $3A + 2I$ (1) $\frac{1}{3} \frac{d[A]}{dt} = \frac{d[C]}{dt} = k[A]^{t}$ (3) $+ \frac{1}{3} \frac{d[A]}{dt} = \frac{d[C]}{dt} = k[A]^{t}$	B → C + D, the differen $[B]^m$	tial rate law can be writte [JEE(Main) 20 (2) $-\frac{d[A]}{dt} = \frac{d[C]}{dt} = k[A]$ (4*) $-\frac{1}{3}\frac{d[A]}{dt} = \frac{d[C]}{dt} = b$	en as : 1 4 Online (19-04-14), 4/120] \] ⁿ [B] ^m k[A] ⁿ [B] ^m
6.	The reaction $2N_2O_5(g) \rightarrow$ only N_2O_5 was found to gases after 60 min. wil b (1) 125 mm Hg	4NO ₂ (g) + O ₂ (g) follow ncrease from 50 mmH e (Assume temperature (2*) 106.25 mm	/s first order kinetics. The g to 87.5 mm Hg in 30 m e remains constant) : [JEE(Main) 2015 (n Hg (3) 116.25 mm	e pressure of a vessel containing nin. The pressure exerted by the Online (10-04-15), 4/120] Hg (4) 150 mm Hg
7.	A + 2B \rightarrow C, the rate eq	uation for this reaction i	s given as	- · · · · ·

	Rate = K[A][B] If the concentration of A is kept the same but that of B is doubled what will happen to the rate itself ?				
	(1) halved	(2) the same	[JEE(Main) 2015 (3*) doubled	5 Online (11-04-15), 4/120] (4) quadrupled	
8.	For the equilibrium, A(g) ← B (g), ∆H is –40 k 2	J/mol. If the ratio of the	activation energies of the forward	
	(E _f) and reverse (E _b) rea (1*) E _f = 80 kJ/mol; E _b = (3) E _f = 30 kJ/mol; E _b =	actions is $\overline{3}$ then : = 120 kJ/mol 70 kJ/mol	[JEE(Main) 2015 On (2) E _f = 60 kJ/mol; E _b (4) E _f = 70 kJ/mol; E _b	l ine (11-04-15), 4/120] = 100 kJ/mol = 30 kJ/mol	
9.	The reaction $2N_2O_5(g)$ - only N_2O_5 was found to gases after 60 min. will	\rightarrow 4NO ₂ (g) + O ₂ (g) follow increase from 50 mm H be (Assume temperature	s first order kinetics. Th g to 87.5 mm Hg in 30 e remains constant) :	ne pressure of a vessel containing min. The pressure exerted by the	
	(1) 125 mm Hg	(2*) 106.25 mm Hg	(3) 116.25 mm Hg	(4) 150 mm Hg	
10.	A + 2B \rightarrow C, the rate equation $R_{ate} = K[\Delta][B]$	quation for this reaction is	s given as [JEE(Main)-2015_Online, 4/120]	
	If the concentration of A (1) halved	A is kept the same but that (2) the same	at of B is doubled what (3*) doubled	will happen to the rate itself ? (4) quadrupled	
11.	For the equilibrium, A(g) = − B(g), ΔH is −40 kJ 2	I/mol. If the ratio of the	activation energies of the forward	
	(E _f) and reverse (E _b) rea (1*) E _f = 80 kJ/mol; E _b = (3) E _f = 30 kJ/mol; E _b =	actions is ³ then : = 120 kJ/mol 70 kJ/mol	[JEE(Ma (2) E _f = 60 kJ/mol; E _b (4) E _f = 70 kJ/mol; E _b	a in)-2015_Online, 4/120] = 100 kJ/mol = 30 kJ/mol	
12.	The reaction of ozone process show below:	with oxygen atoms in th	ne presence of chloring	e atoms can occur by a two step JEE(Main)-2016 Online. 4/120]	
	$O_3(g) + CI(g) \rightarrow O_2(g) + k_i = 5.2$	- ClO [·] (g) : × 10º L mol⁻¹ s⁻¹	(i)		
	$CIO^{\cdot}(g) + O^{\cdot}(g) \rightarrow O_2(g)$ k _{ii} = 2.6	+ Cl ⁻ (g) S × 10 ¹⁰ L mol ^{−1} s ^{−1}	(ii)		
	The closest rate constations (1) 1.4×10^{20} L mol ⁻¹ s ⁻¹ (3) 3.1×10^{10} L mol ⁻¹ s ⁻¹	nt for the overall reactior -1 -1	n O ₃ (g) + O [•] (g) → 2O ₂ (g (2 [*]) 5.2 × 10 ⁹ L mol ⁻¹ (4) 2.6 × 10 ¹⁰ L mol ⁻¹)) is: s ^{−1} s ^{−1}	
13.	The rate law for the rea	ction below is given by th	ne expression k [A][B]		
	$A + B \rightarrow$ Product If the concentration of I constant will be :	B is increased from 0.1 t	o 0.3 mole, keeping th [JI	e value of A at 0.1 mole, the rate EE(Main)-2016_Online, 4/120]	
	(1) 9 K	(2) 3 K	(3) K/3	(4 ⁻) K	
14.	temperature of reaction a reaction B is twice to th (1) 9.84 K	A doubles on increasing B should be increased fi at of reaction A. (2) 19.67 K	rom 300 K so that rate [JEE(Main) 2017 C (3) 2.45 K	300 to 310 K. By now much, the doubles if activation energy of the Dnline (08-04-17), 4/120] (4*) 4.92 K	
15.	The rate of a reaction	quadruples when the te	emperature changes fro	om 300 to 310 K. The activation	
	(Assume activation ene 8.314 J mol ⁻¹ K ⁻¹) (1) 53.6 kJ mol ⁻¹	ergy and pre-exponential (2) 26.8 kJ mol ⁻¹	factor are independen [JEE(Main) 2017 (3*) 107.2 kJ	t of temperature; ln2 = 0.693; R = ' Online (09-04-17), 4/120] mol ⁻¹ (4) 214.4 kJ mol ⁻¹	

