Ravi Maths Tuition

Chemical Kinetics

12th Standard

Chemistry

Multiple Choice Question 154 x 1 = 154

1) In the reaction BrO^-_3 (aq) + 5 Br^- (aq) + 6 $H^+ \longrightarrow$ 3 Br_2(l) + 3 H_2O (l), the rate of apperance of bromine (BHr_2) is related to the disapearance of bromide uions as follows :

(a) $\frac{d[Br_2]}{dt} = -\frac{5}{3}\frac{d[Br^-]}{dt}$ (b) $\frac{d[Br_2]}{dt} = \frac{5}{3}\frac{d[Br^-]}{dt}$ (c) $\frac{d[Br_2]}{dt} = \frac{3}{5}\frac{d[Br^-]}{dt}$

(d) $\frac{d[Br_2]}{dt} = -\frac{3}{5}\frac{d[Br^-]}{dt}$

2) Time required for 100 percent completion of a zero order reaction is

(a) $\frac{2k}{a}$ (b) $\frac{a}{2k}$ (c) $\frac{a}{k}$ (d) a k

3) For the reaction aA + bB $\longrightarrow$ cC, if -3 $\frac{d[A]}{dt} = +1.5\frac{d[C]}{dt}$, then a, b, and c respectively are

(a) 3, 1, 2 (b) 2, 1, 3 (c) 1, 3, 2 (d) 6, 2, 3

4) The rate of a gaseous reaction is given by the expression k [A][B]. If the volume of the reaction vessel is suddenly reduced to 1/4 th of the initial volume, the reaction rate relating to original rate will be

(a) 1/10 (b) 1/8 (c) 8 (d) 16

5) In a reaction $\longrightarrow$ B, the rate of reaction increases two times on increasing the concentration of the reactant four times, then order of reaction is

(a) 0 (b) 2 (c) 1/2 (d) 4

6) The rate of the reaction 2 NO + $Cl_2 \rightarrow$ 2NOCl is given by the rate equation : rate = k $[NO]_2$ $[Cl_2]$. The value of the rate constant can be increased by

(a) increasing the temperature (b) increasing the concentration of NO (c) increasing the concentration of Cl_2

(d) doing all of these

7) The unit of rate constant for a zero order reaction is

(a) mol L^{-1} s^{-1} (b) L mol^{-1} s^{-1} (c) L^2mol^{-1} s^{-1} (d) s^{-1}

8) A first order reaction has a half-life period of 34.65 seconds. Its rate constant is

(a) 2×10^{-2} sec^{-1} (b) 4×10^{-4} sec^{-1} (c) 20 sec^{-1} (d) 2×10^{-4} sec^{-1}

9) Rate constant of a reaction (k) is 175 $litre^2$ mol^{-2} sec^{-1}. What is the order of reaction?

(a) first (b) second (c) third (d) zero

10) The molecularity and order of the reaction 2 NO (g) + O_2 (g) $\rightarrow$ $2NO_2$ (g) are respectively

(a) one and one (b) two and two (c) three and three (d) two and three

11) Consider the reaction : Cl_2 (aq) + H_2S (aq) $\rightarrow$ S (s) + 2 H^+ (aq) +2 Cl^- (aq) The rate equation for this reaction is rate k $[Cl_2]$ $[H_2S]$ Which of these mechanisms is / are consistant with this rate equation ?

A. Cl_2+$H_2S \longrightarrow$ H^+ + Cl- + Cl^+ HS^- (slow) ; Cl+ $Hs^- \longrightarrow$ H^+ + Cl^- + S (fast)

B. $H_2S \rightleftharpoons$ H^+ + HS - (fast equilibrium) ; Cl_2 + $HS^- \longrightarrow$ 2 Cl^- + H^+ S (slow)

(a) Neither A nor B (b) A only (c) B only (d) Both A and B

12) For the reaction R $\longrightarrow$ P, a graph of [R] against time is found to be a straight line with negative slope. What is the order of reaction ?

(a) Second order (b) Third order (c) First order (d) Zero order

13) The reaction A $\longrightarrow$ B follows first order kinetics. The time taken for 0.8 mole of A to produce 0.6 mole of B is 1 hour. What is the time taken for conversion of 9.9 mole of A to produce 0.675 mole of B ?

(a) 1 hour (b) 0.5 hour (c) 0.25 hour (d) 2 hours

14) The rate of a chemical reaction doubles for every 10°C rise of temperature. If the temperature is raised by 50°C, the rate the reaction increses by about :

(a) 24 times (b) 32 times (c) 64 times (d) 10 times

15) 75% of the first order reaction was completed in 32 min. 50% of the reaction was completed in

(a) 24 min (b) 8 min (c) 16 min (d) 4 min

16) 1[A] vs time is a straight line. The order of the reaction is

(a) 1 (b) 2 (c) 3 (d) 0

17) The rate constant, the activation energy and the Arrchenius parameter of a chemical reaction at 25°C are $3.0 \times 10^{-4} s^{-1}$,104.4 kJ mol^{-1}, and $6.0 \times 10^{14} s^{-1}$ respectively. The value of the rate constant as T $\longrightarrow \infty$ is

(a) $2.0 \times 10^{18} s^{-1}$ (b) $6.0 \times 10^{14} s^{-1}$ (c) Infinity (d) $3.6 \times 10^{30} s^{-1}$

18) If a graph is plotted between In k ad 1/T for the first order reaction. the slope of the straight line so obtained is given by

(a) $-\frac{E_a}{R}$ (b) $-\frac{E_a}{2.303R}$ (c) $-\frac{2.303}{E_a R}$ (d) $-\frac{E_a}{2.303}$

19) A chemical reaction was carried out at 300 K and 280 K the rate constants were found to be K_1 and K_2 respectively. Then

(a) $K_2 = 4K_1$ (b) $K_2 = 2K_1$ (c) $K_2 = 0.25$ K (d) $K_2 = 0.5\ K_1$

20) Collision Theory is applicable to

(a) First order reactions (b) Zero order reactions (c) Bimolecular reactions (d) Intramolecular reactions

21) 10 g of a radioactive isotope is reduced to 1.25 g in 12 years, therefore half-life period of the isotope is

(a) 24 years (b) 4 years (c) 3 years (d) 8 years

22) The half-life period of a radioactive element is 20 days. What will be the remaining mass of 100 g of it after 60 days?

(a) 25 g (b) 50 g (c) 12.5 g (d) 20 g

23) The chemical reactions in which the reactions require high amount of activation energy are generally

(a) slow (b) fast (c) instantaneous (d) none of these

24) If the activatiopn energy for the forward reaction is 150 kJ mol^{-1} and that of the reserve reaction is 260 kJ mol^{-1}, what is the enthalpy change for the reaction ?

(a) 410 kJ mol^{-1} (b) -110 kJ mol^{-1} (c) 110 kJ mol^{-1} (d) -410 kJ mol^{-1}

25) When ethyl acetate was hydrolysed in presence of 0.1 N HCl, the rate constant was found to be $5.40 \times 10^{-5}\ s^{-1}$. From these values we can say that

(a) H_2SO_4 is stronger than HCl (b) H_2SO_4 is weaker than HCl (c) Both the acids have equal strength

(d) The data is insufficient to compare the strengths of HCl and H_2SO_4

26) The role of a catalyst is to change ..... .

(a) Gibbs energy of reaction (b) enthalpy of reaction (c) activation energy of reaction

(d) equilibrium constant

27) In the presence of a catalyst, the heat evolved or absorbed during the reaction ..... .

(a) increases (b) decreases (c) remains unchanged (d) may increase or decrease

28) Activation energy of a chemical reaction can be determined by ..... .

(a) determining the rate constant at standard temperature

(b) determining the rate constants at two temperatures (c) determining probability of collision

(d) using catalyst

29) Consider a first order gas phase decomposition reaction given below : A(g) $\longrightarrow$ B(g) + C(g) The initial pressure of the system before decomposition of A was pi . After lapse of time 't' , total pressure of the system increased by x the reaction is given as ..... .

(a) k = $\frac{2.303}{t} log \frac{p_i}{p_i - x}$ (b) k = $\frac{2.303}{t} log \frac{p_i}{2p_i - p_i}$ (c) k = $\frac{2.303}{t} log \frac{p_i}{2p_i + p_i}$ (d) k = $\frac{2.303}{t} log \frac{p_i}{p_i + x}$

30) Consider the Arrhenius equation given below and mark the correct option. $k = Ae^{-E_a/RT}$

(a) Rate constant increases exponentially with increasing activation energy and decreasing temperature

(b) Rate constant decreases exponentially with increasing activation energy and decreasing temperature

(c) Rate constant increases exponentially with decreasing activation energy and decreasing temperature

(d) Rate constant increases exponentially with decreasing activation energy and increasing temperature

31) Which of the following statements is not correct about order of a reaction ?

(a) The order of a reaction can be a fractional number

(b) Order of a reaction is experimentally determined quantity.

(c) The order of a reaction is always equal to the sum of the stoichiometric coeffecients of reactants in the balanced chemnical equation for reaction.

(d) The order of a reaction is the sum of the powers of molar concentration of the reaction in the rate law expression.

32) Which of the following statements is correct ?

(a) The rate of a reaction decreases with passage of time as the concentration od reactants decreases

(b) The rate of a reaction is name at any time during the reation

(c) The rate of a reaction is independent of temperature change

(d) The rate of a reaction decreases with increase in concentration of reactant(s)

33) Which of the following expressions is correct for the rate of reaction given below ?
$5Br^-(aq) + BrO^-_3(aq) + 6H^+(aq) \longrightarrow 3Br_2(aq) + 3H_2O(l)$

(a) $\frac{\triangle[Br^-]}{\triangle t} = 5\frac{\triangle[H^+]}{\triangle t}$ (b) $\frac{\triangle[Br^-]}{\triangle t} = \frac{6}{5}\frac{\triangle[H^+]}{\triangle t}$ (c) $\frac{\triangle[Br^-]}{\triangle t} = \frac{5}{6}\frac{\triangle[H^+]}{\triangle t}$

(d) $\frac{\triangle[Br^-]}{\triangle t} = 6\frac{\triangle[H^+]}{\triangle t}$

34) Rate law for the reaction A + 2B $\longrightarrow$ C is found to be Rate = k [A] [B] Concentration of reactant 'B' is doubled, keeping the concentration of 'A' constant, the value of the rate constant will be ..... .

(a) the same (b) doubled (c) quadrupled (d) halved

35) Which of the following statement is incorrect about the collision theory of chemical reaction ?

(a) If considers reactions molecules or atmos to be hard spheres and ignores their structural features

(b) Number of effective collisions determines the rate of reaction

(c) Collision at atoms or molecules possessing sufficient threshold energy results into the product information

(d) Molecules should collide with sufficient threshold energy and proper orientation for the collision to be effective.

36) A first order reaction is 50% completed in $1.26 \times 10^{15} s$. How much time would it take for 100% completion ?

(a) $1.26 \times 10^{15} s$ (b) $2.52 \times 10^{14} s$ (c) $2.52 \times 10^{28} s$ (d) infinite

37) Compounts 'A' and 'B' react according to the following chemical equation :

$A(g) + 2B(g) \longrightarrow 2C(g)$

Concntration of either 'A' or 'B' were changed keeping the concentration of the reactions constant and rates were measured as a function of initial concentration. Following results were obtained. Choose the correct option for the rate equations for this reaction.

EXP.	INITIAL CONCENTRATION OF [A]/MOL L^{-1}	INITIAL CONCENTRATION OF [B]/MOL L^{-1}	INITIAL RATE OF FORMATION OF [C] MOL L^{-1} S^{-1}
1.	0.30	0.30	0.10
2.	0.30	0.60	0.40
3.	0.60	0.30	0.20

(a) Rate = $k[A]^2[B]$ (b) Rate = $k[A][B]^2$ (c) Rate = $k[A][B]$ (d) Rate = $k[A]^2[B]^0$

38) Which of the following statement is not correct for the catalyst ?

(a) It catalyses the forward and backward reaction to the same extent (b) It alters $\triangle G$ of the reaction

(c) It is a substance that does not change the equilibrium constant of a reaction

(d) It proivides an alternate machanism by reducing activation energy between energy between reactants and products.

39) The value of rate constant of a pseudo first order reaction ..... .

(a) depends on the concentration of reactants present in small amount

(b) depends on the concentration of reactants present in excess

(c) is independent of the concentration of reactants (d) depends only on temperature.

40) Rate law cannot be determined from balanced chemical equation if ..... .

(a) reverse reaction is involved (b) it is an elementary reaction (c) it is a sequence of elementary reactions

(d) any of the reactants is in excess.

41) Which of the following statements are applicable to a balanced chemical equation of an elementary reaction ?

(a) Order is same as molecularity (b) Order is less than the molecularity

(c) Order is grater than the molecularity (d) Molecularity can never be zero.

42) In any unimolecular reaction ..... .

(a) only one reacting species is involved in the rate determining step

(b) the order and the molecularity of slowest step are equal to one

(c) the molecularity of the reaction is one and order is zero

(d) both molecularity and order of the reaction are one.

43) For a complex reaction ..... .

(a) order of overall reaction is same as molecularity of the slowest step

(b) order of overall reaction is less than the molecularity of the lowest step

(c) order of overall reaction is grater than molecularity of the slowest step

(d) molecularity of the slowest step is never zero or non integer.

44) At high pressure, the following reaction is of zero order.

$$2NH_3 \xrightarrow[Platinum\ catalyst]{1130K} (g)\ N_2(g) + 3H_2(g)$$

Which of the following options are correct for this reaction ?

(a) Rate reaction = Rate constant (b) Rate of the reaction depends on concentration of amonia

(c) Rate of decomposition of ammonia will remain constant until ammonia disappears completely

(d) Further increase in pressure will change the rate of reaction

45) During decomposition of an activated complex

(a) energy is always realeased (b) energy is always absorbed (c) energy is not change

(d) reaction may be formed

46) According to Maxwell Boltzmann distribution of energy, ...

(a) the fraction of molecules with most probable kinetic energy decreases at higher temperatures

(b) the fraction of molecules with most probable kinetic energy increases at higher temperatures

(c) most probable kinetic energyincreases at higher temperatures

(d) most probable kinetic energy decreasesat higher temperatures.

47) In the graph showing Maxwell Boltzman distribution of energy, ...

(a) area under the curve must not change with increase in temperature

(b) area under the curve increases with increase in temperature

(c) area under the curve decreases with increase in temperature

(d) with increase in temperature curve broadens and shifts to the right hand side.

48) Which of the following statements are in accordance with the Arhenius equation ?

(a) Rate of a reaction increases with decrease in temperature

(b) Rate of a reaction increases with decrease in activation energy

(c) Rate constant decreases exponentially with increase in temperature

(d) Rate of reaction decreases with decrease in activation energy

49) Mark the incorrect statements.

(a) Catalyst provides an alternative pathway to reaction mechanism (b) Catalyst raises the activation energy

(c) Catalyst lowers the activation energy (d) Catalyst alters enthalpy change of the reaction.

50) In a catalytic experiment involving Haber's process, N2 (g) + 3 H_2 (g) $\longrightarrow$ 2 NH_2 (g), the rate of reaction was measured as : Rate = $\frac{d[NH_3]}{dt}$ = 2.0 $\times 10^{-4} Ms^{-1}$. If there were no side reactions, what was the rate of reaction expressed in terms of N_2 ?

(a) $1\times10^{-4}s^{-1}$ (b) $4\times10^{-4}s^{-1}$ (c) $5\times10^{-4}s^{-1}$ (d) $1\times10^{-4}s^{-1}$

51) The decomposition of N_2O_5 in CCl_4 at 318 K is studied by monitoring the concentration of N_2O_5 in the solution. Initially, the concentration of N_2O_5 is 2.4 mol L^{-1} and after 200 minutes, if is reduced to 2.4 mol L^{-1}. what is the rate of production of NO_2 during this period in mol L^{-1} min^{-1} ?

(a) 4×10^{-3} (b) 2×10^{-3} (c) 1×10^{-3} (d) 2×10^{-4} (e) 5×10^{-3}

52) In the synthesis of ammonia from nitrogen and hydrogen gases, if 6×10^{-2} mole of hydrogen disappears in 10 minutes, the number of moles of ammonia formed in 0.3 minutes is

(a) 1.8×10^{-2} (b) 1.2×10^{-2} (c) 4×10^{-2} (d) 3.6×10^{-2}

53) The rate of a gaseous reaction is generally expressed in terms of $\frac{dP}{dt}$. If it were expressed in terms of change in number of moles per unit time $(\frac{dn}{dt})$ or in terms of change in molar concentration per unit time $(\frac{dC}{dt})$, which of the following relationship will hold good ?

(a) $\frac{dC}{dt} = \frac{dn}{dt} = \frac{dP}{dt}$ (b) $\frac{dC}{dt} = \frac{1}{V}(\frac{dn}{dt}) = \frac{1}{RT}(\frac{dP}{dt})$ (c) $\frac{dC}{dt} = \frac{dn}{dt} = \frac{1}{RT}(\frac{dP}{dt})$

(d) None of these

54) The rate law for a reaction between the substances A and B is given by Rate = $k[A]^n [B]^m$ On doubling the concentration of B, the ratio of the new rate to the earlier rate of the reaction will be

(a) m+n (b) (n-m) (c) $2^{(n-m)}$ (d) $\frac{1}{2^{(m+n)}}$

55) Consider the decomposition of N_2O_5 as

$N_2O_5 \longrightarrow 2\ NO_2 + \frac{1}{2}\ O_2$

The rate of reaction is given by

$-\frac{d[N_2O_5]}{dt} = \frac{1}{2}\frac{d[NO_2]}{dt} = 2\frac{d[O_2]}{dt} = k_1[N_2O_5]$

Therefore, $-\frac{d[N_2O_5]}{dt} = k_1[N_2O_5]$

$+\frac{d[NO_2]}{dt} = k_1[N_2O_5] = k_1'[N_2O_5]$

$+\frac{d[O_2]}{dt} = \frac{1}{2}k_1[N_2O_5] = k_1''[N_2O_5]$

Choose the correct option

(a) $k_1 = k_1' = k_1''$ (b) $k_1 = 2k_1' = k_1''$ (c) $2k_1 = k_1' = k_1''$ (d) $4k_1 = 2k_1' = k_1''$

56) The rate constant is numerically the same for three reactions of first, second and third order respectively. Which one of the following is true for the rate of these three reactions if concentration of the reactant is same and grater than 1 M ?

(a) $r_1 = r_2 = r_3$ (b) $r_1 > r_2 > r_3$ (c) $r_1 < r_2 < r_3$ (d) There can be no definite order

57) For the reaction, $Ag^+ + 2\ NH_3 \rightleftharpoons [Ag(NH_3)_2]^+$ Then which of the following statement/s is are correct ?

(a) Rate constant for forward reaction = 2×10^7 (b) Rate constant for backward reaction = 1×10^{-2}

(c) Equilibrium constant of the reaction = 2×10^9 (d) All the above

58) For the reaction A + B $\longrightarrow$ C + D, doubling the concentration of both the reactants increases the reaction rate by 8 times and doubling the concentration of only B simply doubles the reaction rate. The rate law is given as

(a) $r = k[A]^{1/2}\ [B]^{1/2}$ (b) $r = k[A]\ [B]^2$ (c) $r = k[A]^2[B]$ (d) r = k[A] [B}

59) Higher order (> 3) reactions are rare due to

(a) Low probability of simulateous collision of all the reacting species

(b) Increase in entropy and activation energy as more molecules are involved

(c) shifting of equlibrium towards reactants due to elastic collisions (d) loss of active species on collision

60) The rate of the reaction A $\longrightarrow$ Products, at the initial concentration of $3.24 \times 10^{-2} M$ is nine times its rate at another initial concentration of $1.2 \times 10^{-3} M$. The order of the reaction is

(a) $\frac{1}{2}$ (b) $\frac{3}{4}$ (c) $\frac{3}{2}$ (d) $\frac{2}{3}$ (e) $\frac{1}{3}$

61) The time for half period of a certain reaction A $\longrightarrow$ Products is 1 hour. When the initial concentration of the reactant 'A' is 2.0 mol L^{-1}, how much 0.50 to 0.25 mol L^{-1} it is a zero order reaction ?