PART - II : JEE (ADVANCED) / IIT-JEE PROBLEMS (PREVIOUS YEARS)

1.	The rate constant for th s^{-1} , then the concentra (A) 1.4	ne reaction,2N₂O₅ → 4 tion of N₂O₅ (in mol L ⁻¹) is (B) 1.2	4NO ₂ + O ₂ , is 3 ×10 ⁻⁵ s ⁻¹ . s : (C) 0.04	If the rate is 2.4 × 10 ⁻⁵ mol L ⁻¹ [JEE-2000(S), 1/35] (D*) 0.8		
2.	If 'I' is the intensity of a	bsorbed light and 'C' is th	e concentration of AB fo	r the photochemical process,		
	$AB + hv \rightarrow AB^*$, the ra (A) C	ate of formation of AB*is (B*) I	directly proportional to (C) I ²	[JEE-2001(S), 1/35] (D) C.I		
3.	Consider the chemical	reaction,				
	$N_{2}(g) + 3H_{2}(g)$ The rate of this reaction Identify the correct relation $(A^{*}) \text{ Rate} = -\frac{d [N_{2}]}{dt} = -d$	$2NH_{3}(g)$ in can be expressed in ter- tionship amongst rate exp $-\frac{1}{3}\frac{d}{dt}\frac{[H_{2}]}{dt} = \frac{1}{2}\frac{d}{dt}\frac{[NH_{3}]}{dt}$ $\frac{1}{2}\frac{d}{dt}\frac{[H_{2}]}{dt} = \frac{1}{2}\frac{d}{dt}\frac{[NH_{3}]}{dt}$	ms of time derivatives of pressions : [JEE-2 (B) Rate = d d	conc. of N ₂ (g) , H ₂ (g) or NH ₃ (g). 002(S), 3/90] $\frac{N_2}{t} = -3 \frac{d}{dt} \frac{[H_2]}{dt} = 2 \frac{d}{dt} \frac{[NH_3]}{dt}$ $\frac{[N_2]}{dt} = -\frac{d}{dt} \frac{[H_2]}{dt} = \frac{d}{dt} \frac{[NH_3]}{dt}$		
	(C) Rate = dt	3 dt 2 dt	(D) Rate =	dt dt dt		
4.	In the biologically-catal reaction from 800 mol (A) 3.45 × 10 ⁻⁵	lysed oxidation of ethano dm ⁻³ to 50 mol dm ⁻³ in 2 x (B*) 1.38 × 10 ⁻⁴	I, the concentration of et $\times 10^4$ s. The rate constant (C) 1.00 $\times 10^{-4}$	hanol decreases in a first order t (s ⁻¹) of the reaction is : [JEE-2003(S), 3/84] (D) 5.00 × 10 ⁻⁵		
5.	Given X	 product (Taking 1st orde 0.0025 40 	er reaction)			
	Initial rate of reaction is	s in mol $\ell/$ /min.		[JEE-2004(S), 3/84]		
_	(A*) 3.43 × 10 ^{−4}	(B) 1.73 × 10 ^{−4}	(C) 3.43 × 10 ^{−5}	(D) 1.73 × 10 ^{−5}		
Compr	ehension # Carbon–14 is used to c ¹⁴ C by neutron capture	determine the age of orga in the upper atmosphere ${}^{14}_7N_{+0}n^1 \longrightarrow {}^{14}_6C_{+1}p$	nic material. The proced 1	ure is based on the formation of		
	¹⁴ C is absorbed by living organisms during photosynthesis. The ¹⁴ C content is constant in living organism, once the plant or animal dies, the uptake of carbon dioxide by it ceases and the level of ¹⁴ C in the dead being, falls due to the decay which C ¹⁴ undergoes ${}^{14}_{6}C \longrightarrow {}^{14}_{7}N + \beta^{-}$					
	The half life period of $\frac{1}{0.693}$	⁴ C is 5770 years. The dec	cay constant (λ) can be c	alculated by using the following		
	formula $\lambda = t_{1/2}$ The comparison of the β^- activity of the dead matter with that of the carbon still in circulation enables measurement of the period of the isolation of the material from the living cycle. The method however, ceases to be accurate over periods longer than 30,000 years. The proportion of ¹⁴ C to ¹² C in living matter is 1 : 10 ¹² .					
6.	Which of the following (A) Rate of exchange of	option is correct? of carbon between atmosp	ohere and living is slowe	[JEE-2006, 5/184] r than decay of ¹⁴ C.		

(B) Carbon dating can be used to find out the age of earth crust and rocks (C*) Rate of exchange of ¹⁴C between atmosphere and living organism is so fast that an equilibrium is set up between the intake of ¹⁴C by organism and its exponential decay. (D) Carbon dating can not be used to determine concentration of ¹⁴C in dead beings. 7. What should be the age of fossil for meaningful determination of its age? [JEE-2006, 5/184] (A) 6 years (B*) 6000 years (C) 60,000 years (D) It can be used to calculate any age Sol. Fossil has 6000 year age for the determination of the age of old organism. A nuclear explosion has taken place leading to increase in concentration of ¹⁴C in nearby areas. ¹⁴C 8. concentration is C_1 in nearby areas and C_2 in areas far away. If the age of the fossil is determined to be [JEE-2006. 5/184] T_1 and T_2 at the places respectively then (A*) The age of the fossil will increase at the place where explosion has taken place and $T_1 - T_2 = \lambda$ In C_1 C_2 (B) The age of the fossil will decrease at the place where explosion has taken place and $T_1 - T_2 = \lambda$ In C_1 \overline{C}_2 (C) The age of fossil will be determined to be same T_1 C_1 T_2 C_2 (D) 9. Consider a reaction $aG + bH \rightarrow$ Products. When concentration of both the reactants G and H is doubled, the rate increases by eight times. However, when concentration of G is doubled keeping the concentration of H fixed, the rate is doubled. The overall order of the reaction is : [JEE-2007, 3/162] (A) 0 (B) 1 (C) 2 (D*) 3 Under the same reaction conditions, initial concentration of 1.386 mol dm⁻³ of a substance becomes half 10. \mathbf{k}_1 \mathbf{k}_{0} in 40 seconds and 20 seconds through first order and zero order kinetics, respectively. Ratio of the rate constant for first order (k_1) and zero order (k_0) of the reaction is. [JEE-2008, 3/162] (A*) 0.5 mol⁻¹ dm³ (B) 1.0 mol dm⁻³ (C) 1.5 mol dm⁻³ (D) 2.0 mol⁻¹ dm³ For a first order reaction $A \rightarrow P$, the temperature (T) dependent rate constant (k) was found to follow the 11. equation log k = -(2000) T + 6.0. The pre-exponential factor A and the activation energy E_{a} , respectively, are : [JEE-2009, 3/160] (A) 1.0 × 10⁶ s⁻¹ and 9.2 kJ mol⁻¹ (B) 6.0 s⁻¹ and 16.6 kJ mol⁻¹ (C) 1.0 × 10⁶ s⁻¹ and 16.6 kJ mol⁻¹ (D*) 1.0 x 10⁶ s⁻¹ and 38.3 kJ mol⁻¹ 12. Plots showing the variation of the rate constant (k) with temperature (T) are given below. The plot that follows Arrhenius equation is : [JEE-2010, 3/163] k k k k (A*) т т (C) Т (D) Т (B)

13. In the reaction, $P + Q \longrightarrow R + S$

(A) 2

(D*) 1

the time taken for 75% reaction of P is twice the time taken for 50% reaction of P. The concentration of Q varies with reaction time as shown in the figure. The overall order of the reaction is :



- 14. The initial rate of hydrolysis of methyl acetate (1M) by a weak acid (HA, 1M) is 1/100th of that of a strong acid (HX, 1M), at 25°C. The Ka of HA is : [JEE(Advanced)-2013, 4/120] (A*) 1 × 10⁻⁴ (B) 1 × 10⁻⁵ (C) 1 × 10⁻⁶ (D) 1 × 10⁻³
- 15. For the elementary reaction $\mathbf{M} \rightarrow \mathbf{N}$, the rate of disappearance of **M** increases by a factor of 8 upon doubling the concentration of **M**. The order of the reaction with respect to **M** is : (B*) 3 (A) 4 (C) 2 (D) 1
- 16. The % yield of ammonia as a function of time in the reaction : $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g), \Delta H < 0$ at (P, T_1) is given below.