(a) 0.25 h (b) 1 h (c) 4 h (d) 0.5 h

62) The rate constant of the reaction A $\longrightarrow$ B is 0.6×10^3 mole per litre per second. If the concentration of A is 5 M, then concentration of B after 20 minutes is

(a) 0.36 M (b) 0.72 M (c) 1.08 M (d) 3.60 M

63) A first order reaction is carried out staring with 10 mol L^{-1} of the reactant. It is 40 % complete in one hour. If the same reaction is carried out with an initial concentration of 5 mol L^{-1}, the percentage of the reaction that is completed in one hour will be

(a) 40 % (b) 80 % (c) 20 % (d) 60 %

64) Half -lives of a first order and a zero order reaction are same. Then the ratio of the initial rates of the first order reaction to that of zero order reaction is

(a) $\frac{1}{0.693}$ (b) $2 \times$ 0.693 (c) 0.693 (d) $\frac{2}{0.693}$

65) For a first order reaction, the time taken to reduce the initial concentration by a factor of $\frac{1}{4}$ is 20 minutes. The time required to reduce initial concentration by a factor of 1/16 is

(a) 20 min (b) 10 min (c) 80 min (d) 40 min (e) 5 min

66) The rate constant of a second order reaction, $2A \longrightarrow$ Products, is 10^{-4} lit mol^{-1} min^{-1}. The initial concentration of the reactant is 10^{-2} mol lit^{-1}. What is the half-life (in min) ?

(a) 10 (b) 1000 (c) 100 (d) 10^6

67) The time taken for 10% completion of a first order reaction is 20 min. Then for 19% completion, the reaction will take

(a) 40 mins (b) 60 mins (c) 30 mins (d) 50 mins

68) The following data is obtained during the first order thermal decomposition of 2 A (g) $\longrightarrow$ B (g) + C (s) at constant volume and temperature

S. NO.	TIME	TOTAL PRESSURE IN PASCALS
1. 2.	At the end of 10 minutes After completion	300 200

The rate constant in min^{-1} is

(a) 0.0693 (b) 6.93 (c) 0.00693 (d) 69.3

69) Rate constant of a reaction is 0.0693 min^{-1}. Starting with 10 mol L^{-1}, rate of reaction after 10 minutes will be

(a) 0.0693 M min^{-1} (b) 0.0693×2.5 M min^{-1} (c) 0.0693×5 M min^{-1} (d) 0.0693×10 M min^{-1}

70) For the reaction A + 2 B $\longrightarrow$ C, the reaction rate is doubled if the increased by four times when concentration of both A and B are increased by four times. The order of reaction is

(a) 3 (b) 0 (c) 1 (d) 2

71) The initial rates of reaction 3 A + 2 B + C $\longrightarrow$ Product, at different initial concentration are given below :

INITIAL RATE , MS^{-1}	$[A]_0$, M	$[B]_0$, M	$[C]_0$, M
5.0×10^{-3}	0.010	0.005	0.010
5.0 $[A]_0$, M	0.010	0.005	0.015
1.0×10^{-2}	0.010	0.010	0.010
1.25×10^{-3}	0.005	0.005	0.010

The order with respect to the reactant A,B and C are respectively.

(a) 3,2,0 (b) 3,2,1 (c) 2,2,0 (d) 2,2,1 (e) 2,1,0

72) At 500 K, the half-life period of a gaseous reaction at the initial pressure of 80 kPa is 350 sec. When the pressure is 40 kPa, the half-life period is 175 sec. The order of reaction is

(a) second (b) more than zero but less than first (c) zero (d) first

73) A relation P $\longrightarrow$ Q is completed 25 % in 25 min 50 % completed in 25 min if [P] is halved, 25% completed in 50 min if [P] is doubled. The order of reaction is

(a) 1 (b) 2 (c) 0 (d) 3

74) $t_{1/4}$ can be taken as the time taken for the concentration of a reactant to drop to $\frac{3}{4}$ of its initial value. If the rate constant for a first order reaction is K, then $t_{1/4}$ can be written as

(a) 0.10/K (b) 0.29/K (c) 0.69/K (d) 0.75/K

75) For a reaction A + B $\longrightarrow$ product, rate law is $-\frac{d[A]}{dt} = k[A]_0$ The concentration of X changes from 0.1 M to 0.025 M, then the rate of reaction when concentration of X is 0.01 M is

(a) $1.73 \times 10^{-4} M/min$ (b) $3.47 \times 10^{-5} M/min$ (c) $3.47 \times 10^{-4} M/min$

(d) $1.73 \times 10^{-5} M/min$

76) For a first order reaction, the time required for 99.9% of the reaction to take place is nearly

(a) 10 times that required for half of the reaction (b) 100 times that required for two - thirds of the reaction

(c) 10 times that required forone - fourth of the reaction (d) 20 times that required for half of the reaction

77) Te half-life of a reaction is halved as the initial concentration of the reactant is doubled. The order of reaction is

(a) 0.5 (b) 1 (c) 2 (d) 0

78) For a second order reaction, 2 A $\longrightarrow$ Products, a plot of log t 1/2 vs log a (where a is the initial concentration) will give an intercept equal to which of the following ?

(a) 1/k (b) log (1/2 k) (c) log (1/k) (d) log k

79) Under the same reaction conditions, initial concentration of 1.386 mol dm^{-3} of a substance becomes half in 40 seconds and 20 seconds through first order and zero kinetices respectively. Ratio (k_1/k_0) of the rate constants for first order (k_1) and zero order (k_0) of the reactions is

(a) 0.5 mol^{-1} dm^3 (b) 1.0 mol^{-1} dm^{-3} (c) 1.5 mol^{-1} dm^{-3} (d) 2.0 mol^{-1} dm^3

80) Kinetics of the reaction A (g) $\longrightarrow$ 2 B (g) + C (g) is followed by measuring the total pressure at different times. It is given that
Initial pressure of A = 0.5 atm.
Total pressure of A after 2 hours = 0.7 atm
Rate constant of the reaction = 1 $\times 10^{-3} s^{-1}$
What is the rate of reaction $-\frac{d[A]}{dt}$ when the total pressure is 0.7 atm?

(a) 2.0 $\times 10^{-4} Ms^{-1}$ (b) 4.0$\times 10^{-4} Ms^{-1}$ (c) 5.0$\times 10^{-4} Ms^{-1}$ (d) 7.0$\times 10^{-4} Ms^{-1}$

81) For the non-stoiciometric reaction :
2 A + B $\longrightarrow$ C + D, the following kinetic data were obtained in three separate experiments all at 298 K

INITIAL CONCENTRATION [A]	INITIAL CONCENTRATION [B]	INITIAL RATE OF FORMATION OF C (MOL L^{-1} S^{-1})
0.1 M	0.1 M	1.2 $\times 10^{-3}$
0.1 M	0.2 M	1.2$\times 10^{-3}$
0.2 M	0.1 M	2.4$\times 10^{-3}$

(a) $\frac{dC}{dt} = k[A]$ (b) $\frac{dC}{dt} = k[A][B]$ (c) $\frac{dC}{dt} = k[A]^2[B]$ (d) $\frac{dC}{dt} = k[A][B]^2$

82) For the elementary reaction M $\longrightarrow$ N, the rate of disappearance of M increses by a factor of 8 upon doubling the concentration of M. The order of reaction with respect to M is

(a) 4 (b) 3 (c) 2 (d) 1

83) For a first order reaction, t_{av} (average life time), $t_{50\%}$ and $t_{75\%}$ are in the order :

(a) $t_{50} < t_{av} < t_{75}$ (b) $t_{50} < t_{75} < t_{av}$ (c) $t_{av} < t_{50} < t_{75}$ (d) $t_{av} < t_{50} < t_{75}$

84) In the study of inversion of surcose in presence of readings at times r0 , r1 and r_∞ represent the polarimetric readings at times 0, t and ∞ respectively, then at the 50% inversion, which of the following relationship will hold good ?

(a) $r_t = r_0 + r_\infty$ (b) $r_t \frac{1}{2}(r_0 + r_\infty)$ (c) $r_t = r_0 - r_\infty$ (d) $r_t \frac{1}{2}(r_0 - r_\infty)$

85) Number of natural life times (t_{av}) required for a first reaction to complete 99.9% is

(a) 6.93 (b) 2.31 (c) 9.2 (d) infinite

86) Half-life period of a first order reaction is 100 min. After 144.3 min, concentration of reactant is reduced to... of the original concentration

(a) 40% (b) 30% (c) 1/e (d) $1/e^2$

87) The activation energy of a reaction can be determined from the slope of which of the following graph ?

(a) ln k vs $\frac{1}{T}$ (b) $\frac{T}{Ink} vs \frac{1}{T}$ (c) ln k vs T (d) $\frac{Ink}{T}$ vs T

88) The rate of a reaction doubles when its temperature changes from 300 K to 310 K activation energy of such a reaction will be

(a) 60.5 kJ mol^{-1} (b) 53.6 kJ mol^{-1} (c) 48.6 kJ mol^{-1} (d) 58.5 kJ mol^{-1}

89) A reactant (A) forms two products:
A $\xrightarrow{k_1}$ B, Activation Energy E_{a_1}
A $\xrightarrow{k_1}$ C, Activation Energy E_{a_2}
If E_{a_2} = $2E_{a_1}$, then k_1 and k_2 are related as

(a) $k_1 = 2k_2\, e^{Ea/_2RT}$ (b) $k_2 = k_1\, e^{Ea/_2RT}$ (c) $k_2 = k_1\, e^{Ea/_2RT}$ (d) $k_1 = Ak_2 e^{Ea/_2RT}$

90) In the presence of a catalyst, the activation energy of a reaction is lowered by 2kcal at 27°C. The rate of reaction will increase by

(a) 2 times (b) 14 times (c) 28 times (d) 20 times

91) The rate constant of reaction at temperature 200 K is 10 times less than the rate constant at 400 K. what is the activation energy of the reaction ?

(a) 1842.4 R (b) 921.2 R (c) 460.6 R (d) 230.3 R

92) H2O2 is formed in the upper atmosphere through the following mechanism
H2O + (O) $\longrightarrow$ 2OH $\longrightarrow$ H_2O_2
The overall enthalpy change and activation energy for the forward reaction are 72 kJ mol^{-1} and 77 kJ mol^{-1} respectively. The activation energy for the decomposition of H_2O_2 to give back H_2O and (O) will be

(a) 5 kJ mol^{-1} (b) -5 kJ mol^{-1} (c) 149 kJ mol^{-1} (d) -149 kJ mol^{-1}

93) For an endothermic reaction, where $\triangle H$ represents the enthalpy of the reaction in kJ/mol. The minimum value for the energy of activation will be

(a) less than $\triangle H$ (b) zero (c) more than $\triangle H$ (d) equal to $\triangle H$

94) When a catalyst increase the rate of a chemical reactiom, the rate constant

(a) remains constant (b) increases (c) decreases (d) decrease depending on the order of reaction.

95) For a reaction taking place in three steps, the rate constants are k1,k2 and k3. The overall rate constant is $k = \frac{k_1 k_2}{k_3}$. The overall energy of activation in kJ mol^{-1} is

(a) 30 (b) 150 (c) 50 (d) 60

96) The rate constants k_1 and k_2 for two different reactions are 10^{16}. $e^{-2000/T}$ and 1015. $e^{-1000/T}$ respectively. The temperature at which $k_1 = k_2$ is

(a) 1000 K (b) $\frac{2000}{2.303} K$ (c) 2000 K (d) $\frac{1000}{2.303} K$

97) For first reaction A $\longrightarrow$ P, the temperature (T) dependent rate constant (k) was found to follow the equation log k = -(2000)$\frac{1}{T}$ +6.0.
The pre-exponential factor A and the activation energy E_a respectively, are

(a) $1.0 \times 10^6 s^{-1}$ and 9.2 kJ mol^{-1} (b) $6.0\ s^{-1}$ and 16.6 kJ mol^{-1} (c) $1.0 \times 10^{-1} s^{-1}$ and 16.6 kJ mol^{-1}
(d) $1.0 \times 10^6 s^{-1}$ and 38.3 kJ mol^{-1}

98) The activation energy for a reaction at temperature T K was found to be 2.303 RT J mol^{-1}. The ratio of the rate constant to Arrhenius factor is

(a) 10^{-1} (b) 10^{-2} (c) 2×10^{-3} (d) 2×10^{-2}

99) Which one of the following is not correct ?

(a) Every biomolecular collision does not result into a chemical reaction.
(b) collosion theory is not applicable to unimolecular reaction
(c) according to collision frequency, k = $PZ_{AB}\, e^{-E/RT}$ where Z_{AB} is collision frequency and P is steric factor
(d) Collision theory assumes molecules to be hard speres

100) One mole of N_2O_4 gas at 300 K is kept in a closed container at 1 atm. It is heated to 600 K when 20% by mass of N_2O_4 decomposes to NO_2(g). The resultant pressure in the container would be

(a) 1.2 atm (b) 2.4 atm (c) 2.0 atm (d) 1.0 atm

101) Consider the following statements :
(i) increase in concentration of reactant increses the rate of zero order reaction
(ii) rate constant k is equal to collision frequency A is $E_a = 0$
(iii) rate constant k is equal to collision frequency A if $E_a = \infty$.
(iv) In k vs T is a straight line
(v) in k vs 1/T is a straight line.
correct statement are :

(a) (i) and (iv) (b) (ii) and (v) (c) (iii) and (iv) (d) (ii) and (iii)

102) The oxidation of a certain metal is found to obey the equation A2 = $\alpha t + \beta$, where A is the thickness of the oxide film at time t , α and β are constants. The order of this reaction is

(a) 0 (b) 1 (c) -1 (d) 2

103) The initial rate hydrolysis of methyl acetate (1 M) by a week acid (HA, 1 M) is 1/100th of that of a strong acid (HX, 1 M) at 25°C. The k_a of HA is

(a) 1×10^{-4} (b) 1×10^{-5} (c) 1×10^{-6} (d) 1×10^{-3}

104) In a hypothetical reaction X $\longrightarrow$ Y, the activation energy for the forward and the backward reaction are 15 and 9 kJ mol^{-1} respectively. The potential energy of X is 10 kJ mol^{-1}. Then

(a) Threshold energy of the reaction is 25 kJ (b) The potential energy of Y is 16 kJ
(c) Heat of reaction is 6 kJ (d) The reaction is endothermic

105) A catalyst

(a) increases the average kinetic energy of the reacting molecules. (b) decreases the activation energy
(c) alters the reaction mechanism (d) increaes the frequency of collision of the reacting species

106) For the first order reaction
$2\ N_2O_5\ (g) \longrightarrow 4\ NO_2\ (g) + O_2\ (g)$

(a) the concentration of the reactant decreases exponentially with time
(b) the half-life of the reaction decreses with increases temperature
(c) the half-life of the reaction depends on the initial concentration of the reactant
(d) the reaction proceeds to 99/6% completion in eight half-duration

107) Rate of which of the following reactions can be determined easily?

(a) Rusting of iron in the presence of air and moisture (b) Hydrolysis of starch
(c) Reaction of silver nitrate with sodium chloride (d) All of the above

108) Contact process is used in the formation of sulphur trioxide,
$2SO_2(g) + O_2(g) \rightleftharpoons 2SO_3(g)$
The rate of reaction can be expressed as
$\frac{-\Delta(O_2]}{\Delta t} = 2.5 \times 10^{-4}\ \text{mol L}^{-1}\ \text{s}^{-1}$
Then rate of disappearance of $[SO_2]$will be

(a) $50.0 \times 10^{-5}\ \text{mol L}^{-1}\ \text{s}^{-1}$ (b) $3.75 \times 10^{-4}\ \text{mol L}^{-1}\ \text{s}^{-1}$
(c) $2.5 \times 10^{-4}\ \text{mol L}^{-1}\ \text{s}^{-1}$ (d) $4.12 \times 10^{-4}\ \text{mol L}^{-1}\ \text{s}^{-1}$

109) In a reaction, 2x $\rightarrow$ y, the concentration of x decreases from 3.0 M to 1.5 Min 4 min. The rate of the reaction is

(a) 0.187 M min^{-1} (b) 1.87 M min^{-1} (c) 3.75 x 10^{-1}M min^{-1} (d) 0.75 M min^{-1}

110) The factors affecting the rate of a reaction are

(a) temperature (b) pressure (c) concentration of reactant or product (d) catalyst

111) During a chemical reaction with increase in temperature, rate of a reaction

(a) decreases (b) increases (c) remains constant (d) show irregular trends

112) Find the order of the reaction whose rate constant is 2.5 x 10^{-2} min^{-1}

(a) zero (b) three (c) two (d) one

113) For which of the following, the units of rate constant and rate of the reaction are same?

(a) Zero order reaction (b) First order reaction (c) Second order reaction (d) Third order reaction

114) Consider the data given below for a hypothetical reactions, M → N

Time(s)	**Rate of reaction** (mol L^{-1} s^{-1})
0	4.20 x 10^{-4}
10	4.20 x 10^{-4}
20	4.20 x 10^{-4}
30	4.20 x 10^{-4}
40	4.18 x 10^{-4}

For the above data, the order of reaction is

(a) one (b) two (c) three (d) zero

115) The unit of the rate constant of nth order is

(a) mol^{1-n} $L^{n-1}s^{-1}$ (b) mol^{n-1} $L^{n-1}s^{-1}$ (c) mol^{n-1} $L^{n-1}s$ (d) mol^{n} $L^{1-n}s^{-1}$

116) For the given rate expression = $k[A]^{3/2}[B]^{-1}$, the overall-order of a reaction is

(a) zero (b) half (c) one (d) two

117) The reaction,

$2N_2O_5 \rightleftharpoons 2N_2O_4 + O_2$ is

(a) bimolecular and first order (b) unimolecular and second order (c) bimolecular and second order

(d) unimolecular and first order

118) When the rate of reaction is independent of the concentration of reactants, then the order of that chemical reaction is

(a) one (b) two (c) three (d) zero

119) Four reactions are given below. Which one of them is of zero order?

(a) $\mathrm{PCL_5 \longrightarrow PCl_3 + Cl_2}$ (b) $\mathrm{2FeCl_s + SnCl_2 \longrightarrow 2FeCl_2 + SnCl_4}$ (c) $\mathrm{H_2 + Cl_2 \longrightarrow 2HCl}$

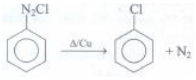
(d) $\mathrm{N_2O_5 \longrightarrow 2NO_2 + \frac{1}{2}O_2}$

120) Equation for rate constant of a first order reaction is

(a) $k = \frac{2.303}{t}\log_{10}\frac{a}{(a-x)}$ (b) $k = \frac{4{\cdot}306}{t}\log_{10}\frac{a}{(a-x)}$ (c) $k = \frac{2.303}{t^2}\log_{10}\frac{a}{(a-x)}$

(d) $k = \frac{10}{t}\log_{10}\frac{a}{(a-x)}$

121) For the reaction,



half-life does not depend on the concentration of the reactant. After 10 min, volume of N_2 gas is 20 L and after the completion of reaction, it is 100 L. Hence, rate constant is

(a) $\frac{2.303}{10}$ log 5 min^{-1} (b) $\frac{2.303}{10}$ log 10 min^{-1} (c) $\frac{2.303}{10}$ log 10 min^{-1} (d) $\frac{2.303}{10}$ log 20 min^{-1}

122) Time taken to complete 90% of first order reaction is

(a) 2.2 of half life period (b) 3.3 of half life period (c) 1.1 of half life period (d) 4.4 of half life period

123) The time taken for the 90% completion of a first order reaction is approximately

(a) 2.2 of half life period (b) 3.3 of half life period (c) 1.1 of half life period (d) 4.4 of half life period

124) Expression for the half-life of zero order reaction is given as

(a) $t_{1/2} = \frac{[R]}{2k}$ (b) $t_{1/2} = \frac{[R]_0}{2k}$ (c) $t_{1/2} = \frac{0.693}{k}$ (d) $t_{1/2} = \frac{0.301}{k}$

125) When one reactant is present in large excess in a chemical reaction between two substances, then the reaction is known as

(a) first order reaction (b) second order reaction (c) zero order reaction (d) pseudo first order reaction

126) The temperature coefficient of a reaction is

(a) the ratio of rate constant at two temperatures

(b) the ratio of rate constant differing by 10^o preferably 25^oC and 35^oC

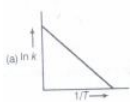
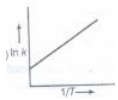
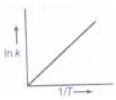
(c) the rate constant at a fixed temperature (d) None of the above

127) Arrhenius equation may not be represented as

(a) $\ln \frac{A}{k} = \frac{E_a}{RT}$ (b) $K = Ae^- Ea/RT$ (c) $\log A = \log k + \frac{E_\alpha}{2303RT}$

(d) $\log k - \left(\frac{E_a}{RT}\right) = A$

128) According to Arrhenius equation rate constant k is equal to A $e^{-Ea/RT}$ Which of the following options represents the graph of ln k vs 1/T

(a)  (b)  (c)  (d) 

129) After introducing the factor P, expression for the rate of a reaction, becomes

(a) $Rate = \frac{Z_{AB}e^{-Ea/RT}}{P}$ (b) $Rate = PZ_{AB}e^{-E_a/RT}$ (c) $Rate = \frac{Z_{AB}.P}{e_a^E/RT}$

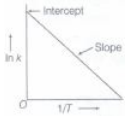
(d) $Rate = \frac{e^{Ea/Rt}}{PZ_{AB}}$

130) For a hypothetical reaction, R ⟶products; rate = -k[R]. The negative sign used in the rate expression indicates.