% yield

(B) 3



T₁

Additional Problems For Self Practice (APSP)

PART - I : PRACTICE TEST PAPER

Max. Marks : 120 Max. Time : 1 Hr.

Important Instructions

- 1. The test is of 1 hour duration.
- 2. The Test Booklet consists of 30 questions. The maximum marks are 120.
- 3. Each question is allotted 4 (four) marks for correct response.
- 4. Candidates will be awarded marks as stated above in Instructions No. 3 for correct response of each question. ¼ (one fourth) marks will be deducted for indicating incorrect response of each question. No deduction from the total score will be made if no response is indicated for an item in the answer sheet. vH;kfFkZ;ksa dks izR;sd lgh mÙkj ds fy, mijksDr funsZ'ku la[;k 3 ds funsZ'kkuqlkj ekDlZ fn;s tk,axsA izR;sd iz'u ds xyr mÙkj ds fy;s ¼ oka Hkkx fy;k tk;sxkA ;fn mÙkj iqfLrdk esa fdlh iz'u dk mÙkj ugha fn;k x;k gks rks dqy izkIrkad ls dksbZ dVkSrh ugha fd tk;sxhA
- 5. There is only one correct response for each question. Filling up more than one response in any question will be treated as wrong response and marks for wrong response will be deducted accordingly as per instructions 4 above.
- 1. The reaction $A(g) + 2B(g) \rightarrow C(g)$ is an elementary reaction. In an experiment involving this reaction, the initial partial pressures of A and B are $P_A = 0.40$ atm and $P_B = 1.0$ atm respectively. When pressure of C becomes 0.3 atm in the reaction the rate of the reaction relative to the initial rate is :

1	1	1		
(1) 12	(2) 50	(3*) 25	(4) none of	these
nj (aftar t = t) = K [0.1][0.4] ²				
$R_{(t=t)}$ K[0.1] [0.4] ²	1			
$R_{(t=0)} = K[0.4]$ [1]	= <u>25</u>			
The rate low for the dim	variantian of NO. in			
Ine rate law for the dim				
	<u>-21</u>			
_ u	$k = k [NO_2]^2$			
which of the following cl	hanges will change the v	alue of the spec	ific rate constant , k :	
Doubling the total pr	essure on the system	(2*) Doubling th	ne temperature	
(3) Both of (1) and (2)		(4) None of the	above	
Which of the following s	statement is incorrect?			
(1) unit of rate of disapp	perarance is Ms ⁻¹	(2) Unit of rate	of reaction is Ms ⁻¹	
(3) Unit of rate constant	k is depend on order	(4 [*]) Unit of k fo	r first order reaction i	s Ms⁻¹
Which of the following re of reactants and produc	elation is correct for kr ar	nd k₀ in an equilit	prium process that co	ontains equal moles
· · · · ·	(-) .	(a) .	(4 + 1)	

- (1) $k_f = k_b$ (2) $k_f > k_b$ (3) $k_f < k_b$ (4*) we cannot prodict
- 5. Let there be a first order reaction, $A \longrightarrow B + C$. Let us assume all there are gases. We are required to calculate the value of rate constant based on the following data

Time	0	t	∞
Total pressure	Ρ.	P _t	-

Calculate the expression of rate constant.

2.

3.

4.

$$\frac{1}{(1) k = t} \ln \left(\frac{2P_0 - P_t}{P_0}\right) = \frac{1}{(2^*) k = t} \ln \left(\frac{P_0}{2P_0 - P_t}\right) = \frac{1}{(3) k = t} \ln \left(\frac{P_0}{2P_0 - P_t}\right) = \frac{1}{(4) k = t} \ln \left(\frac{P_t}{2P_0 - P_t}\right)$$

6	Which of the	following	statement is incorrect?
υ.		ionowing	

(1*) A second order reaction must be a bimolecular elementary reaction

(2) A bimolecular elementary reaction must be a second order reaction

- (3) Zero order reaction must be a complex reaction
- (4) First order reaction may be complex or elementary reaction
- 7. $A_2 + B_2 \rightarrow 2AB$; Rate of reaction = k[A]^a [B]^b

1.	$A_2 + B_2 - 2AB$, Nate of reaction = $A[A]^2 [B]^2$						
		Initial [A ₂]	Initial [Br ₂]	R.O.R. (r) Ms ^{−1}			
		0.2	0.2	0.04			
		0.1	0.4	0.04			
		0.2	0.4	0.08			
	Order of reaction $(1^*) a = 1, b = 1$	with respect to A_2 and (2) $a = 2, b =$	nd B₂ are respective 0 (3) a = 2	ly : 2, b = 1 (4	None of these		
8.	For a reaction A(sand B increase by	s) + B(s) \rightarrow C(s) is / factor 4 and 2 resp	rate = k[A] ^{1/2} [B] ² . V pectively.	/hat changes in ra	te if intial concentration of A		
	(1) 4	(2) 6	(3*) 8	(4) None of these		
9.	Reaction $A \rightarrow B$ formation of B a factor	follows second orde actor of :	er kinetics. Doubling	the concetration of	of A will increase the rate of		
	(1) 1/4	(2) 1/2	(3) 2	(4	*) 4		
10.	. The forward rate constant for the elementary reversible gaseous reaction $C_2H_6 \Longrightarrow 2CH_3$ is $1.57 \times 10^{-3} s^{-1}$ at 100 K What is the rate constant for the backward reaction at this temperature if 10^{-4} mole of CH ₃ and 10 moles of C_2H_6 are present in a 10 litre vessel at equilibrium. (1) 1.57×10^9 L mol ⁻¹ s ⁻¹ (2) 1.57×10^{10} L mol ⁻¹ s ⁻¹ (3) 1.57×10^{11} L mol ⁻¹ s ⁻¹ (4*) 1.57×10^7 L mol ⁻¹ s ⁻¹						
11.	Rate constant k i mole/litre then rat	is 2.303 min ⁻¹ for a e of reaction after 1	a particular reaction minutes is :	. The initial conce	ntration of the reaction is 1		
	(1) 2.303 M min ⁻¹	(2 [*]) 0.2303 N	$/1 \text{ min}^{-1}$ (3) 0.1 M	/i min ⁻ ' (4) none of these		
12.	For an elementary volume then rate	y reaction 2A + B $-\frac{1}{2}$	\rightarrow A ₂ B if the volume of	of vessel is quickly	reduced to half of it's original		
	(1) unchange	ttimoo	(2) incre	ease four times			
	(3) increase eign	it umes	(4) dech	ease engrit time			
13.	The value of maximum rate constant is equal to (1*) Frequency factor (A)(2) Activation energy (EA)(3) Order of the reaction (n)(4) Infinite						
14.	In the presence o and to 0.05 M in 1	f acid, the initial con I0 hr. The reaction r	centration, of cane- nust be of	sugar was reduced	d from 0.2 M to 0.1 M in 5 hr		
	(1) Zero order	(2*) First ord	er (3) Seco	ond order (4) Fractional order		
15.	For an exothermic (i) A + B \rightarrow X (sle the process of rea	c chemical process (ow) action can be best d	occurring in two ster (ii) X→ escribed by :	os as follows → AB (fast)			



- **16.** The temperature coefficient of a reaction is :
 - (1) The rate constant
 - (2) The rate of constant at a fixed temperature
 - (3) The ratio of rate constant at two temperature
 - (4*) The ratio of rate constant differing by 10°C preferably k308/k298
- **17.** The reaction $A(g) + 2B(g) \longrightarrow C(g) + D(g)$ is an elementary process. In an experiment, the initial partial pressure of A and B are $P_A = 0.60$ and $P_B = 0.80$ atm. When $P_C = 0.2$ atm, the rate of reaction relative to the initial rate is :
- **18.** In the following reaction, how is the rate of appearance of the underlined product related to rate of disappearance of the underlined reactant :

$$BrO_{3^{-}}(aq) + 5 \underline{Br}^{-}(aq) + 6 H^{+}(aq) \longrightarrow 3 \underline{Br}_{2}(\ell) + 3 H_{2}O(\ell)$$
(1) $\frac{d[Br_{2}]}{dt} = -\frac{5}{3} \frac{d[Br^{-}]}{dt}$
(2) $\frac{d[Br_{2}]}{dt} = -\frac{d[Br^{-}]}{dt}$
(3) $\frac{d[Br_{2}]}{dt} = -\frac{d[Br^{-}]}{dt}$
(4*) $\frac{d[Br_{2}]}{dt} = -\frac{3}{5} \frac{d[Br^{-}]}{dt}$

19. $3 A \longrightarrow B + C$

It would be a zero order reaction when :