(a) decrease in the concentration of reactants with time (b) decrease in the rate with time

(c) reaction is reversible (d) None of the above

131) Consider the following plot between ln k and 1/T,



In this plot, the intercept and slope respectively are

(a) $-\frac{E_a}{R}; \ln A$ (b) $\ln A; -\frac{E_\alpha}{R}$ (c) $\frac{E_a}{R}; -\ln A$ (d) $\frac{E_a}{R}; A$

132) The half life period of first order reaction is 1386 seconds. The specific rate constant ofthe reaction is

(a) 0.5 x 10^{-2} s^{-1} (b) 0.5 x 10^{-3} s^{-1} (c) 5.0 x 10^{-2} s^{-1} (d) 5.0 x 10^{-3} S^{-1}

133) The rate constant of a reaction A ⟶ B is 0.6 x 10^{-3} mole per second. If the concentration of [A] is 5 M, then what will be concentration of [B] after 20 months?

(a) 0.36 M (b) 0.72 M (c) 1.08 M (d) 3.60 M

134) Which of the following is affected by catalyst?

(a) △ H (b) △ S (c) △ G (d) E_a

135) A first order reaction has specific reaction rate 10^{-2} s^{-1} . How much time it will take for 20g of reactant to reduce to 5g?

(a) 138.6 s (b) 346.5 s (c) 693.0 s (d) 238.6 s

136) Mechanism of a hypothetical reaction $X_2 + Y_2 \rightarrow 2$ x Y is given below

$a_2 \rightleftharpoons x + x(\text{ fast })$

$X + Y_2 \rightarrow XY + Y$ (slow)

$X + Y \rightarrow XY$ (fast)

The overall order of reaction is

(a) 2 (b) 0 (c) 1.5 (d) 1

137) The rate of first order reaction is 0.04 mol L^{-1} s^{-1} at 10 sec. and 0.03 mol L^{-1} at 20 seconds after initiation of the reaction. $t_{1/2}$ of reaction is

(a) 44.1 s (b) 54.1 s (c) 24.1 s (d) 34.1 s

138) If the initial concentration of reactant is doubled, $t_{1/2}$ is also doubled, the order of reaction is

(a) zero (b) 1 (c) 2 (d) 3

139) For a reaction taking place in three steps, the overall rate constant $k = \frac{k_1 k_2}{k_3}$ If Ea_1, Ea_2 and Ea_3 are the 40, 50 and 60 kJ mol^{-1}, the overall E_a is

(a) 30 (b) 40 (c) 60 (d) 50

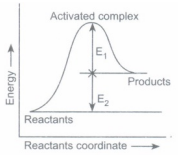
140) If conc. of reactant' A' is increased 10 times and rate of reaction becomes 100 times. What is order with respect to 'A'?

(a) 1 (b) 2 (c) 3 (d) 4

141) In the first order reaction the concentration of reactant decreases from 0.6 M to 0.3 M in 30 minutes. The time taken for the concentration to change from 0.1 M to 0.025 M:

(a) 60 min (b) 30 min (c) 15 min (d) 50 min

142) Consider Fig. and mark the correct option.



(a) Activation energy of forward reaction is $E_1 + E_2$ and product is less stable than reactant.

(b) Activation energy of forward reaction is $E_1 + E_2$ and product is more stable than reactant.

(c) Activation energy of both forward and backward reaction is $E_1 + E_2$ and reactant is more stable than product.

(d) Activation energy of backward reaction is E_1 and product is more stable than reactant.

143) The rate of chemical reaction double for every 10° rise of temperature. If the temperature is raised by 50°, the rate of reaction will increase by

(a) 10 times (b) 24 times (c) 32 times (d) 64 times

144) In Arrhenius plot of Ink Vs $\frac{1}{T}$ is a linear plot obtained with slope of -2 x 10^4 k. Ea of reaction in kJ mol^{-1}.

(a) 83 (b) 166 (c) 249 (d) 332 kJ mol^{-1}

145) The non-stoichiometric reaction:

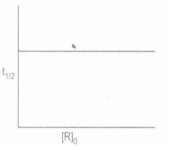
$2A + B \rightarrow C + D$

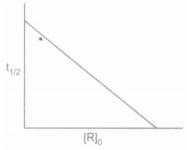
Initial conc A	Initial conc of B	Initial rate (Mol L^{-1})
0.1 M	0.1 M	1.2 x 10^{-3}
0.1 M	0.2M	1.2 x 10^{-3}
0.2 M	0.1 M	2.4 x 10^{-3}

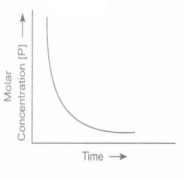
The rate law for formation of c is

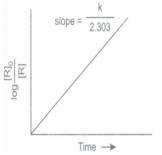
(a) $\frac{dc}{dt} = k[A]$ (b) $\frac{dc}{dt} = k[A][B]$ (c) $\frac{dc}{dt} = k[A]^2[B]^1$ (d) $\frac{dc}{dt} = k[A][B]^2$

146) Which of the following graphs is correct for a first order reaction?

(a) 

(b) 

(c) 

(d) 

147) The rate of a reaction increases sixteen times when the concentration of the reactant increases four times.The order of the reaction is

(a) 2.5 (b) 2.0 (c) 1.5 (d) 0.5

148) For the reaction A + 2B $\longrightarrow$ C + D. The order of the reaction is

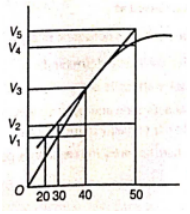
(a) 1 with respect to A (b) 2 with respect to B (c) can't be predicted as order is determined experimentally.

(d) 3

149) For the reaction 3A → 2B, rate of reaction is equal to d[B]/dt

(a) $\frac{-3}{2}\frac{d[A]}{dt}$ (b) $\frac{-2}{3}\frac{d[A]}{dt}$ (c) $\frac{-1}{3}\frac{d[A]}{dt}$ (d) $\frac{+2d[A]}{dt}$

150) A graph of volume of hydrogen released vs time for the reaction between zinc and dil. HCl is given in figure. On the basis of this, mark the correct option.



(a) Average rate upto 40 s is $\frac{V_3-V_2}{40}$ (b) Average rate upto 40 s is $\frac{V_3-V_2}{40-30}$ (c) Average rate upto 40 s is $\frac{V_3}{40}$

(d) Average rate upto 40 s is $\frac{V_3-V_1}{40-20}$

151) The following experimental rate data were obtained for a reaction carried out at 25C

A(g)+ B(g) → C(g)+ D(g)

Initial [A(g)] / mol dm^{-3}	Initial [B(g)] / mol dm^{-3}	Initial rate / mol dm^{-3} s^{-1}
3.0×10^{-2}	2.0×10^{-2}	1.89×10^{-4}
3.0×10^{-2}	4.0×10^{-2}	1.89×10^{-4}
6.0×10^{-2}	4.0×10^{-2}	7.56×10^{-4}

What are the orders with respect to A(g) and B(g)?

(a)

Order with respect to A(g)	Order with respect to B(g)
Zero	Second

(b)

Order with respect to A(g)	Order with respect to B(g)
First	Zero

(c)

Order with respect to A(g)	Order with respect to B(g)
Second	Zero

(d)

Order with respect to A(g)	Order with respect to B(g)
Second	First

152) The slope in the plot of In[R]vs time for a first order reaction is

(a) +k/2.303 (b) -k (c) -k/2.303 (d) +k

153) The half-life for a zero order reaction equals

(a) $\frac{2k}{R}$ (b) $\frac{1}{2}\frac{k}{R^2}$ (c) $\frac{R^2}{2k}$ (d) $\frac{R}{2k}$

154) The rate of reaction A + B → Products, is given by the equation r = k[A] [B]. If Bis taken in large excess, the order of reaction would be

(a) 2 (b) 0 (c) 1 (d) Cannot be predicted

Fill up / 1 Marks 28 x 1 = 28

155) For a gaseous reaction, the units of the reaction are.....

156) In the plot of concentratiuon of reactant versus time, the tangent at any instant of time has a..... slope (opositive or negative or zero).

157) If the rate of reaction, $4\ NH_3 + O_2 \longrightarrow 2\ NO + 5\ H_2O$ at any instant of time is 9×10^{-4} mol L^{-1} s^{-1}, then rate of disapperance of NH_3 is ..... .

158) The rate of reaction when the concentration of each reactant is taken as unity is called ..... .

159) In the reaction, $2\ NO_2\ (g) + F_2\ (g) \longrightarrow 2\ NO_2F\ (g)$, order with respect to NO_2 is..... and that with respect to F_2 is ..... .

160) The units of the rate constant for reactions of second order are ..... .

161) The overall rate of a reaction depends upon the ..... .

162) Rate constant and rate of a reaction have the same units for reactions of ..... order.

163) In the decomposition of ozone , $2\ O_3 \longrightarrow 3\ O_2$, order with respect to O_3 is ..... and that with respect to O_2 is..... .

164) For the zero order reaction, A $\longrightarrow$ Products, with rate constant k, the half-life period is given by $t\ 1/2$ = ...

165) In a first order reaction, the concentration of the rectants decreases..... with time (linearly or exponentially or sinusoidally).

166) The half life period of a first order reaction is ..... of initial concentration of the reactant reduces to ..... proportional to the rate constant.

167) Average life of a first order reaction is the time in which concentration of the reactant reduces to ..... of the original concentration.

168) Doubling the concentration of the reactant doubles the half- life period of the reaction. The order of reaction is..... .

169) Inversion of cane sugar is an example of a ..... reaction.

170) The difference between the energy of the activated complex and the average energy of the rectants is called .....

171) The sum of the activation energy and energy possessed by the reactants is called ..... .

172) Temperature cofficient of most of the reactions lies between ..... and ..... .

173) The factor $e^{-E/RT}$ in Arrhenius equation is called ..... factor

174) Activation energy of reactions for which rate constant is doubled when the temperature is increased by 10^o (from 300 K to 310 K) is nearly..... .

175) In the presence of catalyst, activation energy for forward reaction..... , that for backward reaction..... and the value enthalpy change..... .

176) According to collision theory, rate constant, $k = PZ_{AB}\ e^{-E_a/RT}$. Here, Z_{AB} represents ..... and P represents..... .

177) In the Arrhenius equation k = A cxp (-E/RT), A may be termed as rate constant at..... .

178) If activation energy for forward reaction $(E_a)_f$ = 150 kJ and $(E_a)_b$ is 260 kJ, $\triangle$ H of reaction = _____

179) If $t_{1/2}$ of first order and zero order are same. Then the ratio of the initial rates of first order reaction to the zero order reaction is _____

180) In Bimolecular reaction if one of the reactants is in excess it is called _____

181) The activation energy for a reaction TK is 2.303 RT Jmol $^{-1}$, the ratio of rate constant to Arrhenius factor is _____

182) For a chemical reaction at 27°C, the activation energy is 600 R. The ratio of rate constant at 327°C to that at 27°C will be _____

True or False 7 x 1 = 7

183) S_N1 (substitution nucleophilic reaction) in Tertiary halide is bimolecular but order is 1.

(a) True (b) False

184) S_N1 (substitution nucleophilic reaction) in Primary halide is bimolecular and order is 2.

(a) True (b) False

185) $t_{99\%} = 2t_{90\%}$ in first order reaction

(a) True (b) False

186) $t_{1/2}$ is inversely proportional to initial concentration in zero order reaction.

(a) True (b) False

187) If $t_{1/2}$ = 25 min, amount of reactant left after 100 min will k $\frac{1}{16}$

(a) True (b) False

188) Photosynthesis is zero order reaction.

(a) True (b) False

189) Decomposition of N_2O_5 is first order reaction.

(a) True (b) False

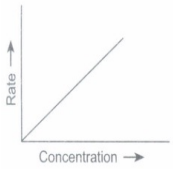
Match the following 29 x 1 = 29

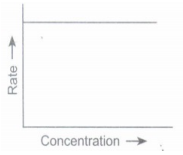
190) $2\,HI \longrightarrow H_2 + I_2$	(1) short interval of time
191) $2\,NH3 \longrightarrow N_2 + 3\,H_2$	(2) I/[A] vs time t for t for 1st order.
192) $2\,H_2O_2 \longrightarrow 2H_2O + O_2$	(3) 1st order
193) $COCl_2 \longrightarrow CO + Cl_2$	(4) by lowering the activation energy
194) Zero order reactions	(5) long duration of time
195) First order reactions	(6) Zero order
196) Second order reactions	(7) Conc.[A] vs time t for zero order
197) Pseduounimolecular reactions	(8) 2
198) Linear plot passing through the orgin	(9) proper orinentation is not there always
199) Linear horizontal plot	(10) $t_{100\%} = [A]_{0/k}$
200) Linear plot with -ve slope and intercept	(11)

refers to the fraction of molecules with energy equal to or grater than activation energy

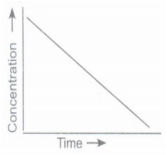
201) Linear plot with +ve slope and an intercept	(12) $t_{1/2} \propto \frac{1}{[A]_0}$
202) Catalyst alters the rate of reactiuon	(13) total probability is one
203) Molecularity	(14) order of slowest step
204) Second half life or first order reaction	(15) $t_{1/2}$ vs $[A]_0$ for 2 and order
205) $e^{-E_a/RT}$	(16) cannot be fraction or zero
206) Energetically favourable reactions are sometimes slow	(17) rate constant
207) Area under the Maxwell Boltzmann curve is constant	(18) 1st order
208) Diamond	(19) $[A] = [A]_0\, e^{-kt}$
209) Instantaneous rate	(20) 0
210) Average rate	(21) ordinarily rate of conversion is imperceptible
211) Mathametical expression for rate of reaction	(22) 1
212) Rate of reaction for zero order reaction is same as that of	(23) Involves at least two reactants
213) Units of rate constant for zero order reaction is same as that of	(24) rate law
214) Order of a complex reaction is determined by	(25) Zero order

(26) $t_{1/2}$ vs $[A]_0$ for 1and order

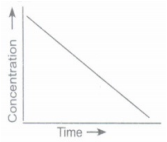
215) 

216) 

(27) is same as the first

217) 

(28) rate of a reaction

218) 

(29) $1\frac{1}{2}$

Assertion and reason 33 x 1 = 33

219) In the following questions. an Assertion (A) is followed by a corresponding Reason (R) Use the following keys to choose the appropriate answer.

Assertion $(\mathrm{A})\ \Delta[R]$ is multiplied with -1 to make the rate of the reaction a positive quantity.

Reason (R) $\Delta[R]$ is a negative quantity in the expression, rate of disappearance of $R = \frac{-\Delta[R]}{\Delta t}$

Codes:

(a) Both (A) and (R) are correct, (R) is the correct explanation of (A).
(b) Both (A) and (R) are correct, (R) is not the correct explanation of (A).
(c) (A) is correct; (R) is incorrect.
(d) (A) is incorrect; (R) is correct.

220) In the following questions. an Assertion (A) is followed by a corresponding Reason (R) Use the following keys to choose the appropriate answer.

Assertion (A) Some zero order reactions may have order in fractions.

Reason (R) Order cannot be determined from balanced chemical equation.

Codes:

(a) Both (A) and (R) are correct, (R) is the correct explanation of (A).
(b) Both (A) and (R) are correct, (R) is not the correct explanation of (A).
(c) (A) is correct; (R) is incorrect.
(d) (A) is incorrect; (R) is correct.

221) In the following questions. an Assertion (A) is followed by a corresponding Reason (R) Use the following keys to choose the appropriate answer.

Assertion (A) Decomposition of gaseous ammonia on a hot platinum surface is a zero order reaction at high pressure.

Reason (R) At high pressure, the metal surface gets saturated with gas molecules.

Codes:

(a) Both (A) and (R) are correct, (R) is the correct explanation of (A).
(b) Both (A) and (R) are correct, (R) is not the correct explanation of (A).
(c) (A) is correct; (R) is incorrect.
(d) (A) is incorrect; (R) is correct.

222) In the following questions. an Assertion (A) is followed by a corresponding Reason (R) Use the following keys to choose the appropriate answer.
Assertion (A) A catalyst increases the rate of reaction.
Reason (R) Catalyst also changes the equilibrium constant.
Codes:
(a) Both (A) and (R) are correct, (R) is the correct explanation of (A).
(b) Both (A) and (R) are correct, (R) is not the correct explanation of (A).
(c) (A) is correct; (R) is incorrect.
(d) (A) is incorrect; (R) is correct.

223) In the following questions. an Assertion (A) is followed by a corresponding Reason (R) Use the following keys to choose the appropriate answer.
Assertion (A) A positive catalyst increases the rate of reaction.
Reason (R) A catalyst increases the rate of reaction by making available a new and more efficient mechanism.
Codes:
(a) Both (A) and (R) are correct, (R) is the correct explanation of (A).
(b) Both (A) and (R) are correct, (R) is not the correct explanation of (A).
(c) (A) is correct; (R) is incorrect.
(d) (A) is incorrect; (R) is correct.

224) In the following questions. an Assertion (A) is followed by a corresponding Reason (R) Use the following keys to choose the appropriate answer.
Assertion (A) Order of reaction can be zero or fractional.
Reason (R) We cannot determine order from balanced chemical equation.
Codes:
(a) Both (A) and (R) are correct, (R) is the correct explanation of (A).
(b) Both (A) and (R) are correct, (R) is not the correct explanation of (A).
(c) (A) is correct; (R) is incorrect.
(d) (A) is incorrect; (R) is correct.

225) In the following questions. an Assertion (A) is followed by a corresponding Reason (R) Use the following keys to choose the appropriate answer.
Assertion (A) All collisions of reactant molecules lead to product formation.
Reason (R) Only those collisions in which molecules have correct orientation and sufficient kinetic energy lead to compound formation.
Codes:
(a) Both (A) and (R) are correct, (R) is the correct explanation of (A).
(b) Both (A) and (R) are correct, (R) is not the correct explanation of (A).
(c) (A) is correct; (R) is incorrect.
(d) (A) is incorrect; (R) is correct.

226) In the following questions. an Assertion (A) is followed by a corresponding Reason (R) Use the following keys to choose the appropriate answer.
Assertion (A) Rate constant determined from Arrhenius equation are fairly accurate for simple as well as complex molecules.
Reason (R) Reactant molecules undergo chemical change irrespective of their orientation during collision.
Codes:
(a) Both (A) and (R) are correct, (R) is the correct explanation of (A).
(b) Both (A) and (R) are correct, (R) is not the correct explanation of (A).
(c) (A) is correct; (R) is incorrect.
(d) (A) is incorrect; (R) is correct.

227) **Assertion :** The rate of the reaction is the rate of change of concentration of a reactant or a product.
Reason : Rate of reaction remains constant during the complete reaction.
Codes :
(a) Assertion and reason both are correct statements and reason is correct explanation for assertion.
(b) Assertion and reason both are correct statements but reason is not correct explanation for assertion.
(c) Assertion is correct statement but reason is wrong statement.
(d) Assertion is wrong statement but reason is correct statement.

228) **Assertion :** Rate of reaction can be expressed as rate of change in partial pressure of the gaseous reactants or products.
Reason : Partial pressure of a gas is equal to its concentration.
Codes :
(a) Assertion and reason both are correct statements and reason is correct explanation for assertion.
(b) Assertion and reason both are correct statements but reason is not correct explanation for assertion.
(c) Assertion is correct statement but reason is wrong statement.
(d) Assertion is wrong statement but reason is correct statement.

229) **Assertion :** The molecularity of the reaction, $H_2 + Br_2 \rightarrow 2HBr$ is 2.
Reason : The rate of reaction is given by k $[H_2][Br_2]$
Codes :
(a) Assertion and reason both are correct statements and reason is correct explanation for assertion.
(b) Assertion and reason both are correct statements but reason is not correct explanation for assertion.
(c) Assertion is correct statement but reason is wrong statement.
(d) Assertion is wrong statement but reason is correct statement.

230) **Assertion :** Molecularity has no meaning for a complex reaction.
Reason : The overall molecularity of a complex reaction is equal to the molecularity of the slowest step.
Codes :
(a) Assertion and reason both are correct statements and reason is correct explanation for assertion.
(b) Assertion and reason both are correct statements but reason is not correct explanation for assertion.
(c) Assertion is correct statement but reason is wrong statement.
(d) Assertion is wrong statement but reason is correct statement.