(1) the rate of reaction is proportional to square of concentration of A

- (2*) the rate of reaction remains same at any concentration of A
- (3) the rate remains unchanged at any concentration of B and C
- (4) the rate of reaction doubles if concentration of B is increased to double

$$3 A \longrightarrow B + C$$

- **20.** At room temperature, the reaction between NO and O₂ to give NO₂ is fast, while that between CO and O₂ is slow. It is due to :
 - (1) CO is smaller in size than that of NO
 - (2) CO is poisonous
 - (3*) The activation energy for the reaction, $2NO + O_2 \longrightarrow 2NO_2$ is less then $2CO + O_2 \longrightarrow 2CO_2$. (4) None of the above
- **21.** The time of decay for a nuclear reaction is given by $t = 4t_{1/2}$. The relation between the mean life (T) and time of decay (t) is given by :

			$-\frac{1}{2}$ ln2
(1) 2 T ln 2	(2*) 4 T ln 2	(3) 2T ⁴ ln 2	(4) T ²

22. In three different reactions, involving a single reactant in each case, a plot of rate of the reaction on the y-axis, versus concentration of the reactant on the x-axis, yields three different curves shown below.

dC dC dC dt dt dt С С (ii) С (iii) (i) What are the possible orders of the reactions (i), (ii), (iii) ? (3) 0, 1, 2(1) 1, 2, 3 (2^*) 2, 1, 1/2 (4) 0, 1, 1/223. The mechanism of the reaction $2NO + O_2 \longrightarrow 2NO_2$ is **→** N₂O₂ (fast) ; NO + NO $\frac{k_{-1}}{k_{-1}}$ $N_2O_2 + O_2 \xrightarrow{k_2} N_2O_2$ (slow); The rate constant of the reaction is : [Ref. Cengege] (1) k₂ (2) $k_2k_1(k_{-1})$ (3) k2k1 24. $t_{1/2}$ = constant, confirms that the order of the reaction is one. $a^2 t_{1/2}$ = constant, confirms that the reaction is of : [Ref. Cengege] (1) Zero order (2) First order (3) Second order (4*) Third order 25. For which of the following reactions, the units of rate constant and rate of reaction are same ? (1) First order reaction (2) Second order reaction (3) Third order reaction (4*) Zero order reaction 26. The half-life period of a second order reaction is : [Ref. Cengege] (1) Proportional to the initial concentration of reactants (2) Independent of the initial concentration of reactants (3*) Inversely proportional to the initial concentration of reactants (4) Inversely proportional to the square of initial concentration of reactants 27. If the initial concentration of reactants in certain reaction is double, the half-life period of the reaction doubles, the order of a reaction is : [Ref. Cengege] (1*) Zero (2) First (3) Second (4) Third 28. The time elapsed of a certain reaction between 33% and 67% completion of a first order reaction is 30 minutes. What is the approximate time needed for 25% completion? (1) 150.5 minutes (2*) 12.5 minutes (3) 180.5 minutes (4) 165.5 minutes 29. There are two radio nuclei A and B. A is a α -emitter and B is β -emitter, their disintegration constant are in the ratio of 1:2. What should be the number of atoms of two at time t = 0, so that probability of getting of α and β -particles are same at time t = 0 (1*) 2 : 1 (2) 4 : 1 (3) 1 : 2 (4) 1 : 430. For rate constant is numerically the same for three reactions of first, second and third order respectively. Which of the following is correct : (1) if [A] = 1 then $r_1 = r_2 = r_3$ (2) if [A] < 1 then $r_1 > r_2 > r_3$ (3) if [A] > 1 then $r_3 > r_2 > r_1$ (4*) All

OBJECTIVE RESPONSE SHEET (ORS)										
Que.	1	2	3	4	5	6	7	8	9	10
Ans.										
Que.	11	12	13	14	15	16	17	18	19	20
Ans.										
Que.	21	22	23	24	25	26	27	28	29	30
Ans.										

Practice Test (IIT-JEE (Main Pattern))