231) **Assertion :** The order .of the reaction
$CH_3COOC_2H_5 + H_2O \rightarrow CH_3COOH + C_2H_5OH$ is 1.
Reason : The molecularity of this reaction is 2.
Codes :
(a) Assertion and reason both are correct statements and reason is correct explanation for assertion.
(b) Assertion and reason both are correct statements but reason is not correct explanation for assertion.
(c) Assertion is correct statement but reason is wrong statement.
(d) Assertion is wrong statement but reason is correct statement.

232) **Assertion :** The decomposition of NH3 on finely divided platinum surface is first order when the concentration is low, however at higher concentration, the reaction becomes zero order.
Reason : In first order reaction, the rate of reaction is proportional to the first power of the concentration of the reactant
Codes :
(a) Assertion and reason both are correct statements and reason is correct explanation for assertion.
(b) Assertion and reason both are correct statements but reason is not correct explanation for assertion.
(c) Assertion is correct statement but reason is wrong statement.
(d) Assertion is wrong statement but reason is correct statement.

233) **Assertion :** For the reaction, $2\ N_2O_5 \rightarrow 4NO_2 + O_2$
Rate = k $[N_2O_5]$
Reason : Rate of decomposition of N_2O_5 is determined by slow step.
Codes :
(a) Assertion and reason both are correct statements and reason is correct explanation for assertion.
(b) Assertion and reason both are correct statements but reason is not correct explanation for assertion.
(c) Assertion is correct statement but reason is wrong statement.
(d) Assertion is wrong statement but reason is correct statement.

234) **Assertion :** The rate law equation can be found only by experiment.
Reason : It can be written from stoichiometric equation.
Codes :
(a) Assertion and reason both are correct statements and reason is correct explanation for assertion.
(b) Assertion and reason both are correct statements but reason is not correct explanation for assertion.
(c) Assertion is correct statement but reason is wrong statement.
(d) Assertion is wrong statement but reason is correct statement.

235) **Assertion :** Hydrolysis of cane sugar is a pseudo first order reaction.
Reason : Water is present in large excess during hydrolysis.
Codes :
(a) Assertion and reason both are correct statements and reason is correct explanation for assertion.
(b) Assertion and reason both are correct statements but reason is not correct explanation for assertion.
(c) Assertion is correct statement but reason is wrong statement.
(d) Assertion is wrong statement but reason is correct statement.

236) **Assertion :** Half-life period of a reaction of first order is independent of initial concentration.
Reason : Half-life period for a first order reaction,
$t_{1/2} = \frac{2.303}{k} \log 2$
Codes :
(a) Assertion and reason both are correct statements and reason is correct explanation for assertion.
(b) Assertion and reason both are correct statements but reason is not correct explanation for assertion.
(c) Assertion is correct statement but reason is wrong statement.
(d) Assertion is wrong statement but reason is correct statement.

237) **Assertion :** 50% of a zero order reaction is completed in 100 see, therefore, 75% reaction will be completed in 150 sec.
Reason : The rate constant of a zero order reaction depends upon time.
Codes :
(a) Assertion and reason both are correct statements and reason is correct explanation for assertion.
(b) Assertion and reason both are correct statements but reason is not correct explanation for assertion.
(c) Assertion is correct statement but reason is wrong statement.
(d) Assertion is wrong statement but reason is correct statement.

238) **Assertion :** Formation of HI is a bimolecular reaction.
Reason : Two molecules of reactants are involved in this reaction.
Codes :
(a) Assertion and reason both are correct statements and reason is correct explanation for assertion.
(b) Assertion and reason both are correct statements but reason is not correct explanation for assertion.
(c) Assertion is correct statement but reason is wrong statement.
(d) Assertion is wrong statement but reason is correct statement.

239) **Assertion :** Chemical kinetics deals with the rate of reaction, the factors affecting the rates of the reactions and the mechanism by which the reaction proceed.
Reason : Nature of reactants, concentration of reactants, products and catalyst affect the rate of reaction.
Codes :
(a) Assertion and reason both are correct statements and reason is correct explanation for assertion.
(b) Assertion and reason both are correct statements but reason is not correct explanation for assertion.
(c) Assertion is correct statement but reason is wrong statement.
(d) Assertion is wrong statement but reason is correct statement.

240) **Assertion :** Kinetics explains the reaction mechanism.
Reason : Kinetics explains the formation of products.
Codes :
(a) Assertion and reason both are correct statements and reason is correct explanation for assertion.
(b) Assertion and reason both are correct statements but reason is not correct explanation for assertion.
(c) Assertion is correct statement but reason is wrong statement.
(d) Assertion is wrong statement but reason is correct statement.

241) **Assertion :** The rate of reaction is always negative.
Reason : Minus sign used in expressing the rate shows that concentration of product is decreasing.
Codes :
(a) Assertion and reason both are correct statements and reason is correct explanation for assertion.
(b) Assertion and reason both are correct statements but reason is not correct explanation for assertion.
(c) Assertion is correct statement but reason is wrong statement.
(d) Assertion is wrong statement but reason is correct statement.

242) Assertion: Order and molecularity are same.
Reason: Order is determined experhnentally and molecularity is the sum of the stoichiometric coefficient of rate determining elementary step.
Codes:
(a) Both assertion and reason are correct and the reason is correct explanation of assertion.
(b) Both assertion and reason are correct but reason does not explain assertion.
(c) Assertion is correct but reason is incorrect.
(d) Both assertion and reason are incorrect.
(e) Assertion is incorrect but reason is correct.

243) In the following questions a statement of assertion followed by a statement of reason is given.
Assertion: All collision of reactant molecules lead to product formation.
Reason: Only those collisions in which molecules have correct orientation and sufficient kinetic energy lead to compound formation .
Codes:
(a) Both assertion and reason are correct and the reason is correct explanation of assertion.
(b) Both assertion and reason are correct but reason does not explain assertion.
(c) Assertion is correct but reason is incorrect,
(d) Both assertion and reason are incorrect.
(e) Assertion is incorrect but reason is correct.

244) In the following questions a statement of assertion followed by a statement of reason is given.
Assertion: Rate constants determined from Arrhenius equation are fairly accurate for simple as well as complex molecules.
Reason: Reactant molecules undergo chemical change irrespective of their orientation during collision.
Codes:
(a) Both assertion and reason are correct and the reason is correct explanation of assertion.
(b) Both assertion and reason are correct but reason does not explain assertion.
(c) Assertion is correct but reason is incorrect,
(d) Both assertion and reason are incorrect.
(e) Assertion is incorrect but reason is correct.

245) **Assertion (A)** The units of rate constant of a zero order reaction and the rate of reaction are the same.
Reason (R) In zero order reaction, the rate of reaction is independent of the concentration of reactants.
(a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
(b) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A).
(c) Assertion (A) is true, but Reason (R) is false.
(d) Asserton (A) is false, but Reason (R) is true.

246) **Assertion (A)** Inversion of configuration is observed in S_N2 reaction.
Reason (R) The reaction proceeds with the formation of carbocation.
(a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
(b) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A).
(c) Assertion (A) is true, but Reason (R) is false.
(d) Asserton (A) is false, but Reason (R) is true.

247) **Assertion (A)** Inversion of configuration is observed when 1-bromobutane is hydrolysed.
Reason (R) The reaction is S_N2 and proceeds with the formation of transition state.
(a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A).
(b) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A).
(c) Assertion (A) is true, but Reason (R) is false.
(d) Assertion (A) is false, but Reason (R) is true.

248) Assertion (A) : For a zero order reaction the unit of rate constant and rate of reaction are same.
Reason (R) : Rate of reaction for zero order reaction is independent of concentration of reactant.
(a) Both Assertion and Reason are correct, Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are correct, Reason is not the correct explanation of Assertion.
(c) Assertion is correct; Reason is incorrect.
(d) Assertion is incorrect; Reason is correct.

249) Assertion (A) : For complex reactions, molecularity and order are not same.
Reason (R) : Order of reaction may be zero.
(a) Both Assertion and Reason are correct, Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are correct, Reason is not the correct explanation of Assertion.
(c) Assertion is correct; Reason is incorrect.
(d) Assertion is incorrect; Reason is correct.

250) Assertion (A) : Order and molecularity of a reaction are always same.
Reason (R) : Complex reactions involve a sequence of elementary reactions and the slowest step is rate determining.
(a) Both Assertion and Reason are correct, Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are correct, Reason is not the correct explanation of Assertion.
(c) Assertion is correct; Reason is incorrect.
(d) Assertion is incorrect; Reason is correct.

251) Assertion (A) : Hydrolysis of an ester follows first order kinetics.
Reason (R) : Concentration of water remains nearly constant during the course of the reaction.
(a) Both Assertion and Reason are correct, Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are correct, Reason is not the correct explanation of Assertion.
(c) Assertion is correct; Reason is incorrect.
(d) Assertion is incorrect; Reason is correct.

Passage Based Questions 15 x 1 = 15

252) Most of the chemical reactions are accelerated by increase in temperature T. At a particular temperature T, all the molecules of reactants do not have the same kinetic energy but the fractions of molecules having particular kinetic energies.at a particular temperature remain constant. The distribution of kinetic energy may be described by plotting the fraction of molecules (N_E/ N_T) with a given kinetic energy (E). This is called Maxwell's Boltzmann distribution of energies. Here, NE is the number of molecules with energy E and NT is the total number of molecules. The temperature dependence of rate of a chemical reaction is expressed by Arrhenius equation,
$k = Ae^{-Ea/RT}$
Give the Maxwell's Boltzmann's distribution curve showing temperature dependence of rate of reaction.

253) Most of the chemical reactions are accelerated by increase in temperature T. At a particular temperature T, all the molecules of reactants do not have the same kinetic energy but the fractions of molecules having particular kinetic energies.at a particular temperature remain constant. The distribution of kinetic energy may be described by plotting the fraction of molecules (N_E/ N_T) with a given kinetic energy (E). This is called Maxwell's Boltzmann distribution of energies. Here, NE is the number of molecules with energy E and NT is the total number of molecules. The temperature dependence of rate of a chemical reaction is expressed by Arrhenius equation,
$k = A\,e^{-E_a/RT}$
What does the peak of the distribution curve represents?

254) Most of the chemical reactions are accelerated by increase in temperature T. At a particular temperature T, all the molecules of reactants do not have the same kinetic energy but the fractions of molecules having particular kinetic energies at a particular temperature remain constant. The distribution of kinetic energy may be described by plotting the fraction of molecules (N_E/ N_T) with a given kinetic energy (E). This is called Maxwell's Boltzmann distribution of energies. Here, NE is the number of molecules with energy E and NT is the total number of molecules. The temperature dependence of rate of a chemical reaction is expressed by Arrhenius equation,
$k = Ae^{-E_a/RT}$
How does the graph show that on increasing the temperature rate of reaction gets doubled?

255) Most of the chemical reactions are accelerated by increase in temperature T. At a particular temperature T, all the molecules of reactants do not have the same kinetic energy but the fractions of molecules having particular kinetic energies.at a particular temperature remain constant. The distribution of kinetic energy may be described by plotting the fraction of molecules (N_E/ N_T) with a given kinetic energy (E). This is called Maxwell's Boltzmann distribution of energies. Here, NE is the number of molecules with energy E and NT is the total number of molecules. The temperature dependence of rate of a chemical reaction is expressed by Arrhenius equation,
$k = Ae^{-E_a/RT}$
The rate constant of a reaction is $1.5x\ 10^7\ s^{-1}$ at 50°C and $4.5 \times 10^{-7}\ s^{-1}$ at 100°C. Calculate the value of activation energy E_a for the reaction R = 8.314 J K^{-1} mol^{-1}.

256) Most of the chemical reactions are accelerated by increase in temperature T. At a particular temperature T, all the molecules of reactants do not have the same kinetic energy but the fractions of molecules having particular kinetic energies.at a particular temperature remain constant. The distribution of kinetic energy may be described by plotting the fraction of molecules (N_E/ N_T) with a given kinetic energy (E). This is called Maxwell's Boltzmann distribution of energies. Here, NE is the number of molecules with energy E and NT is the total number of molecules. The temperature dependence of rate of a chemical reaction is expressed by Arrhenius equation,
$k = Ae^{-E_a/RT}$
With the help of Arrhenius equation, how can you say that increasing the temperature result in an increase in the rate of reaction.

257) Most of the chemical reactions are accelerated by increase in temperature T. At a particular temperature T, all the molecules of reactants do not have the same kinetic energy but the fractions of molecules having particular kinetic energies.at a particular temperature remain constant. The distribution of kinetic energy may be described by plotting the fraction of molecules (N_E/ N_T) with a given kinetic energy (E). This is called Maxwell's Boltzmann distribution of energies. Here, N_E is the number of molecules with energy E and N_T is the total number of molecules. The temperature dependence of rate of a chemical reaction is expressed by Arrhenius equation,
$k = Ae^{-E_a/RT}$
Give the Maxwell's Boltzmann's distribution curve showing temperature dependence of rate of reaction.

258) Most of the chemical reactions are accelerated by increase in temperature T. At a particular temperature T, all the molecules of reactants do not have the same kinetic energy but the fractions of molecules having particular kinetic energies.at a particular temperature remain constant. The distribution of kinetic energy may be described by plotting the fraction of molecules (N_E/ N_T) with a given kinetic energy (E). This is called Maxwell's Boltzmann distribution of energies. Here, N_E is the number of molecules with energy E and N_T is the total number of molecules. The temperature dependence of rate of a chemical reaction is expressed by Arrhenius equation,
$k = Ae^{-E_a/RT}$
What does the peak of the distribution curve represents?

259) Most of the chemical reactions are accelerated by increase in temperature T. At a particular temperature T, all the molecules of reactants do not have the same kinetic energy but the fractions of molecules having particular kinetic energies.at a particular temperature remain constant. The distribution of kinetic energy may be described by plotting the fraction of molecules (N_E/ N_T) with a given kinetic energy (E). This is called Maxwell's Boltzmann distribution of energies. Here, N_E is the number of molecules with energy E and N_T is the total number of molecules. The temperature dependence of rate of a chemical reaction is expressed by Arrhenius equation,
$k = Ae^{-E_a/RT}$
How does the graph show that on increasing the temperature rate of reaction gets doubled?

260) Most of the chemical reactions are accelerated by increase in temperature T. At a particular temperature T, all the molecules of reactants do not have the same kinetic energy but the fractions of molecules having particular kinetic energies.at a particular temperature remain constant. The distribution of kinetic energy may be described by plotting the fraction of molecules (N_E/ N_T) with a given kinetic energy (E). This is called Maxwell's Boltzmann distribution of energies. Here, N_E is the number of molecules with energy E and N_T is the total number of molecules. The temperature dependence of rate of a chemical reaction is expressed by Arrhenius equation,
$k = Ae^{-E_a/RT}$
The rate constant of a reaction is 1.5×10^7 s^{-1} at 50°C and 4.5×10^{-7} s^{-1} at 100°C. Calculate the value of activation energy E_a for the reaction R = 8.314 J K^{-1} mol^{-1}.

261) Most of the chemical reactions are accelerated by increase in temperature T. At a particular temperature T, all the molecules of reactants do not have the same kinetic energy but the fractions of molecules having particular kinetic energies at a particular temperature remain constant. The distribution of kinetic energy may be described by plotting the fraction of molecules (N_E/ N_T) with a given kinetic energy (E). This is called Maxwell's Boltzmann distribution of energies. Here, N_E is the number of molecules with energy E and N_T is the total number of molecules. The temperature dependence of rate of a chemical reaction is expressed by Arrhenius equation,
$k = Ae^{-E_a/RT}$
With the help of Arrhenius equation, how can you say that increasing the temperature result in an increase in the rate of reaction.

262) First order reaction means, the rate of the reaction is proportional to the first power of the concentration of reactant, R. For the reaction, $R \longrightarrow P,\ \text{rate} = \frac{d[R]}{dt} = k[R]$ and the integrating rate equation is $k = \frac{1}{t}\ln\frac{[R_0]}{[R]}$ where [R] is final concentration and $[R_o]$ is initial concentration of reactant respectively. Give the example of first order reaction.

263) First order reaction means, the rate of the reaction is proportional to the first power of the concentration of reactant, R. For the reaction, $R \longrightarrow P,\ \text{rate} = \frac{d[R]}{dt} = k[R]$ and the integrating rate equation is $k = \frac{1}{t}\ln\frac{[R_0]}{[R]}$ where [R] is final concentration and $[R_o]$ is initial concentration of reactant respectively.
Plot the graph between $\log[R_o]/[R]$ vs time (t) for a first order reaction.

264) First order reaction means, the rate of the reaction is proportional to the first power of the concentration of reactant, R. For the reaction, $R \longrightarrow P,\ \text{rate} = \frac{d[R]}{dt} = k[R]$ and the integrating rate equation is $k = \frac{1}{t}\ln\frac{[R_0]}{[R]}$ where [R] is final concentration and $[R_o]$ is initial concentration of reactant respectively.
Give the mathematical expression for the half life of a first order reaction and also give the unit of rate constant.

265) First order reaction means, the rate of the reaction is proportional to the first power of the concentration of reactant, R. For the reaction, $R \longrightarrow P,\ \text{rate} = \frac{d[R]}{dt} = k[R]$ and the integrating rate equation is $k = \frac{1}{t}\ln\frac{[R_0]}{[R]}$ where [R] is final concentration and $[R_o]$ is initial concentration of reactant respectively.
Time required to decompose SO_2Cl_2 to half of its initial amount is 60 min. If the decomposition is a first order reaction, calculate the rate constant of the reaction.

266) First order reaction means, the rate of the reaction is proportional to the first power of the concentration of reactant, R. For the reaction, $R \longrightarrow P,\ \text{rate} = \frac{d[R]}{dt} = k[R]$ and the integrating rate equation is $k = \frac{1}{t}\ln\frac{[R_0]}{[R]}$ where [R] is final concentration and $[R_o]$ is initial concentration of reactant respectively.
A first order reaction takes 40 min for 30% decomposition. Calculate the rate constant.

2 Marks 320 x 2 = 640

267) A reaction is second order with respect to a reactant. How is the rate of reaction affected if the concentration of the reactant is
(i) doubled?
(ii) reduced to half?

268) The decomposition of hydrocarbon follows the equation $k = (4.5 \times 10^{11} s^{-1})\ e^{-28000K/T}$ Calculate E_a.

269) The rate of a reaction quadruples when the temperature changes from 293 K to 313 K. Calculate the energy of activation of the reaction assuming that it does not change with temperature. [R = 8.314 JK^{-1} mol^{-1}][log 4 = 0.6021]

270) The conversion of molecules X to Y follows second order kinetics. If concentration of X is increased to three times how will it affect the rate of formation of Y?

271) The rate constant for a first order reaction is 60 s^{-1}. How much time will it take to reduce the initial concentration of the reactant to its $1/16^{th}$ value?

272) For the reaction R $\longrightarrow$ P, the concentration of a reactant changes from 0.03M to 0.02M in 25 minutes. Calculate the average rate of reaction using units of time both in minutes and seconds.

273) In a reaction, 2 A $\longrightarrow$ products, the concentration of A decreases from 0.5 mol L^{-1} to 0.4 mol L^{-1} in 10 minutes. Calculate the rate during this interval.

274) What will be the effect of temperature on rate constant ?

275) From the rate expressions for the following reactions, determine their order of reaction and the dimentions of the rate constants :
(i) 3 NO (g) $\longrightarrow$ N_2) (g) ; Rate = k $[NO]_2$
(ii) H_2O_2 (aq) + $3I^-$ (aq) + 2 H^+ $\longrightarrow$ $2H_2O$ (l) + I^-3 ; Rate = k $[H_2O_2]I^-]$
(iii) CH_3CHO (g) $\longrightarrow$ CH_4 (g) + CO (g) ; Rate k$[CH_3CHO]^{3/2}$
(iv) C_2H_5Cl (g) $\longrightarrow$ C_2H_4 (g) + HCl (g) ; Rate k$[C_2H_5Cl]$.

276) The decomposition of dimethyl ether leads to the formation of CH_4, H_2 and CO and the reaction rate is given by Rate = k$[PCH_3OCH_3]^{3/2}$. If the pressure is measured in bar and time in minutes then what are the units of the rate and rate constants ?

277) What is the effect of temperature on the rate constant of a reaction ? How can this temperature effect on the rate constant be represented quantitively ?

278) In a pseudo first order hydrolysis of an ester in water, the following results were obtained :

T/S	**0**	**30**	**60**	**90**
[Ester]/molL^{-1}	0.55	0.31	0.17	0.085

(i) Calculate the average rate of reactions between the time interval 30 to 60 seconds.

279) A reaction is first order in A and second order in B
(i) Write differential rate equation.
(ii) How is the rate affected on increasing the concentration of B three times ?
(iii) How is the rate affected when concentration of both A and B is doubled ?