	P	ART - II : P	RAC	TICE	UESTION	NS
1.	In the formation of sulp $\frac{d(O_{f})}{d(O_{f})}$	hur trioxide by th	ne conta	ct proces	s 2SO2(g) + O2	2(g) 2SO3(g) The rate of reaction
	is expressed as – dt (1*) 5 × 10 ⁻⁴ mol L ⁻¹ S [−] (3) 3.75 × 10 ⁻⁴ mol L ⁻¹	$_{1} = 2.5 \times 10^{-4} \text{ m}$ S ⁻¹	ol L ^{_1} se	e^{-1} . The rate of disappearance of (SO ₂) will be – (2) – 2.25 × 10 ⁻⁴ mol L ⁻¹ S ⁻¹ (4) 50.0 × 10 ⁻⁴ mol L ⁻¹ S ⁻¹		
2.	The specific rate constant of a first order reaction (1) Conc. of the reactant (3) Time			on depends on the : (2) Conc. of the product (4*) Temperature		
3.	If the rate of the reaction (1*) 0	on is equal to the (2) 1	e rate co	nstant, tł (3) 2	ne order of the r	eaction is : (4) 3
4.	In a first order reaction the reacting substance substance will be left after an hour the reaction (1) 1/6 of initial concentration (3) 1/12 of initial concentration			 has half-life period of ten minutes. What fraction of the has occurred ? : (2*) 1/64 of initial concentration (4) 1/32 of initial concentration 		
5.	For a certain reaction, a the reactant and C is th (1) 3	a plot of {[C₀ – C] ne reactant conce (2) zero	/ [C]} agentration	gainst the after tim (3) 1	e time t, yields a e t. What is the	a straight line. C ₀ = initial conc. of order of the reaction : (4*) 2
6.	The rate constant of a of reaction would be : $(1^*) 8 \times 10^{-5} \text{ M sec}^{-1}$	first order reactio (2) 4 × 10 ⁻³ M s	on is 4 × sec ⁻¹	10 ⁻³ sec (3) 2 ×	. At a reactant o 10 ⁻¹ M sec ⁻¹	concentration of 0.02 M. the rate (4) 4×10^{-1} M sec ⁻¹
7.	In a first order reaction (1*) (2.303 × 3log2)/10	the a/(a–x) was (2) (2.303 × 2lo	found to g3)/10	be 8 afte (3) 10 >	er 10 minute. Th 2.303 × 2log3	ne rate constant (min ⁻¹) is (4) 10 × 2.303 × 3 log2
8.	A first order reaction ha	as a half life perio	od of 69.	3 sec. At	0.10 mol lit ⁻¹ re	eactant concentration rate will be
	: (1) 10 ⁻⁴ M sec ⁻¹	(2*) 10 ⁻³ M sec	-1	(3) 10-1	M sec ⁻¹	(4) 6.93 × 10 ⁻¹ M sec ⁻¹
9.	Select the rate law that Exp. 1. 2. 3. 4.	corresponding to [A] 0.012 0.024 0.024 0.024 0.012	o the da [B] 0.035 0.070 0.035 0.070	ta showr	for the followin Initial rate 0.10 1.6 0.20 0.80	ig reaction A + B → C

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	(1) Rate = K [B] ³	(2) Rate = K[B] ⁴	(3*) rate = K[A][B] ³	(4) Rate = $K[A]^2[B]^2$	
10.	How much faster would (1) 2 times	a reaction proceeds at 2 (2) 5 times	25°C than at 0°C if the ac (3*) 11 times	ctivation energy is 65 kJ ? (4) 16 times	
11.	The energy of activation	of a forward reaction is	50 Kcal. The energy of ac	ctivation of its backward reaction	
	(1) Equal to 50 Kcal.(3) Less than 50 Kcal.	mic)	(2*) Greater than 50 Kc (4) Either greater or les	al. ss than 50 Kcal.	
12.	An exothermic reaction reaction is –20 KJ, then (1) 10 KJ	$X \rightarrow Y$ has an activation the activation energy fo (2) 20 KJ	on energy 30 KJ mol ⁻¹ . If r the reverse reaction is : (3*) 50 KJ	energy change (Δ E) during the (4) -30 KJ	
				dc	
13.	For the reaction $NO_2 + 0$ of molecules of CO invo	$CO \rightarrow CO_2 + NO$ the exp plved in the slowest step	erimental rate expressior will be :	$h = h = k[NO_2]^2$, the number	
14	(I) U	(2) I	(3) 2	(4) 3	
14.	(i) $X + Y =$ (i) $X + Y =$ (ii) $M + Z =$ (iii) $O + Y =$ What is the rate law for (1) Pote = k[7]	$rac{2}{\Rightarrow}$ N occurs by the folic $rac{2}{\Rightarrow}$ M very rapid equilibriu $rac{2}{\Rightarrow}$ O slow (2) Poto = k[X] [X] ² [Z]	um	(4*) Poto – k[V] [V] [7]	
15	(1) Rate = $\kappa[Z]$	(2) Rate = $k[\Lambda] [f]^{-} [Z]$	$(3) \operatorname{Rate} = [N]$	(4) Rate = R[A] [1] [2]	
13.	$2A + B \rightarrow D +$ step-1 A + B → C + D step-2 A + C → E - (f the rate law expression	E D – (slow) fast) for the reaction is %			
	(1) r = K[A] ² [B]	(2*) r = K [A] [B]	(3) $r = K [A]^2$	(4) r = K[A][C]	
16.	According to the mecha (1) It is unimolecular rea (3*) It is an elementry re	nism a reaction proceed action. eaction.	s via a single transtion sta (2) It is bimolecular read (4) It is a complex react	ate. Choose the correct options. ction. ion.	
17.	Rate of formation of S	O3 in the following react	tion 2SO ₂ + O ₂ \rightarrow 2SO ₃	B is 100 g min ⁻¹ . Hence rate of	
	disappearance of O_2 is (1) 50 g min ⁻¹	: (2) 40 g min ⁻¹	(3) 200 g min ⁻¹	(4*) 20 g min ⁻¹	
18.	For a reaction of the ty the reaction rate to be the equation is	pe A + B \rightarrow products, It four times increased, but	is observed that doublin t doubling the amount of	ng the concentration of A cause B does not effect the rate. The	
	(1) Rate = K [A] [B]	(2*) Rate = K [A] ²	(3) Rate = K [A] ² [B]	(4) Rate = K [A] ² [B] ²	
19.	The rate for the reaction RCI + NaOH (aq) \rightarrow ROH + NaCI is given by rate = K ₁ [RCI] The rate of the reaction is – (1) Doubled on doubling the concentration of NaOH (2*) Halved on reducing the concentration of RCI to half (3) Decreased on increasing the temperature of reaction (4) Unaffected by increasing the temperature of the reaction				
20.	For the reaction 4A + B The incorrect statemen (1) The rate of disappea (2*) The rate of appear	\rightarrow 2C + 2D at is : arance of B is one fourth ance of C is half the rate	the rate of disappearanc of disappearance of B	e of A	

- (3) The rate of formation of D is half the rate of consumption of A
- (4) The rates of formation of C and D are equal
- In presence of HCl, sucrose gets hydrolysed into glucose and fructose. The concentration of sucrose was found to reduce from 0.4 M to 0.2 M in 1 hour and to 0.1 M in 2 hours. The order of the reaction is :

 (1) zero
 (2*) one
 (3) two
 (4) None of these
- 22. Two substances A (t_{1/2} = 5 min) and B (t_{1/2} = 15 min) are taken in such a way that initially [A] = 4[B]. The time after which both the concentration will be equal is : (Assume that reaction is first order) (1) 5 min
 (2*) 15 min
 (3) 20 min
 (4) concentration can never be equal
- 23. For the reaction 2A + 3B → products, when A is in excess and on changing the concentration of B from 0.1 M to 0.4 M, rate becomes doubled, Thus, order with respect to B would be :
 (1) 1 (2) 2 (3) -1 (4*) 0.5
- **24.** From different sets of data of $t_{1/2}$ at different initial concentration say 'a' for a given reaction, the product $[t_{1/2} \times a]$ is found to be constant. The order of reaction is :



25. Which of the following curves represent a Ist order reaction :



26. A reaction $2A + B \xrightarrow{k} C + D$ is first order with respect to A and 2nd order with respect to B. Initial conc. (t = 0) of A is C₀ while B is 2C₀. If at t = 30 minutes the conc. of C is C₀/4 then rate expression at t = 30 minutes is : (1) R = 7 C₀³ k/16 (2) R = 27 C₀³ k/32 (3) R = 247 C₀³ k/64 (4*) R = 49 k C₀³/32

27. In a certain gaseous reaction between X and Y, X + 3Y XY₃ The initial rates are reported as follows –

	[X]	[Y]	Rate			
	0.1 M	0.1 M	0.002	∕ I S ^{−1}		
	0.2 M	0.1 M	0.002	∕ I S ^{−1}		
	0.3 M	0.2 M	0.008	∕ I S ^{−1}		
	0.4 M	0.3 M	0.018 N	∕ I S ^{−1}		
The rate	e law is :					
(1) r = ŀ	K [X] [Y]³	$(2^*) r = K[X]^0[Y]$]2	(3) r = K [X] [Y]	(4) $r = [X]^0[Y]^3$	
If for a reaction in which A(g) converts to B(g) the reaction carried out at						

const. V & T results into the following graph.

(1) then the reaction must be $A(g) \rightarrow 3B(g)$ and is a first order reaction.

(3^{*}) then the reaction must be $A(g) \rightarrow 3B(g)$ and is a zero order reaction.

(4) then the reaction must be $A(g) \leftrightarrow 3B(g)$ and is a first order reaction.

(2) then the reaction must be A(g) \rightarrow 3B(g) and is a second order reaction.



28.



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	(1) ^a / _{2K}	(2) ¹ / _{aK}	$(3) \frac{\log 2}{K}$	$(4^*) \frac{\ln 2}{K}$
37.	All radioactive decompo (1) 2 nd order	ostion reactions are : (2*) 1 st order	(3) 0 order	(4) 3 order