280) Calculate the half-life of a first order reaction from their rate constants given below:
(a) 200 s^{-1}
(b) 2 min^{-1}
(c) 4 $year^{-1}$

281) During nuclear exposion, one of the products is ^{90}Sr with half life of 28.1 years. if 1 μg of ^{90}Sr was absorbed in bones of a newly born baby instead of calcium, how much of it will remain after 10 years and 60 years it it is not lost metaboliucally?

282) The rate constant for the decomposition of N_2O_5 at various temperature is given below:

T/^oC	**0**	**20**	**40**	**60**	**80**
105$\times$ k/s^{-1}	0.0787	1.70	25.7	178	2140

Draw a graph between in k and 1/T and calculate the values of A and E_a.Predict the rate constant at 30^{o}C and 50^{o}C.

283) Consider a certain reaction A $\longrightarrow$ Produces with k = $2.0\times10^{-2}s^{-1}$. Calculate the concentration of A remaining after 100 s if the initial concentration of A is 1.0 mol L^{-1}.

284) Sucrose decomposes in acid solution into glucose and fructose according to the first order rate law with $t_{1/2}$ = 3.00 hours. What fraction of the sample of sucrose remains after 8 hours?

285) A first order reaction is found to have a rate constant k = 5.5 x $10^{-14}s^{-1}$. Find the half life of this reaction.

286) The rate constant for the first order decomposition of H_2O_2 is given by the following equation :
log k = 14.34 - 1.25 $\times10^4$ K/T calculate the Ea for this reaction and what temperature will its half-period be 256 minutes?

287) For a reaction A+B$\longrightarrow$ P, the rate law is given by, $r = klA]^{1/2}[B]^2$ .What is the order of this reaction?

288) Mention the factors that affect the rate of chemical reaction.

289) A first order reaction takes 40 min for 30%. decomposition. Calculate $t_{1/2}$

290) When reaction is completed 99.9%, $[R]_n = [R]_0 - 0.999[R]_0$

291) Time required to decompose SO_2Cl_2 to half of its initial amount is 60 minutes. If the decomposition is a first order reaction, calculate the rate constant of the reaction.

292) Why does the rate of a reaction not remain constant throughout the reaction process?

293) For the reaction $Cl_2(g) + 2NO(g) \rightarrow 2NOCl(g)$ the rate law is expressed as rate = $k[Cl_2][NO]^2$ What is the overall order of this reaction?

294) Express the rate of the following reaction in terms of disappearance of hydrogen in the reaction: $3H_2(g) + N_2(g) \rightarrow 2NH_3(g)$.

295) What is meant by order of a reaction being zero?

296) The rate of reaction X $\rightarrow$ Y becomes 8 times when the concentration of the reactant X is doubled. Write the rate law of the reaction.

297) Is there any reaction for which reaction rate does not decrease with them?

298) Express the relation between the half-life period of a reactant and its initial concentration if the reaction involved is of second order.

299) Express the relation between the half-life period of a reactant and its initial concentration for a reaction of n^{th} order.

300) How does the value of rate constant vary with reactant concentration?

301) A substance with initial concentration 'a' follows zero order kine ics with the rate constant 'k' mol $L^{-1}s^{-1}$. In how much time will the reaction go to completion?

302) When is the rate of reaction equal to specific reaction rate?

303) According to Arrhenius, rate of reaction increases with increase in temperature. Give reasons.

304) For a reaction, A $\rightarrow$ B, the rate of reaction can be denoted by $-\frac{d[A]}{dt}$ or + $\frac{d[B]}{dt}$. State the significance of plus and minus sign.

305) For a hypothetical reaction A + 2B $\rightarrow$ C it is found that the rate = k [A] [B]. What is the most likely rate determining step?

306) $t_{1/2}$ of the reaction increases with increase in initial concentration. What is the order of reaction?

307) Define threshold energy of a reaction.

308) What is the shape of graph between log k vs $\frac{1}{T}$ What is the relationship between its slope and activation energy $(E)_a$)?

309) A first order reaction takes 40 min for 30% decomposition. Calculate $t_{1/2}$ for the reaction. [log 1.428 = 0.1548]

310) A first order reactions has rate constant k = 5.5×10^{-14} s^{-1}. Find the half life of the reaction.

311) If half life period of first order reaction is 'X' and $\frac{3}{4}$ the life period of same reaction is 'Y', how are 'x' and 'y' are related to each other?

312) In some cases it is found that a large number of colliding molecules have energy more than threshold energy but yet the reaction is slow. Why?

313) With the help of diagram explain the role of activated complex in a reaction.

314) What is physical significance of energy of activation? Explain with diagram.

315) A reaction is of first order in reactant A and of second order in reactant B. How is the rate of this reaction affected when
(i) the concentration of B alone is increased to three times
(ii) the concentrations of A as well as B are doubled?

316) State a condition in which bimolecular reaction is kinetically first order reaction.

317) For a reaction A + B $\rightarrow$ Products, the rate law is Rate = k[A] $[B]^{3/2}$. Can the reaction be an elementary reaction?

318) For a zero order reaction will the molecularity be equal to zero?

319) The reaction between $H_2(g)$ and $O_2(g)$ is highly feasible yet allowing the gases to stand at room temperature in the same vessel does not lead to the formation of water. Explain.

320) Oxygen is available in plenty in air yet fuels do not burn by themselves at room temperature. Explain.

321) Why is the probability of reaction with molecularity higher than three very rare?

322) Why does the rate of any reaction generally decreases during the course of the reaction?

323) Thermodynamic feasibility of the reaction alone cannot decide the reaction. Explain with the help of one example.

324) Why in the redox titration of $KMnO_4$ vs oxalic acid, we heat oxalic acid solution before starting the titration?

325) Why can't molecularity of any reaction be equal to zero?

326) For the reaction A $\rightarrow$ B, the rate of reaction becomes twenty-seven times when the concentration of A is increased three times. What is the order of the reaction?

327) What do you understand by the rate law and rate constant of a reaction? Identify the order of a reaction if the units of its rate constant are :
(i) L^{-1} mol s^{-1}
(ii) L mol^{-1} s^{-1}

328) The thermal decomposition of HCO_2H is a first-order reaction with a rate constant of 2.4×10^{-3} s^{-1} at a certain temperature. Calculate how long will it take for three-fourths of initial quantity of HCO_2H to decompose. (log 0.25 = - 0.6021)

329) Explain the terms:
(i) Rate determining step of a reaction
(ii) Molecularity of a reaction

330) In a first order reaction, the concentration of the reactant is reduced from 0.6 mol L^{-1} to 0.2 mol L^{-1} in 5 minutes. Calculate the rate constant of the reaction.

331) A reactant has a half-life of 10 minutes.
(i) Calculate the rate constant for the first order reaction.
(ii) What fraction of the reactant will be left an hour of the reaction has occurred?

332) Calculate the rate constant of a reaction at 293 K, given that: E_α = 103 kJ mol^{-1}, k = 7.87×10^{-7} s^{-1} at 273 K, R - 8.314 JK^{-1} mol^{-1}.

333) The rate constant for a reaction of zero order in A is 0.0030 mol L^{-1} s^{-1}. How long will it take for the initial concentration of A to fall from 0.10 M to 0.075 M?

334) Define:
(i) Elementary reaction in a process
(ii) Rate of a reaction

335) Show that for a first order reaction, the time required for half the change (half-life period) is independent of initial concentration.

336) A first order decomposition reaction takes 40 minutes for 30% decomposition. Calculates its $t_{1/2}$ value.

337) What is meant by the 'rate constant, k' of a reaction? If the concentration be expressed in mol L^{-1} units and time in seconds, what would be the units for k
(i) for a zero order reaction and
(ii) for a first order reaction?

338) The rates of most reactions double when their temperature is raised from 298 K to 308 K. Calculate activation energy of such a reaction.
(R = 8.314 J $mol^{-1}K^{-1}$, log 2 = 0.3010)

339) Show by using rate law, how much rate of reaction: $2NO(g) + O_2(g) \rightarrow 2NO_2(g)$ will change if the volume of the reaction vessel is reduced to one-third of its initial value.

340) What is the effect of catalyst on activation energy? Why?

341) Time required for a particular reaction to be half completed is 693 seconds. Calculate the time required for 90% completion of this reaction.

342) At 300 K a certain reaction is 50% completed in 20 minutes. At 350 K, the same reaction is 50% completed in 5 minutes. Calculate the activation energy for the reaction.

343) Why molecularity is applicable only for elementary reactions and order is applicable for elementary as well as complex reactions?

344) Calculate the overall order of a reaction which has the raise expression
(a) Rate = $k [A]^{1/2} [B]^{3/2}$
(b) Rate = $k [A]^{3/2} [B]^{-1}$
(i) $k = 2.3 \times 10^{-s}$ L mol^{-1} s^{-1}
(ii) $k = 3 \times 10^{-4}$ s^{-1}

345) For a reaction $A \rightarrow B$, the rate of reaction can be denoted by - $\frac{dA}{dt} or + \frac{dB}{dt}$. State the significance of plus and minus signs in this case.

346) Why in general a reaction does not proceed with a uniform rate throughout or why instantaneous rate is preferred over average rate ?

347) Why boilling of an egg or cooking of rice in an open vessel takes more time at a hill station ?

348) A reaction proceeds with a uniform rate throughout. What do you conclude? or Is there any reaction whose rate does not decrease with time ?

349) When the rate of reaction equal to specific reaction rate ?

350) What is the order of reaction whose rate constant has the same units as the rate of reaction ?

351) Why are reactions of higher order less in number ?

352) For a reaction, the graph of the rate reaction against molar concentration of the reactant is as shown. What is the order of the reaction ?

353) For a reaction, the rate law is : Rate $k = [A] [B]^{1/2}$. can this reaction be an elementry reaction ?

354) The rate expression for the reaction, $(CH_3)_3$ C-Cl + $OH^- \rightarrow$ $(CH_3)_3$ C - OH + Cl^- is Rate = k[$(CH_3)_3$ C-Cl]. Propose the mechansim for the reaction.

355) A reaction is 50 % complete in 2 hours and 75% complete in 4 hours what is the order of reactions ?

356) What are the units of the rate constant of a pseudo unimolecular reaction ?

357) Why hydrolysis of ethyl acetate with NaOH is reaction of second order which with HCl, it is of first order ?

358) The rate constant for a second order reaction is $k = \frac{2.303}{t(a-b)} log \frac{b(a-x)}{(b-x)}$ where a and b are initial concentrations of the two reactants A and B involved. If one of the reactants is present in excess, it becomes pseudo unimolecular. Explain how ?

359) On the basis of ethalpy of formation, graphite is more stable than diamond, yet diamond does not change into graphic for years. Explain why ?

360) The reaction 2 NO (g) + O_2 (g) $\longrightarrow$ 2 NO_2 (g) and 2 CO (g) + O_2 (g) $\longrightarrow$ 2 CO_2 (g) look to be similar. Yet the former is faster than the latter at the same temperature. Explain why.

361) Can a reaction have zero activation energy ?

362) Can a reaction have negative activatiuon energy?

363) What is the fraction of molecules having energy equal to or grater than activation energy, E_a ? What is this quality called ?

364) Assuming that energy of activation for most of the reactions is 52 kJ, what conclusion you draw about the effect of temperature on the rate of the rate of a reaction ? (Based on Arrhenius equations)

365) Why equilibrium constant of a reaction does not change in the presence of catalyst ?

366) What is the effect of adding catalyst on the free energy vhange ($\triangle G$) of a reaction ?

367) A reaction is second order with respect to a reactant, How is the rate of reaction affected if the concentration of bthe reactant is (i) doubled (ii) reduced to 1/2?

368) The half-life for radioactive decay of ^{14}C is 5730 y. An archalogiucal artifact contained wood that had only 80% of the 14 C found in living tree. Estimate the age of the example.

369) A first oder reaction takes 40 min for 30^ decomposition. Calculate t_{12}.

370) Write the rate equation for the reaction 2 A + B $\longrightarrow$ C if the order of the reaction is zero.

371) How can you determine the rate law of the following reaction ?
2 NO (g) + O_2 (g) $\longrightarrow$ 2 NO_2 (g)

372) For which type of reactions, order and molecularity have the same value ?

373) In a reaction, if the concentration of reaction A is tripled, the rate of reaction becomes twenty seven times. What is the order of the reaction ?

374) Derive an expression to calculate time required for completion of zero reaction.

375) For a reaction A + B $\longrightarrow$ Products, the rate law is : Rate = k [A] $[B]^{3/2}$. Can the reaction be an elementary reaction ? Explain .

376) For a certain reaction, large fraction of molecules has energy more than the threshold energy, yet the rate of reaction is very slow. Why ?

377) For a zero order reaction, will be molecularity be equal to zero ? Explain.

378) For a general reaction A $\longrightarrow$ B, plot of concentration of A vs time is given in Fig. Answer the following questions on the basis of this graph.
(i) What is the order of the reaction ?
(ii) What is the slope of the curve ?
(iii) What are the units of rate constant

379) The reaction between H_2 (g) and O_2 (g) is highly feasible yet allowing the gases to stand at room temperature in the same does not lead to the formation of water. Explain

380) Why does the rate of a reaction increase with rise in temperature ?

381) Why is the probability of reaction with molecularity higher than three very rare?

382) Why does the rate of any reaction generally decreases during the course of the reaction ?

383) Thermodynamic feasibility of the reaction alone cannot decide the rate of the reaction. Explain with the help of the one example .

384) Why in the redox titration of $KMnO_4$ vs oxalic acid, we heat oxalic acid, we heat oxalic acid solution before starting the titration?

385) Why can't molecularity of any reaction be equal to zero ?

386) Why molecularity of any reactions and order is applicable for elementary reactions and order is applicable for elementary as well as complex reactions ?

387) Why we cannot determine the order of a reaction by talking into consideration the balanced chemical equation?

388) What is the meant by 'rate constant, k' of a reaction ? If the concentration be expressed in mol L^{-1} units and time in seconds, what would be the units for k
(i) for a zero order reaction
(ii) for a first order reaction.

389) Notric oxide, NO, reacts with Oxygen to produce nitrogen dioxide : 2NO (g) + O_2(g) $\longrightarrow$ $2NO_2$(g). The rate law for this, reaction is : Rate = k $[NO]^2$ $[O_2]$.

390) Give any four differences between order of a reaction and its molecularity ?

391) Write expression for rate of reactuion in terms of each reactant and product for the reaction
$N_2 + 3H_2 \longrightarrow 2NH_3$.

392) for the staraight reaction.
$X_2(g) + 2Y_2(g) \longrightarrow 2XY_2(g)$, write the rate equation in terms of disappearance of Y_2

393) The rate law for the reaction : Ester + H+ $\longrightarrow$ Acid + Alcohol is : $\frac{dx}{dt} = k[Ester][H^+]^0$ what would be the effect on the rate if (i) concentration of the ester is doubled ? concentration of H^+ is doubled ?

394) Write the names of four factors affecting the rate of a reaction.

395) Define : Specific reaction and rate constant.

396) Define : Rate of reaction and rate constant.

397) What is the differebce between Rate law and law of Mass Action ?

398) Give an example of a reaction having fractional order.

399) The rate law for the decomposition of N_2O_5 is : rate = k$[N_2O_5]$. What is the significance of k in this equation ?

400) Give an example of first order reaction.

401) Rate of a reaction is given by the equation: Rate = k$[A]^2$[B]. What are the units for the rate and the rate constant for this reaction?

402) The composition reaction of ammonia gas on platinum surface has a constant = 2.5×10^{-4} mol $L^{-1}s^{-1}$. What is the order of the reaction ?

403) Give an example of a reaction where order and molecularity are equal.

404) What is the meant by an elementary reaction ?

405) For the reaction NO_2+ CO $\longrightarrow$ CO_2 + NO, the rate law is: Rate = k$[NO_2]_2$. Propose the probable mechanism of this reaction.

406) For a reaction: A + H_2O $\longrightarrow$ B, Rate $\propto$ A]. What is its (i) Molecularity (ii) Order of reaction?

407) State any one under which a bimolecular reaction may be kinetically of first order.

408) In the reaction aA +bB $\longrightarrow$ products, if concentration of A is doubled (keeping B constant) the initial rate becomes four times and if B is doubled (keeping A constant), the rate becomes double. What is the rate law equation and order of reaction ?

409) The reaction A + B $\longrightarrow$ C has zero order. What is the rate equation ?

410) A substance with initial concentartion 'a' follows zero order kinetics. In much time will the reaction go to completion?

411) Give an example of a zero order reaction and write an expression for its velocity constant.

412) Write the expression showing the change of concentration with time in the exponential form for reactions of first order.

413) How is half-life period related to initial concentration for a second order reaction ?

414) Write expression for half life in case of a reaction between hydrogen and chlorine to form hydrochloric acid gas.

415) Three-forth of a first order reaction is completed in 32 minutes. what is the half-life period of this reaction ?

416) Radioactive disntegration is a first order reaction. Explain why.

417) Define activation energy of a reaction.

418) What are the two necessary conditions for a collision between two molecules to be effective collision ?

419) The rate of decomposition of ammonia is found to depend upon the concentration of NH3 according to the equation $-\frac{d[NH_3]}{dt} = \frac{k_1[NH_3]}{1+k_2[NH_3]}$ What will be the order of reaction when
(i) concentration of NH_3 is very high ?
(ii) Concentration of NH_3 is very low ?

420) The rate law equation for the reaction A $\longrightarrow$ B is found to be -$\frac{d[A]}{dt} = k[A]^{1/2}$ If [A]0 were the initial concentration of A, derive expressions for
(i) rate constant in the intergrated form
(ii) half-life period of the reaction.

421) While studying the decomposition of N_2O_5(g), it is observed that a plot of logarithm of its partial pressure versus time is linear. what kinetic parameter can be obtained from this ?

422) Write the elementary steps of the reaction $2O_3 \rightleftharpoons 3O_2$ and hence derive the rate law expression for this reaction. Comment on the order of reaction.

423) For a first order reaction, derive expression for the degree of dissociation of the reactant in the expressional form.

424) For a reaction A $\rightarrow$ B, the rate of reaction can be denoted by $\frac{dA}{dt}\ or + \frac{dB}{dt}$. State the significance of plus and minus signs in this case.

425) For the reaction N2(g) + 3 H_2 (g) $\longrightarrow$ 2NH_3 (g), if $\triangle[NH_3]/\triangle t = 4 \times 10^{-8} mol L^{-1} s{-}1$ what is the value of -$\triangle[H_2]/\triangle t$?

426) A chemical reaction 2 A $\longrightarrow$ 4B + C, in gas phase occurs in a closed vessel. The concentration of B is found to be increased by 5×10^{-3} mol L^{-1} in 10 seconds. calculate
(i) the rate of apperance of B
(ii) the rate of appearance of A.

427) Identify the reaction order from the following rate constant :
k = 2.3 $\times 10^{-5}$ litre $mol^{-1} sec^{-1}$

428) The rate constant for an isomerisation reaction, A $\longrightarrow$ B is 4.5 $\times 10^{-3} min^{-1}$. if the initial concentration of A is 1 M, calculate the rate of reaction after 1 h.

429) The rate of a gaseous reaction is halved when the volume of the vessel is doubled. what ius the order of reaction ?

430) (a) write any four differences between 'rate of reaction' and 'rate constant' of a reaction.
(b) Give any four differences between order of a reaction and its molecularity ?

431) (a) Derive an expression to calculate the time required for completion of zero order reaction.
(b) The decompletion of NH_3 on platinum surface, 2 NH_3 (g) $\overset{pt}{\longrightarrow}$ N_2(g) + 3H_2 (g), is zero order with k = 2.5 $\times 10^{-4}$ mol L^{-1} s^{-1} . what are the rates of production of N_2 and H_2 ?

432) A first order reaction 40% complete in 50 minutes. Calculate the value of the rate constant. In what time will the reaction be 80 % complete?

433) For a first order reaction, time taken for half of the reaction to complete is t_1 whereas that for 3/4 th of the reaction to complete id t_2. how are t_1 and t_2 related to each other?

434) If half-life period of a reaction is inversely proiportional to initial concentration of the reactant, what is the order of reaction ?

435) One-fourth of a first order reaction is completed in 32 minutes. What is the half-life period of this reaction ?

436) (a) What are the units of the rate constant of a psudeo unimolecular reaction ?
(b) why hydeolysis of ethyl acetate with NaOH is reaction of second order while with HCl, it is of first order ?

437) The rate constants of a reaction at 500 K and 700 K are kJ/mol. Calculate the values of E_a and A.

438) The activation energy of a reaction is zero. Will the rate constant of the depend upon temperature ? Give reason.

439) (a) Why does the rate of a reaction increase with rise in temperature ?
(b) What is the effect of adding catalyst on the free energy change ($\triangle G$) of a reaction ?

440) Write the Arrhenius equation for the rate constant k_1 and k_2 at temperature T_1 and T_2 in terms of activation energy, E_a

441) What are pseudo-first order reactions? Give one example

442) The reaction:
$SO_2Cl_2 \longrightarrow SO_2 + Cl_2$ is a first order reaction. The half life period of this reaction is 60 minutes. calculate the rate constant of this reaction.

443) How is the rate constant related to the the rate constant?

444) Determine the order of reaction which has the rate expression $Rate = k[A]^{1/2}[B]^1$

445) The rate constant of a reaction is $1.2 \times 10^{-3} L\ mol^{-1}\ s^{-1}$. what is the order of the reaction?

446) For the reaction:
$3H_2(g) + N_2(g) \longrightarrow 2NH_3(g).$
How are the rate of reaction expressions
$\frac{-d[H_2]}{dt} and \frac{d[NH_3]}{dt} interelated?$

447) After five half life periods for a first order reaction what fraction of reactant remains?

448) A substance with initial concentration C_0 follows zero order kinetics. How long will this reaction take to go to completion?

449) For a reaction A $\longrightarrow$ B, the rate of reaction becomes twenty seven times when the concentration of A is increased three ttimes. what is the order of the reaction?

450) How will you distinguish between reaction rate and rate constant of a reaction?

451) Give the important difference between order and molecularity of a reaction.

452) (a) If concentration of A and B are expressed in terms of $mol\ dm^{-3}$ and time in min.
Calculate the units for the rate constant for the following reaction:
$A + B \longrightarrow AB$
(b) What are the units for a zero order reaction? (concentrations are expressed in mol/litre and time in seconds.)

453) Derive a relation for the rate constant of the first order reaction and three-fourth of the reaction to complete

454) What is energy of activation? How is the rate of constant of a reaction related to its activation energy?

455) What do you understand by zero order reaction? give one example.

456) What do you understand by rate determining step in a multistep reaction?

457) Derive an expression fo a half-life period for the first order reaction and show that it is independent of the initial concentration of the reactants

458) What is known as activation energy? how is the activation energy affected by
(i) the use of a catalyst
(ii) a rise in temperature?

459) Derive an expression for the rate constant of a zero order reaction

460) (a) Draw a schematic graph showing how the rate of a first order reaction changes with change in concentration of the reactant
(b) Rate of reaction is given by the equation
$Rate = k[A]^2[B]$. What are the units for the rate and rate constant for this reaction?

461) The kinetics of the reaction
$2NO + 2H_2 \longrightarrow N_2 + 2H_2O$
is explained by the following two steps:
(i) $2NO + H_2 \longrightarrow N_2 + H_2O_2$ (slow)
(ii) $H_2O_2 + H_2 \longrightarrow 2H_2O$ (fast)
what is the predicted rate law?

462) For the reaction:
$2NO_2(g) + F_2 \longrightarrow 2NO_2F_{(g)}$
the following mechanism is suggested:
$NO_2 + F_2 \longrightarrow NO_2F + F\ slow$
$NO_2 + F^2 \longrightarrow NO_2F\ fast$
what is the predicted rate law?

463) Define the following:
(i) Elementary step in a reaction
(ii) Rate of reaction

464) Distinguish between rate expression and rate constant of a reaction.

465) A reaction of second order with respect to a reactant. How is its rate affected if the concentration of the reactants is
(i) doubled
(ii) reduced to half?

466) Write two difference between 'order of reaction' and molecularity of reaction

467) Define rate constant(k).

468) Express the rate of the following reaction in terms of the formation of ammonia:
$N_{2(g)} + 3H_{2(g)} \rightarrow 2NH_{3(g)}$

469) Define rate of reaction

470) What is meant by rate of a reaction? Differentiate between average rate and instantaneous rate of a reaction.

471) If the rate constant of a reaction $k = 3 \times 10^{-4} s^{-1}$ is then identify the order of the reaction.

472) Define the following terms:
(i) Pseudo first order reaction
(ii) Half-life period of a reaction$(t_{1/2})$

473) Explain the following terms:
(i) Rate constant (k)

474) Write two differences between 'order of reaction' and 'molecularity of reaction'.

475) Write units of rate constants for zero order and for the second order reactions if the concentration is expressed $molL^{-1}$ in and time in second.

476) For a reaction: $H_2 + Cl_2 \overset{hv}{\rightarrow} 2HCl$
Rate = k
(i) Write the order and molecularity of this reaction,
(ii) Write the unit of k.

477) On increasing temperature, activation energy of a reaction decreases, why?

478) With the help of a diagram, explain the physical significance of energy of activation (E_a) in chemical reactions.

479) For a reaction R $\rightarrow$ P, half-life ($t_{1/2}$) IS observed to be independent of the initial concentration of reactants. What is the order of reaction?

480) Define rate of reaction. Write two factors that affact the rate of reaction.

481) Identify giving reasons, the reaction order from each of the following rate constants.
$k = 2.3 \times 10^{-5}$ L mol^{-1} s^{-1}
$k = 3.0 \times 10^{-4}$ s^{-1}

482) Discuss any four factors which affect the rate of a chemical reaction.

483) List the factors on which the rate of a chemical reaction depends.

484) Explain the term order of reaction. Derive the unit for first order rate constant.

485) Define the following terms.
(i) Half-life of a reaction ($t_{1/2}$)
(ii) Rate constant (k)

486) Define half-life of a reaction. Write the expression of half-life for
(i) zero order reaction
(ii) first order reaction

487) What are pseudo first order reactions? Give one example of such reactions

488) What is the effect of adding a catalyst on
(a) Activation energy (Ea) and
(b) Gibbs energy (ΔG) of a reaction?

489) Define activation energy.

490) (i) Define the following terms.
(i) Rate constant (k)
(ii) Activation energy (E_a)
(iii) A first order reaction takes 10 min for 25% decomposition. Calculate $t_{1/2}$ for the reaction.
(Given: log 2 = 0.3010, log 3 = 0.4771, log 4 = 0.6021)

491) How does a change in temperature affect the rate of a reaction? How can this effect on the rate constant of a reaction be represented quantitatively?

492) The rate of a reaction becomes four times when the temperature changes from 300 K to 320 K. Calculate the energy of activation of the reaction, assuming that it does not change with temperature. ($R = 8.314$ J $K^{-1}mol^{-1}$)

493) The half life period of two samples are 0.1 and 0.4 seconds. Their initial concentrations are 200 and 50 mol L^{-1} respectively. What is the order of reaction?

494) What is the ratio of $t_{3/4} : t_{1/2}$ for a first order reaction ?

495) Higher molecularity reactions (viz. molecularity, 4 and above) are very rare. Why?

496) Consider the reaction $2A + B \longrightarrow$ Products. When concentration of B alone was doubled, half life time does not change. When conc. of A alone doubled, the rate increases by two times . What are the units of K and what is the order of reaction?

497) The rate of reaction is given by $K = P.Z.e^{-Ea/RT}$. Name the factor which is to be decreased to bring an increase in the rate of reaction.

498) For a second order reaction $2A \longrightarrow$ Product, a plot $t_{1/2}$ vs log a (a = initial conc.), what does the intercept represent?

499) A substance undergoes first order decomposition. The decomposition follows two o parallel first order reaction as
$A \rightarrow B + C$
$k_1 = 1.26 \times 10^{-4}$ s^{-1}
$k_2 = 3.8 \times 10^{-5}$ s^{-1}
Find out the % distribution of B and C.

500) A systematic plot of ln Keq versus 1/T for a reaction has been shown below: Prove that this reaction is exothermic

501) Proposed mechanism for below given reaction :
$2NO + Br_2 \rightarrow 2NOBr$ is as follows
$NO(g) + Br_2(g) \rightarrow NOBr_2(g)$
$NOBr_2(g) + NO(g) \rightarrow 2NOBr(g)$
Find out the order w.r.t. NO (g)

502) The rate for a reaction between the substance A and B is given by Rate = $k[A]^n [B]^m$
On doubling the conc. of A and halving the conc. of B, find out the ratio of new rate to that of earlier rate of reaction.

503) Decomposition of NH_3 (g) on surface of catalyst
$2NH_3 \rightarrow N_2 (g) + 3H_2(g)$
Under low pressure follows first order kinetics while at high pressure it is zero order reaction. Why?

504) In the reversible reaction.
Find out the rate of disappearance of NO_2

505) What is the rate of disappearance of hydrogen in the following reaction?
$3H_2 + N_2 \rightarrow 2NH_3$

506) The rate for the formation of C, for the reaction given below, is 2.2×10^{-3} mol L^{-1} min^{-1}. $2A+B \rightarrow C$ What is the value of d[A] / dt?

507) How is the rate law different from law of mass action?

508) What is the rate for the reaction given below?
$Cl_2(g) + 2NO(g) \rightarrow 2NOCl(g)$

509) How can average and instantaneous rates of a reaction can be determined from the plot of concentration versus time?

510) For a certain reaction, the rate law is, Rate $=k[A] [B]^{3/2}$. Can this belongs to an elementary reaction?

511) Molecularity of any reaction not be equal to zero?

512) What is the order of the reaction which has constant, $k = 3 \times 10^{-4} L\ mol^{-1} s^{-1}$?

513) (i) Distinguish between order and molecularity.
(ii) Why is the probability of reaction with molecularity higher than three, is very rare?

514) Aplot of rate of reaction (Y-axis) versus concentration of reactant (X-axis) gives a line parallel to X-axis . What is the order of reaction?

515) A chemical reaction occurs between reactants A and B but the rate does not depend on the concentration of any of the reactants. Can you predict the order of the reaction?

516) Why does radioactive disintegration follows first order kinetics?

517) What is the order of a reaction that is 50% complete after 2 h and 75% complete after 4 h?

518) Derive integrated rate equation for rate constant of a first order reaction.

519) Why equilibrium constant remain unchanged in the presence of a catalyst?

520) Why a reaction does not have a zero activation energy?

521) (i) Explain why H_2 and O_2 do not react at room temperature.
(ii) Write the rate equation for the reaction, $A_2 + 3B_2 \rightarrow 2C$, if the overall order of the reaction is zero.

522) The rate constant of a reaction is $1.5 \times 10^7\ s^{-1}$ at 50°C and $4.5 \times 10^7\ s^{-1}$ at 100°C. Calculate the value of activation energy, E_a for the reaction. R = 8.314 JK-1 mol^{-1}.

523) Why are ionic reaction usually faster?

524) Under what conditions, a bimolecular reaction is kinetically first order?

525) For a reaction, X + H_2O -- > Y, rate ∝ [X].
What is its
(i) molecularity?
(ii) order of reaction?

526) In what case order of reaction is equal to the sum of the stoichiometric coefficients of reactants in the balanced chemical equation for a reaction

527) Why does the hydrolysis of ethyl acetate being a bimolecular reaction is said to be a first order reaction?

528) What is the value of rate constant at an extremely high temperature? Is this rate constant feasible?

529) If the reaction has the rate constant 1.9 x 10^{-4} atm $^{-1}s^{-1}$ then predict the order of the reaction .

530) If the rate of any reaction is Rate = $k[A]^1[B]^1$ then, what is the order of the reaction?

531) For the reaction, $N_2(g)+3H_2(g) \rightarrow 2NH_3(g)$ under certain conditions of temperature and partial pressure of the reactants, the rate of formation of NH_3 is 0.001 kg h^{-1}. Determine the rate of conversion of H_2 under the same conditions.

532) A substance disintegrated 87.5% in 45 min. What is its half-life?

533) The rate of a reaction is given by rate = $k[N_2O_5]$ In this equation, what does k stand for? What is meant by elementary step in a reaction?

534) One-fourth of reaction is completed in 32 min. What is the half-life period of this reaction? How is half-life period related to initial concentration for a second-order reaction?

535) (i) Illustrate graphically the effect of catalyst on activation energy.
(ii) Catalysts have no effect on the equilibrium constant, why?

536) State the role of activated complex in a reaction and state its relation with activation energy.

537) A+2B → 3C+2D
The rate of disappearance of B is 0.5 x 10^{-3}mol $L^{-1}S^{-1}$ What will be
(i) rate of the reaction?
(ii) rate of change in concentration of A and C?

538) The concentration of R in the reaction; R→ P; was -measured as a function of time and the following data is obtained:

[R] mol L^{-1}	1.0	0.75	0.40	0.10
t (min)	0.0	0.05	0.12	0.18

Determine the order of reaction.

539) For a reaction P → Q, the rate becomes 27 times when concentration of P is tripled. What is the order of the reaction?

540) The rate constant of a reaction of zero order in A is 3.0 x 10^{-3} mol $L^{-1}S^{-1}$. How long will it take for the initial concentration of A to fall from 0.10 M to 0.075 M?

541) For a reaction, X(g) → Y(g) + Z(g) the half-life period is 10 min. In what period of time would the concentration of X be reduced to 10% of original concentration?

542) The half-life period of a first order reaction is 60 min. What percentage will be left after 120 minutes?

543) If time taken for half of the first order reaction to complete is t_1, whereas that for 3/4 th of the reaction to complete is t_2. How are t_1 and t_2, related to each other.

544) The rate of a chemical reaction doubles for every 10°C rise in temperature. If the temperature is raised from 10°to 30°C, what will be the increase in the rate of the reaction?

545) The activation energy of a reaction is 94.14kJ mol $^{-1}$ and the value of rate constant at 298 K is 18 * 10^{-5} S^{-1}. Calculate the frequency factor or pre-exponential factor, A.

546) If the rate constants of a reaction are 1 x 10^3s^{-1} and 2 x 10^3s^{-1} at 27°C and 37°C, respectively. Calculate the activation energy (E_a) of the reaction.

547) In the Arrhenius equation for a certain reaction, the value of A (frequency factor) and E_a (activation energy) are 4 x $10^{13} S^{-1}$ and 98.6 kJ mol^{-1}, respectively. If the reaction is of first order, then find that at what temperature will its half-life period be 10 min?

548) When the temperature of a reaction is raised from 4^0C to 5^0C, the rate of the chemical reactions is doubled. Calculate the E_a. (Given, R = 8.314J mol^{-1} K^{-1})

549) For a reaction, the energy of activation is zero. What is the value of rate constant at 300 K, if k = 1.6 x 10^6 s^{-1} at 280 K?

550) The data given below is for the reaction,
$2N_2O_5(g) \rightarrow 4NO_2(g) + O_2(g)$

S. No.	N_2O_5(mol^{-1})	Rate of disappearance of N_2O_5(mol $L^{-1}min^{-1}$)
1	1.13x 10^{-2}	34 x 10^{-5}
2	0.84x 10^{-2}	25 x 10^{-5}
3	0.62x 10^{-2}	18x 10^{-5}

Determine for this reaction,
(i) Order of reaction
(ii) Rate law
(iii) Rate constant

551) What will be the initial rate of a reaction if its rate constant is $10^{-3}$$min^{-1}$ and the concentration of reactant is 0.2 mol dm^{-3}? How much of the reactant will be converted into products in 200 min?

552) The half-life period and initial concentration for a reaction are as given below. What is the order of reaction?

Initial Concentration (M)	350	540	158
$t_{1/2}$(hr)	425	275	941

553) The decomposition of N_2O_5 according to the equation.
$2N_2O_5(g) \rightarrow 4NO_2(g) + O_2(g)$
is a first order reaction. After 30 min, in a closed vessel, the total pressure is found to be 284.5mm of Hg and on complete decomposition, the total pressure is 584.5 mm of Hg. Then, find the rate constant of the reaction.

554) Give one factor on which rate constant depends?

555) What is the unit 'K' for zero order reaction?

556) Which term is used to express the rate at a particular moment of time?

557) Give another term for rate law.

558) Identify the reaction order of K = 3 x 10^{-4} s^{-1}

559) For which reaction, $t_{1/2}$ is independent of R_o?

560) In Arrhenius equation, $k = Ae^{-Ea/RT}$ what is A?

561) Name the term which is used to define the number of collisions per second per unit volume of reaction mixture.

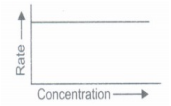
562) Name the order of reaction involved in the decomposition of gaseous ammonia.

563) What will be the units of rate of a reaction in gaseous reactions?

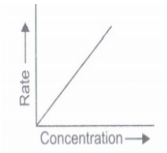
564) What is the difference between law of mass action and rate law?

565) For a reaction, A $\rightarrow$ B, the rate of reaction can be denoted by $-\frac{d[A]}{dt}$ or $+\frac{d[B]}{dt}$. State the significance of plus and minus sign.

566) The graph given below is a plot of the rate of a reaction vs concentration of the reactant. What is the order of the reaction?



567) The graph given below is a plot of the rate of reaction vs concentration of the reactant. What is the order of the reaction?



568) Calculate the overall order of a reaction which has the rate expression
(a) Rate = k $[A]^{1/2}$ $[B]^{3/2}$
(b) Rate = k $[A]^{3/2}$ $[B]^{-1}$

569) For which type of reactions, order and molecularity have same value?

570) In the Arrhenius equation, what does the factor $e^{-Ea / RT}$ corresponds to?

571) Is catalyst alter Gibbs energy ($\triangle$ G) of a chemical reaction

572) Define effective collisions.

573) Define:
(i) Elementary reaction in a process
(ii) Rate of a reaction

574) Define:
(i) Average Rate
(ii) Instantaneous Rate

575) The reaction $2NO_2 + F_2 \rightarrow 2NO_2F$ involves the following steps:
$NO_2 + NO_2 \overset{K}{\rightleftharpoons} N_2O_4(\text{ Fast })$
$N_2O_4 + F_2 \rightarrow 2\,NO_2F$ (Slow)
Write the rate law. Calculate the overall order of the reaction and what is the rate determining step?

576) For a certain chemical reaction variation in concentration [A] vs. time (t) plot is given below:

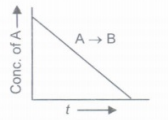
(i) Predict the order of the reaction.
(ii) What does the slope of the line and intercept indicate?
(iii) What is the unit of rate constant indicate?

577) For a reaction
$2H_2O_2 \xrightarrow[\text{alkatine medium}]{I^-} 2H_2O + O_2$
the proposed mechanism is as given below:
$(1)\ H_2O_2 + I^- \rightarrow H_2O + IO^-(\text{slow})$
$(2)\ H_2O_2 + IO^- H_2O + I^- + O_2(\text{ fast })$
(i) Write rate law for the reaction
(ii) write the overall order of reaction
(iii) out of steps (1) and (2), which one is rate determining step.

578) (i) If half life period of a first order reaction is x and $\frac{3}{4}$ th life period of same reaction is y, how are x and y related to each other?
(ii) In some cases, it is found that a large number of colliding molecules have energy more than threshold energy but yet the reaction is slow. Why?

579) Define the following:
(i) Inhibitor
(ii) Activation energy (E_a)

580) For a general reaction A$\rightarrow$ B, plot of concentration of A vs time is given in figure. Answer the following question on the basis of this graph.



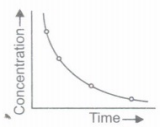
(i) What is the order of the reaction?
(ii) What is the slope of the curve?
(iii) What are the units of rate constant?

581) Give two examples of pseudo first order reaction.

582) Which energy is represented by Maxwell Boltzmann Distribution Curve? Define.

583) What is the unit of second order rate constant?

584) In the reaction A $\rightarrow$ B, if the concentration of A is plotted against time, the nature of the curve obtained will be as shown in figure. What is the order of the reaction?



585) Write the integrated law equation for zero order reaction.

586) Show that in case of a first order reaction, the time taken for completion of 99% reaction is twice the time required for 90% completion of the reaction. (log 10 = 1)

3 Marks 184 x 3 = 552

587) For a first order reaction, show that time required for 99% completion is twice the time required for the completion of 90% of reaction

588) A first order reaction has a rate constant 1.15×10^{-3} s^{-1}. How long will 5 g of this reactant take to reduce to 3 g?

589) The reaction between A and B is first order with respect to A and zero order with respect to B. Fill in the blanks in the following table:

Experiment	**[A]/mol L^{-1}**	**[B]/mol L^{-1}**	**Initial rate in mol L^{-1} min^{-1}**
I	0.1	0.1	2.0×10^{-2}
II	-----	0.2	4.0×10^{-2}
III	0.4	0.4	-----
IV	-----	0.2	2.0×10^{-2}

590) In a reaction between A and B, the initial rate of reaction (r_0) was measured for different initial concentrations of A and B as given below:

A/mol L^{-1}	0.20	0.20	0.40
B/mol L^{-1}	0.30	0.10	0.05
r_0/mol $L^{-1}s^{-1}$	5.07×10^{-5}	5.07×10^{-5}	1.43×10^{-4}

What is the order of reaction with respect to A and B?

591) The rate constants of a reaction at 500 K and 700 K are 0.02 s^{-1} and 0.07 s^{-1} respectively. Calculate the values of E_a and A.

592) The following data were obtained during the first order thermal decomposition of SO_2Cl_2 at a constant volume.
$SO_2Cl_2 \rightarrow SO_2(g)Cl_2(g)$

Experimentq	**Time/s**	**Total pressure/ atm**
1	0	0.5
2	100	0.6

Calculate the rate of the reaction when total pressure is 0.65 atm.

593) The rate of the chemical reaction doubles for an Increase of 10 K from 298 K. Calculate E_a.

594) The activation energy for the reaction, 2 HI (g) $\longrightarrow$ $H_2 + I_2$ (g), is 209.5 kJ mol^{-1} at 581 K. Calculate the fraction of molecules of reactions having energy equal to or grater than activation energy.

595) The rate constant for the decomposition of a hydrocarbon is 2.418 $\times 10^{-5}$ s^{-1} at 546 K. If the energy of activation is 179.9 kJ/mol, what will be value of pre-exponential factor?

596) The first order rate constant for the decomposition of ethyl iodide by the reaction: $C_2H_5I(g) \longrightarrow C_2H_4(g) + HI(g)$ at 600K is 1.60$\times 10^{-5} sec^{-1}$. Its energy of activation is 209 kJ/mol. Calculate the rate constant of the reaction at 700K.

597) For the decomposition of azoisopropane to hexane and nitrogen at 543 K, the following data are obtained :

T (SEC)	P (MM OF HG)
0	35.0
360	54.0
720	63.0

Calculate the rate constant.

598) The decomposition of NH_3 on platinum surface is zero order. What are the rates of production of N_2 and H_2 it k = 2.5 x 10^{-4}mol Ls^{-1}?

599) The decomposition of A into product has value of k as 4.5 × 10^3 s^{-1} at 10°C and energy of activation 60 kJ mol^{-1}. At what temperature would k be 1.5 × $10^4 s^{-1}$?

600) The rate constant for a first order reaction is 60 s^{-1}. How much time will it take to reduce the concentration of the reactant to 1/10^{th} of its initial value?

601) A first order reaction takes 100 minutes for completion of 60% of the reaction. Find the time when 90% of the reaction will be completed.

602) In general it is observed that the rate of chemical reaction doubles with every 10^o rise in temperature. If the generalization holds good for the reaction in the temperature range 295 K to 305 K, what would be the value of activation energy for the this reaction?
(R = 8.314 J mol^{-1} K^{-1})

603) The reaction,
$N_2(g) + O_2(g) \rightleftharpoons 2NO(g)$
Contributes to air pollution whenever a fuel is burnt in air at a high temperature. At 1500 K, equilibrium constant K for it is 1.0 $\times$ 10^{-5}. Suppose in a case $[N_2]$ = 0.80 mol $L^{-1}$and $[O_2]$ = 0.20 mol L^{-1} before any reaction occurs. Calculate the equilibrium concentration of the reactants and the product after the mixture has been heated to 1500 K.

604) Consider than reaction
$2A + B \rightarrow C + D$
Following result were obtained in experiments designed to study the rate of reaction:

Exp. No.	Initial concentration (mol L^{-1})		Initial rate formation
	[A]	[B]	[D] (M/min)
1	0.10	0.10	1.5 $\times$ 10^{-3}
2	0.20	0.20	3.0 $\times$ 10^{-3}
3	0.20	0.40	6.0 $\times$ 10^{-3}

(a) Write the rate law for the reaction.
(b) Calculate the value of rate constant for the reaction
(c) Which of the following possible reaction mechanisms is constant with the rate law found in (a) ?
I. $A + B \rightarrow C + E$ (slow)
$+ E \rightarrow D$ (fast)
II. $B \rightarrow C + E$ (slow)
$A + E \rightarrow F$ (fast)
$A + F \rightarrow D$ (fast)

605) For a decomposition reaction the values of rate constant, k at two different temperatures are given below:
k_1 = 2.15 $\times$ 10^{-8} L mol^{-1} s^{-1} at 650 K
k_2 = 2.39 $\times$ 10^{-7} L mol^{-1} s^{-1} at 700 K
Calculate the value of activation energy for this reaction. (R = 8.314 J K^{-1} mol^{-1})

606) At 300 ^oC the thermal dissociation of HI is found to be 20%. What will be the equilibrium concentrations of H_2 and I_2 in the system
$H_2 + I_2 \rightleftharpoons$ 2HI at this temperature if the equilibrium concentration of HI in it be 0.96 mol L^{-1}?

607) The activation energy of a reaction is 75.24 kj mol^{-1} in the absence of a catalyst and 50.14 kJ mol^{-1} with a catalyst. How many times will the rate of reaction grow in the presence of the catalyst if the reaction proceeds at 25^o C? (R = 8.314 J K^{-1} mol^{-1})

608) The half-life for the decomposition of nitramide is 2.1 hour at 15 ^oC
$NH_2NO_2(aq) \rightarrow N_2O\ (g) + H_2O(l)$
If 6.2 g of NH_2NO_2 is allowed to decompose, calcualte
(i) time taken for NH_2NO_2 to decompose 99%
(ii) volume of N_2O (dry) produced at STP.

609) The half-life for the reaction:
$N_2O_5 \rightarrow 2NO_2 + \frac{1}{2} O_2$ is 2.4 hours at 30 ^oC.
(a) Starting with 100 grams of N_2O_s, how many gram will remain after 9.6 hours?
(b) What time would be required to reduce 5×10^{10} molecules of N_2O_5 to 10^8 molecules?

610) Show that in case of first order reaction, the time required for 99.9% of the reaction to complete is 10 times that required for half of the reaction to take place. [log 2 = 0.301]

611) The first order rate constant for the de-composition of ethyl iodide by the reaction:
$C_2H_sI\ (g) \rightarrow C_2H_4\ (g) + HI\ (g)$ at 600 K is 1.6×10^{-5} s^{-1}. Its energy of activation is 209 $kJmo^{-1}$. Calculate the rate constant of the reaction at 700 k.

612) Express the rate of the following reaction in terms of different reactants and products:$4NH_3(g) + 5O_2(g) \longrightarrow 4NO(g) + 6H_2O(g)$
If the rate of formation of NO is 3.6×10^{-3}mol $L^{-1}s^{-1}$, Calculate
(i) the rate of disappearance of NH_3
(ii) rate of formation of H_2O.

613) The reaction $2N_2O_5(g) \rightleftharpoons 4NO_2(g)+O_2(g)$ was studied in a closed vessel It was found that the concentration of NO increases by 2.0×10^{-2} mol L^{-1} in five seconds. Calculate (i) the rate of reaction (ii) the rate of change of concentration of N_2O_5.

614) For an elementary reaction, $2A + B \longrightarrow 3C$, the rate of appearance of C at time 't' is 1.3×10^{-4} mol L^{-1} s^{-1}. Calculate the
(i) rate of the reaction
(ii) rate of disappearance of A

615) For the decomposition of dinitrogen pentoxide at 200^0C, $N_2O_5(g) \longrightarrow N_2O_5(g) + \frac{1}{2} O_2(g)$ if the initial pressure is 144mm after 25 minutes of the reaction, total pressure of the gaseous mixture is 133mm, calculate the average rate of reaction in (a) atm min^{-1} (b) mol $L^{-1}s^{-1}$

616) Nitrogen dioxide (NO_2)reacts with fluorine(F_2)to form nitryl fuoride(NO_2F)
$2NO_2(g)+F_2(g) \longrightarrow 2NO_2F(g)$
Write the rate of reaction in terms of
(i) rate of formation of NO_2F
(ii) rate of disappearance of NO_2
(iii) rate of disappearance of F_2

617) Express the relationship between the rate of production of water and the rate of disappearance of oxygen in the reaction:$2H_2+O_2 \longrightarrow 2H_2O$

618) For the reaction, $4NH_3(g) + 5O_2(g) \longrightarrow 4NO(g) + 6H_2O(g)$, if the rate expression in terms of disappearance of NH_3 is $-\frac{\Delta[NH_3]}{\Delta t}$, write the rate expression in terms of concentration of O_2 and H_2O.

619) A reaction $2X \longrightarrow Y + 3Z$(e.g., $2NH_3 \longrightarrow N_2+3H_2$) is being carried out in a closed vessel. The rate of disapppearance of X, $-\frac{\Delta[X]}{\Delta t}$ is found to be 0.066 mol $L^{-1}s^{-1}$. Calculate $\frac{\Delta[Y]}{\Delta t}\ and\ \frac{\Delta[Z]}{\Delta t}$

620) A chemical reaction,A$\longrightarrow$ 4B+c, in gas phase occurs in a closed vessel. The concentration of B is found to be increased by 5$\times$ 10^{-3} mol L^{-1} in 10 seconds. Calculate
(i) the rate of appearance of B
(ii) the rate of disappearance of A.

621) A + 2B$\longrightarrow$ 3C + 2D. The rate of disappearance of B is 1$\times$ 10^{-2} mol lit^{-1} sec^{-1}. What will be (i) Rate of the reaction (ii) Rate of change in concentration of A and C?

622) For a homogeneous decomposition of N_2O_5 into NO_2 and O_2,$2N_2O_5(g)\longrightarrow$ $4NO(_2g)$ + $O_2(g)$,rate = $\frac{-\frac{1}{2}\Delta[N_2O_5]}{\Delta t}$ = k[N_2O_5] Find out the order with respect to N_2O_5.

623) The rate law for a reacti0on is found to be: Rate = k[NO^-_2][I^-][H^+]^2 How would the rate of reaction change when
(i) Concentration of H^+ is doubled
(ii) Concentration of I is halved
(iii) Concentration of each of NO_2^-,I^- and H^+ are tripled?

624) NH_3 decomposes as:$2NH_3 \longrightarrow N_2 + 3H_2$ $-\frac{d[NH_3]}{dt} = k_1[NH_3]$,$+\frac{d[N_2]}{dt} = k_2[NH_3]$, $+\frac{d[H-2]}{dt} = k_3[NH_3]$ Derive the ratio between k_1, k_2 and k_3

625) For a reaction,A + B $\longrightarrow$ product, the rate law is given by,r =k[A]$^{1/2}$ [B]^2. What is the order of the reaction?

626) Identify the order from each of the followimg rate constant:
(i) k = 2.3$\times$ 10^{-5} litre mol^{-1} sec^{-1}
(ii) k = 3.1$\times$ 10^{-4} sec^{-1}
(iii) k = 9.3$\times$ 10^{-4} mol $litre^{-1}$ sec^{-1}

627) The rate constant of a reaction is 3$\times$ 10^2h^{-1}. What is the order of the reaction?

628) In the reaction A$\longrightarrow$ B,the value of the rate constant was found to be 1.0$\times$ $10^{-2}mol^{-1}L$ s^{-1}. What is the order of the reaction? How will the catalyst affect the value of the rate constant?

629) The rate of reaction A+B$\longrightarrow$ Product is given by Rate = k[A]$^{1/2}$[B]^2.What are the units of the constant?

630) A reaction is of second order with respect to a reactant. How is the rate of reaction affected if the concentration of the reactant is reduced to that half? What is the unit of rate constant of such a reaction?

631) What are the units of rate constant for zero order and first order reaction?

632) Nitric oxide,NO reacts with oxygen to nitrogen dioxide:2NO(g) + $O_2(g)\longrightarrow$ $2NO_2(g)$ What is the predicted rate law, if the mechnism is:NO + $O_2\overset{k}{\rightleftharpoons}$ NO_3(fast)NO + $NO_3\overset{k_1}{\longrightarrow}$ NO_2 + NO_2(slow).

633) For the chemical reaction 4HBr + $O_2\longrightarrow$ $2H_2O$ + $2Br_2$,Rate = k[HBr][O_2]. What is the probable mechanism of the reaction?

634) For the reaction at 500K,$NO_2(g)$+CO(g)$\longrightarrow$ $CO_2(g)$+NO(g),the proposed mechanism is as below:
(i) NO_2+$NO_2\longrightarrow$ NO+NO_3(slow)
(ii) NO_3+CO$\longrightarrow$ CO_2+NO_2(fast) What is the rate law for the reaction?

635) Nitric oxide reacts with hydrogen to to give nitrogen and water(2NO+$2H_2\longrightarrow$ N_2+$2H_2O$).The kinetics of this reaction is explained by the following steps:
(i) 2NO + $H_2\longrightarrow$ N_2 + H_2O_2(slow)
(ii) H_2 + O_2+$H_2\longrightarrow$ $2H_2O$(fast)

636) The possible mechnism for the reaction: $2H_2$+2NO$\longrightarrow$ N_2+$2H_2O$ is
(i) 2NO$\rightleftharpoons$ N_2O_2
(ii) N_2O_2+$H_2\longrightarrow$ N_2O+H_2O(slow)
(iii) N_2O+$H_2\longrightarrow$ N_2+H_2O(fast). What is
(a) the rate law for the reaction
(b) the order of the reaction?

637) Consider the decomposition of hydrogen peroxide in alkaline medium which is catalysed by iodide ions:$2H_2O_2 \xrightarrow{OH^-} 2H_2O+O_2$
This reaction takes place in two ateps as given below:
Step-I: $H_2O_2+I^- \longrightarrow H_2O+IO^-$ (slow)
Step-II: $H_2O_2+IO^- \longrightarrow H_2O+I^-+O_2$ (fast)
(a) Write the rate law expression and determine the order of reaction w.r.t.H_2O_2
(b) What is the molecularity of each individual step?

638) During the decomposition of a gas on the surface of a solid catalyst,the pressure of the gas at different times was observed to be as follows:

t/s	0	100	200	300
p/Pa	5.00×10^3	4.20×10^3	3.40×10^3	2.60×10^3

Calculate order,rate constantand half-life period of this reaction

639) The decomposition of NH_3 on platinum surface, $2NH_3(g) \xrightarrow{Pt} N_2(g)+3H_2(g)$,is zero order with k = 2.5×10^{-4} mol L^{-1} s^{-1}. What are the rates of production of $N_2$and H_2?

640) The rate constant of a reactio0n of zero order in A is 0.0030 mol L^{-1} s^{-1}. How long will it take for the initial concentration of A to fall from 0.10M to 0.075M?

641) The rate of formation of a dimer in a second order dimerisation reaction is 9.5×10^{-5} mol L^{-1} s^{-1} at 0.01 mol L^{-1} monomer concentration. Calculate the rate constant.

642) The decomposition of N_2O_5 in carbon tetrachloride solution was stuied $N_2O_5(solution) \longrightarrow 2NO_2(solution)+\frac{1}{2} O_2(g)$
The reaction has been found to be first order and rate constant is found to be 4.2×10^{-4}s-1.Calculate the rate of reaction when
(a) $[N_2O_2]$ = 1.25mol L^{-1} and
(b) $[N_2O_5]$ = 0.25mol L_{-1}
(c) What concentration of N_2O_5 would give a rate of 2.4×10^{-3}mol L^{-1} s^{-1}?

643) For the reaction: 2A + B + C $\longrightarrow$ A_2B+C,the rate law has been determined to be Rate = $k[A][B]^2$ with k = 2.0×10^{-6} mol^{-2} L^2 s^{-1}. For this reaction determine the initial rate of the reaction with[A] = 0.1 mol L^{-1},[B] = 0.2mol L^{-1}, [C] = 0.8 mol L^{-1}. Determine the rate after 0.04 mol L^{-1} of A has reacted.

644) The following rate data were obtained at 303K for the following reaction:2A + B $\longrightarrow$ C + D

Experiment	[A]/mol	[B]/mol	Initial rate of fornmation of D/mol L^{-1} min^{-1}
I	0.1	0.1	6.0×10^{-3}
II	0.3	0.2	7.2×10^{-2}
III	0.3	0.4	2.88×10^{-1}
IV	0.4	0.1	2.4×10^{-2}

What is the rate law? What is the order with respect to each reactant and the overall order?Also calculate the rate constant and write its units.

645) For a gaseous reaction $2A+B_2 \longrightarrow 2AB$, the following rate data were obtained at 300K

Rate of disappearance of B_2	**Concentration**	
(mol lit^{-1} min^{-1})	[A]	[B]
(i) 1.8×10^{-3}	0.015	0.15
(ii) 1.08×10^{-2}	0.09	0.15
(iii) 5.4×10^{-3}	0.015	0.45

Calculate the rate constant for the reaction and rate of formation of AB when [A] is 0.02 and $[B_2]$ is 0.04 mol lit^{-1} at 300K.

646) For the reaction $2N_2O_5(g) \longrightarrow 4NO_2(g) + O_2(g)$, the following results have been obtained:

S.No.	$[N_2O_5]$ mol L^{-1}	Rate of disappearance of N_2O_5,mol L^{-1} min^{-1} N_2O_5,mol L^{-1} min^{-1}
1	1.13×10^{-2}	34×10^{-5}
2	0.84×10^{-2}	25×10^{-5}
3	0.62×10^{-2}	18×10^{-5}

(a) Calculate the order of reaction
(b) Write rate law
(c) Calculate rate constant of the reaction

647) For the thermal decomposition of Acetaldehyde,$CH_3CHO(g)\times CH_4(g)+CO(g)$ the following rate data were obtained:

Experiment	Initial Pressure(torr)	Initial rate of increase in total pressure(torr)
1	30	$0.61(r_1)$
2	200	$0.27(r_2)$

Predict of the reaction.

648) The rates of reaction starting with initial concentration of 2×10^{-3}M and 1×10^{-3}M are equal to 2.4×10^{-4}M s^{-1} and 0.60×10^{-4}M s^{-1} respectively. Calculate the order of the reaction with respect to the reactant and also the rate constant.

649) The initial rate of reaction $A+5B+6C \longrightarrow 3L+3M$ has been determined by measuring the rate of disappearance of A under the following condition:

Expt.No	$[A]_0$/M	$[B]_0$/M	$[C]_0$/M	Initial rate/M min^{-1}
1	0.02	0.02	0.02	2.08×10^{-3}
2	0.01	0.02	0.02	1.04×10^{-3}
3	0.02	0.04	0.04	4.16×10^{-3}
40.02	0.02	0.02	0.04	8.32×10^{-3}

Determine the order of reaction with respect to each and overall order of the reaction.What is the rate constant? Calculate the initial rate of change in concentration of B and L

650) The half life period of a substance is 50 minutes at a certain initial concentration. When the concentration is reduced to one half of its initial concentration, the half life period is found to be 25 minutes. Calculate the order of reaction

651) From the following data for the decomposition of NO in carbon tetrachloride solution at 321K, show that the reaction is of the first order and calculate the rate constant.

Time(in minutes):	10	15	20	25	∞
Vol. of O_2 evolved(in cm^3):	6.30	8.95	11.40	13.50	34.75

652) The decomposition of N_2O_5 in CCl_4 solution follows the first order rate law. The concentration of N_2O_5 measured at different intervals are given below:

Time in second (t)	0	80	160	410	600	1130	1720
$[N_2O_5]$mol/L	5.5	5.0	4.8	4.0	3.4	2.4	1.6

Calculate the rate constant at t = 410s and t = 1130s. What do these result show?

653) The following data were reported for the decomposition of N_2O_5 in CCl_4at 303K.

Time(in minutes)	120	160	200	240	∞
Vol. of O_2(in cc)	37.70	45.85	52.67	58.34	84.35

Show that the reaction is if the first order and calculate the rate constant.

654) The rate of decomposition of N_2O_2 in CCl_4 solution has been studied at 318K and the following results have been obtained:

t/time	0	135	342	683	1693
c/M	2.08	1.91	1.67	1.35	0.57

Find the order of the reaction and calculate its rate constant. What is the half-life period?

655) From the following data,show that the decomposition of hydrogen peroxide is a reaction of the first order:

t	0	10	20
x	46.1	29.8	19.3

where t is the time in minutes and x is the volume of standard $KMnO_4$ solution in cm^3 required for titrating the same volume of the reaction mixture.

656) The catalysed decomposition of H_2O_2 in aqueous solution is followed by removing equal volume sample at various time intervals and titrating them with $KMnO_4$ to determine the undecomposed H_2O_2. The results thus obtained are:

Time(second):	0	600	1200
cm^3 of $KMnO_4$:	22.8	13.8	8.2

Show that the reaction is mono-molecular. What is the value of the specific reaction rate?

657) 1.0 ml of ethyl acetate was added to 25ml of N/2 HCl. 2ml of the mixture were withdrawn from time during the progress of the hydrolysis of the ester and titrated against standard NOH solution. The amount of NaOH required for titration at various intervals is given below:

Time(min):	0	20	75	119	183	∞
NaOH(ml):	20.24	.73	25.20	27.60	30.22	43.95

The value at ∞ time was obtained by completing the hydrolysis on boiling. Show that it is a reaction of the first order and find the average value of the velocity constant.

658) Hydrolysis of methyl acetate in aqueous solution has been studied by titrating the liberated acid against sodium hydroxide. The concentration of the ester at different times is given below:

t/min	0	30	60	90
C/mol L^{-1}	0.8500	0.8004	0.7538	0.7096

Show that it follows a pseudo first order reaction as the concentration of H_2O remains nearly constant (55 mol L^{-1}) during the course of the reaction. What is the value k' in this equation?

659) The inversion of cane sugar was studied in 1N HCl at 298K. The following polarimetric were obtained at different intervals of time:

Time(minutes):	0.0	7.18	18.00	27.05	∞
Reading (degree):	+24.09	+21.41	+17.74	+15.00	-10.74

Show that the inversion of cane sugar is a unimolecular reaction.

660) At 373K, the half-life period for the thermal decomposition of N_2O_5 is 4.6 sec and is independent of the initial pressure of N_2O_5. Calculate the specific rate constant at this temperature.

661) A first order reaction is 40% complete in 50 minutes. Calculate the value of the rate constant.In what time will the reaction be 80% complete?

662) Show that in case of a first order reaction, the time required for 99.9% of the reaction to take place is about ten times than that required for half the reaction

663) The reaction,$SO_2Cl_2 \xrightarrow{k_1} SO_2 + Cl_2$, is a first order reaction with $k_1 = 2.2 \times 10^{-5} sec^{-1}$ at 575K.What percentage of SO_2Cl_2 will decomposed in 90minutes when the reaction is carried out at 575K?

664) The initial concentration of NO in the order reaction, $NO(g) \longrightarrow 2NO(g)+1/2O(g)$, was 1.24×10^{-2} mol L^{-1} at 318K. The concentration of NO after 60 minutes was 0.20×10^{-2} mol L^{-1}. Calculate the rate constant of the reaction at 318K.

665) A first order reaction has a specific reaction of 10^{-3} sec^{-1} . How much time will it take for 10g of the reaction to 2.5g? Given log2 = 0.301, log4 = 0.6021, log6 = 0.778.

666) The decomposition of NO(g),i.e., $N_2O_5(g) \longrightarrow 4NO_2(g)+O_2(g)$ is a first order reaction with a rate constant of $5 \times 10^{-2} sec^{-1}$ at 45^0 C. If initial concentration of N_2O_5 is 0.25M, calculate its concentration after 2min. Also calculate half life for the decomposition of $N_2O_5(g)$.

667) The rate constant for an isomerisation reaction, $A \longrightarrow B$ is $4.5 \times 10^{-3} min^{-1}$.If the initial concentration of A is 1M, calculate the rate of reaction after 1h.

668) At 373K,a gaseous reaction $A \longrightarrow 2B+C$ is observed to be of first order. On starting with pure A,it was found that at the end of 10minutes, the total pressure of the system was 176mm of mercury and after a long time,when dissociation of A was complete,it was 270mm. From these data, calculate (i) the initial pressure of A (ii) the pressure of at the end of 10minutes (iii) the rate constant.

669) The decomposition of Cl_2O_7 at 400K in the gas phase to Cl_2 and O_2 is a first order reaction.
(i) After 50 seconds at 400K,the pressure of Cl_2O_7 falls from 0.062 to 0.044 atm. Calculate the rate constant
(ii) Calculate the pressure of Cl_2O_7 after 100 sec of decomposition at this temperature.

670) The rate of a first order reaction is 0.04 mol L^{-1} s^{-1} at 10 minutes and 0.03 mol $L^{-1}s^{-1}$ at 20 minutes after initiayion, Find the half life of the reaction.

671) Time for half change for a first order reaction is 25 minutes.What time will be required for 99% reaction?

672) The half life period of a first order reaction is 25 minutes. What percentage of the reactant will be left behind after 120 minutes?

673) It was found that the solution of cone-sugar in water was hydrolysed to the extent to the extent of 25% in 60 minutes. Calculate the time taken for the sugar to be 50% hydrolysed, assuming that the reaction is of the first order.

674) Decomposition of a gas is of order. It takes 80minutes for 80% of the gas to be decomposed when its initial concentration is $8\times 10\text{-}^{2}$ mole/litre.Calculate the specific rate.

675) Find the two third life($t_{2/3}$) of a first order reaction in which in which k = 5.48×10^{-14} sec^{-1}, (log 3 = 0.4771, log 2 = 0.3010).

676) A first order reaction has rate constant of k=$1.15\times 10^{-3}s^{-1}$.How long will it take for 6g of reactant to reduce to 3g?

677) For a first order reaction,calculate the ratio between the time taken to complete three fourth of the reaction and the time taken to complete half of the reaction.

678) If the rate constant of a first order reaction at a certain temperature is $1.5\times 10^{-1}s^{-1}$ and t_1 and t_2 are the respective times for 50|% and 75% completion of the reaction ,determine the ratio of t_2 to t_1.

679) For a first order reaction,it takes 5 minutes for the initial concentration of 0.6 mol L^{-1} to become 0.4 mol L^{-1}.How long in all will it take for the initial concentration to become 0.3 mol L^{-1}?

680) A first order reaction is 75% complete in 60 minutes.Find the half-life of this reaction.

681) In a reaction,5g ethyl acetate is hydrolysed per litre in the pressure of dill HCl in 300 minutes.If the reaction is of first order and he initial concentration of ethyl acetate is 22g/L,calculate the rate constant of the reaction.

682) In a particular reduction process,the concentration of solution that is initially 0.24M is reduced to 0.12M in 10 hours and 0.06M in 20 hours.What is the rate constant of this reaction?

683) The following rate were obtained for the thermal decomposition of $N_2O_5(g)$
$2N_2O_5(g) \longrightarrow 2N_2O_4(g)+O_2(g)$

Time(sec)	0	50
Total pressure (atm)	0.2	0.25

Calculate the reaction rate when the total pressure is 0.28 atm

684) The half-life period of a first order reaction is 600s.What percent of A remains after 30 minutes?

685) 50% of a reaction is completed in 16 minutes.What fraction of the reaction would occur in 32 minutes?

686) The decomposition of a compound is found to follow a first order rate law.If it takes 15 minutes for 20 percent of original material to react,calculate
(i) specific rate constant
(ii) the time at which 10 percent of the original material remains unreacted,
(iii) the time it takes for the next 20 percent of the reactant left to react after the first 15 minutes.

687) A first order reaction is 15% complete in 20 minutes.How long will it take to be 60% complete.

688) Rate constant of a first order reaction, $A\rightarrow$ Product is $0.016min^{-1}$ .Calculate the time required for 80% of the reaction completed.

689) A first order reaction has a rate of 0.0051 min^{-1}.If we begin with 0.10 M concentration of the reactant,what concentration of the reactant will remains in the solution after 3 hours?

690) A first order reaction has k=1.5×10^{-6} per second at 240^0C.If the reaction is allowed to run for 10hours,what percentage of initial concentrations would have changed to products?What is the half-life period of this reaction?

691) The thermal decomposition of HCO_2 H is a first order reaction with a rate constant of $2.4\times 10^{-3}s^{-1}$ at a certain temperature.Calculate how long will it take for three-fourths of initial quantity of HCO_2H to decompose (log 0.25 = -0.6021)

692) The rate constant of a first order reaction is 60^{-1}.How much time it will take to reduce 75% of its original concentration?

693) The thermal decomposition of a compound is of first order.If 50% of the compound is decomposed in 120 minutes,how long will it take for 9% of the compound to decompose?

694) The following data were obtained during the first thermal decomposition of SO_2Cl_2 at a constant volume

$SO_2Cl_2(g)\longrightarrow SO_2+Cl_2(g)$

Experiment	Time/s	Total Pressure/atm
1	0	0.4
2	100	0.7

Calculate the rate constant.(Given: log 4 = 0.6021, log 2 = 0.3010).

695) The rate constant of a reaction is $1.2\times10^{-3}sec^{-1}$ at 30^0 C and $2.1\times10^{-3}sec^{-1}$ at 40^0 C. Calculate the energy of activation of the reaction.

696) The rate of a particular reaction doubles when temperature changes from 27^oC to 37^0C. Calculate the energy of activation of such a reaction.

697) The activation energy of a reaction is 94.14 kJ mol^{-1} and the value of rate constant at 313K is $1.8\times10^{-1}sec^{-1}$ .Calculate the frequency factor,A.

698) Rate constant k of a reaction varies wi)th temperature according to the equation

log k = constant-$\frac{E_a}{2.303R}\frac{1}{2}$

where E_2 is the energy of activation for the reaction.When a graph is plotted for log k versus 1/T, a straight line with a slope-6670K is obtained. Calculate the energy of activation for this reaction.State the units (R = 8.314 JK^{-1} mol^{-1})

699) The rate constant of a reaction increases by 5% when the temperature of the reaction is increased from 300 to 301K whereas equilibrium constant increases only by 2%. Calculate the activation energy for the forward as well as backward reaction.

700) At 27^0C in the presence of a catalyst, the activation energy of a reaction is lowered by 2kcal. Calculate by how much the rate of reaction will increase?

701) A hydrogenation reaction is carried out at 500K. If the same reaction is carried out in the presence of a catalyst at the same rate, the temperature required is 400K. Calculate the activation energy of the catalyst lowers the activation energy by 20kJ mol^{-1}

702) The rate constants of a reaction are $1\times10^{-3}sec^{-1}$ and $2\times10^{-3}sec^{-1}$ at 27^0C and 37^0 C respectively.Calculate the activation energy of the reaction.

703) The rate of a particular reaction quadruples when the temperature changes from 293K to 313K. Calculate the energy of activation for such a reaction assuming that it does nit change with temperature.

704) The rate of a reaction triples when temperature changes from 50 to 100^0C. Calculate the energy of activation for such a reaction (R = 8.314 J K^{-1} mol^{-1})

705) For a reaction, the energy of activation is zero. What is the value of rate constant at 30K, if k = $1.6\times10^{-6}s^{-1}$ at 280K? [R = 8.31 JK^{-1} mol^{-1}].

706) The activation energy of a first order reaction at 300 K is 60kJ mol^{-1}. In the presence of a catalyst, the activation energy is lowered to 50 kJ mol^{-1} at the same temperature.How many times the rate of reaction will change?

707) Given that the temperature coefficient for saponification of ethyl acetate by NaOH is 1.75. Calculate the activation energy of the reaction.

708) The activation energy of a reaction is 75.2 kJ mol^{-1} in the absence of a catalyst and 50.14 kJ mol^{-1} with a catalyst. How many times will the rate of reaction grow in the presence of the catalyst if the reaction proceeds at 25^0C?(R = 8.314 JK^{-1} mol^{-1})

709) The rate constants of a reaction at 700K and 760K are 0.011 M^{-1} s^{-1} and 0.105 $M^{-1}s^{-1}$ respectively. Calculate the values of Arrhenius parameters.

710) A 1st order reaction is 50% complete in 30minutes at 27^0 C and in 10 min at 47^0C. Calculate
(i) rate constant for the reaction at 27^0C and 47^0C
(ii) energy of activation for the reaction.

711) Two reactions,
(i) A $\longrightarrow$ Products
(ii) B $\longrightarrow$ Products, follow first order kinetics.
The rate of reaction
(i) is doubled when temperature is raised from 300 K to 310 K. The half life for this reaction at 310 K is 30 minutes. At the same temperature, B decomposes twice as fast as A. If the energy of activation for the reaction
(ii) is half that of reaction
(iii), calculate the rate constant of reaction (ii) at 300 K.

712) Ammonia and oxygen react at high temperature as:
$4NH_{3(g)} + 5O_{2(g)} \longrightarrow 4NH_{(g)} + 6H_2O_{(g)}$
In an experiment, rate of formation of NO is $3.6 \times 10^{-3} molL^{-1}s^{-1}$. Calculate
(i) rate of disappearance of ammonia
(ii) rate of formation of water

713) The rate constant of a reaction at 500K and 700K are $0.02\ s^{-1}$ & $0.07\ s^{-1}$ respectively. calculate the value of E_a and A.

714) For a reaction:
$2NH_3(g) \longrightarrow N_2(g) + 3H_2(g) \quad Rate = k$
(i) Write the order and molecularity of this reaction.
(ii) Write the unit of k.

715) The reaction, $2N_2O_5 \rightleftharpoons 4No_2(g) + O_2(g)$ takes place in a closed container. It is found that the concentration of $4NO_2$ increase by $1.6 \times 10^{-2}\ mol\ L^{-1}$ in four seconds. calculate the rate of reaction and rate of change of concentration of N_2O_5

716) For a reaction
$N_2 + 3H_2 \longrightarrow 2NH_3$
the rate of reaction measured as $\frac{\Delta[NH_3]}{\Delta t}$ was found to be $2.4 \times 10^{-4}\ molL^{-1}S^{-1}$. calculate the rate of the reaction expressed in terms of
(i) N_2
(ii) H_2

717) An acidic solution of sugar was hydrolysed to the extent of 57% after 66 minutes. Assuming the reaction to be of first order, calculate the time taken for 75% hydrolysis.

718) Calculate two-third life of a first order reaction having $k = 5.48 \times 10^{-14} s^{-1}$

719) The activation energy of a first order reaction at 300K is $60\ KJ\ mol^{-1}$ In the presence of a catalyst, the activation energy gets lowered to $50\ KJ\ mol^{-1}$ at 300K. How many times the reaction rate changes in the presence of a catalyst at the same temperature?

720) The half life period for a reaction of first order is 2.31×10^3 min. how long will it take for 1/5th of the reactant to be left behind?

721) The rate of a particular reaction triples when temperature changes from 50°C to 100°C. Calculate the activation energy of the reaction.
$log\ 3 = 0.4771,\ R = 8.314\ JK^{-1}mol^{-1}$

722) For a zero-order reaction, starting with initial concentration C_0 , how long will it take for the reaction to go to completion?

723) The $t_{1/2}$ of a reaction is halved as the initial concentration of the reactant is doubled. What is the order of reaction?

724) Ammonia decomposes as:
$2NH_2(g) \longrightarrow N_2(g) + 3H_2(g)$
The rate of reaction can be expressed as:
$\frac{-d[NH_3]}{dt} = k_1\,[NH_3]\,,\ \frac{-d[NH_3]}{dt} = k_2\,[NH_3]\ and\ \frac{-d[NH_3]}{dt} = k_3\,[NH_3]$
Derive relationship between k_1,k_2,k_3.

725) For a reversible reaction
$H_2(g) + I_2(g) \rightleftharpoons 2HI$
derive an expression for the formation of HI

726) Two reaction of the same order have equal pre-exponential factors but their activation energies differ by $24.9\ KJ\ mol^{-1}$. Calculate the ratio between the rate constants of these reactions at 27°C (Gas constant, $R = 8.3\ JK^{-1}mol^{-1}$)

727) Deepak's mother was trying again and again to burn a big lump of coal. But it was not catching fire easily. Deepak suggested to his mother to break the big li lnmp of coal into small pieces and then burn it. HIs mother did so she was happy to find that the coal pieces started burning rapidly.
Now answer the following questions:
(i) Why do small pieces of coal burn rapidly while a big lump of coal burns very slowly?
(ii) What was the idea behind deepak's suggestion?
(iii) What values are associated with deepak's suggesstion?

728) Differentiate between order and molecularity of a reaction.

729) Define pseudo first order reaction and give example.

730) For the first order thermal decomposition reaction, the following data were obtained:
$C_2H_5Cl_{(g)} \rightarrow C_2H_4(g) + HCl(g)$

Time/sec	Total pressure/atm
0	0.30
300	0.50

Calculate the rate constant.
(Given: log 2 = 0.3010, log 3 = 0.4771, log 4 = 0.6021)

731) Rate constant k for a first order reaction has been found to be 2.54 x 10, sec^{-1}. Calculate its 3/4th $^{-3}$, sec^{-1} Calculate its 3/4 th life. (log 4 = 0.6020)

732) A first order gas phase reaction:
$A_2B_{2(g)} \rightarrow 2A_{(g)} + 2B_{(g)}$ at the temperature 400°C has the rate constant $k = 2.0 \times 10^{-4} sec^{-1}$.
What percentage of A_2B_2 is decomposed on heating for 900 seconds ?
[Antilog 0.0781 = 1.197]

733) The rate of a reaction becomes four times when the temperature changes from 293 K to 313 K. Calculate the energy of activation (E_a) of the reaction assuming that it does not change with temperature.
[R = 8.314 JK^{-1} mol^{-1}, log 4 = 0.6021]

734) The rate of most reactions becomes double when their temperature is raised from 298 K to 308 K. Calculate their activation energy.

735) If one percent of the reactant decomposed in first order reaction, in one minute calculate how much reactant would remain undecomposed after one hour.

736) For the reaction,
$2NO(g)+Cl_2(g) \rightarrow 2NOCl(g)$
The following data were collected. All the measurements were taken at 263 K.

Exp. No.	Initial [NO] (M)	Initial $[Cl_2]$(M)	Initial rate of disappearance of Cl_2 (M/min)
1.	0.15	0.15	0.60
2.	0.15	0.30	1.20
3.	0.30	0.15	2.40
4.	0.25	0.25	?

(i) Write the expression for rate law.
(ii) Calculate the value of rate constant and specify its unit.
(iii) What is the initial rate of disappearance of Cl_2 in experiment 4?

737) A first order reaction takes 20 minutes for 25% decomposition. Calculate the time when 75% of the reaction will be completed.
Given: log 2 = 0.3010, log 3 = 0.4771, log 4 = 0.6021

738) Following data are obtained for the reaction:
$N_2O_5 \rightarrow 2NO_2+1/2O_2$

t/s	0	300	600
$[N_2O_5]/moL^{-1}$	1.6×10^{-2}	0.8×10^{-2}	0.4×10^{-2}

Show that it follows first order reaction.
(b) Calculate the half-life. (Given: log 2= 0.3010 ,log 4= 0.6021)

739) The half-life for a first order reaction is 5×10^4s. What percentage of the initial reactant will react in 2 h?

740) A first order reaction is 20% completed in 5 min. Calculate the time taken for the reaction to be 60% complete.

741) Rate constant 'k' of a reaction varies with temperature 'T' according to the equation
$logk = logA - \frac{E_a}{2.303R}\left(\frac{1}{T}\right)$ where E_a is the activation energy. When a graph is plotted for log k vs, 1/T, a straight line with a slope of - 4250 K is obtained. Calculate 'E_a' for the reaction. (R = 8.314 $K^{-1}mol^{-1}$).

742) The decomposition of phosphine,
$4PH_3(g) \rightarrow P_4(g)+6H_2(g)$
has the rate law, rate = k $[PH_3]$
The rate constant is 6.0×10^{-4} s^{-1} at 300 K and activation energy is 3.05×10^5 J mol^{-1} Calculate the value of rate constant at 310 K
(Given, R = 8.314 $JK^{-1}mol^{-1}$).

743) For the reaction, the energy of activation is 75KJ / mol. When a catalyst is added the reaction its energy of activation is lowered to 20KJ / mol. What is the effect of catalyst on the rate of reaction at 20^0C.

744) The gas phase decomposition of CH_3OCH_3 follows first order kinetics
$CH_3OCH_3 \rightarrow CH_4(g) + H_2(g) + CO(g)$
The reaction is carried out in a constant volume container at 500^0 C and has $t_{1/2}$ = 14.5 min. Initially only dimethyl ether is present at a pressure of 0.40 atm. What is the total pressure of the system after 12 min? Assume ideal behavior.

745) A heterogenous reaction is carried out at 500 K. If the same reaction is carried out in the presence of catalyst at the same rate, the temperature requires is 400 K, calculate the activation energy of the reaction if the catalyst lowers the activation barrier by 20 KJ/mol.

746) 50% of the original amount of a reactant was added to the reaction mixture after 40 min. What % of the total amount will be present after 60 min, given that half life period of the reaction is 20 min.

747) The half-life period of a radioactive element is 140 days. After 650 days, what amount of 1g of the element will be reduced?

748) A first order reaction is 50%completed in 40 minutes at 300 K and in 20 minutes at 320 K. Calculate the activation energy of the reaction. (Given: log 2 = 0.3010, log 4 = 0.6021, R = 8.314J $K^{-1}mol^{-1}$)

749) Half - life of a first order reaction is 8×10^4s . What percentage of the initial reactant will react in 2 h?

750) The rate of first order reaction is 0.04 mol $L^{-1}s^{-1}$ at 10 min and 0.03 mol $L^{-1}s^{-1}$ at 20 min after initiation. Thus, find the half-life of the reaction.

751) The rate constant of a certain reaction is given by
logk = 6.8 -213/ T + 5.7 logT
Calculate E_a at 127^0C.

752) The activation energy of a first order reaction is 187.06 kJ mol^{-1} at 750 K and the value of pre -exponential factor, A is 1.97×10^{12} S^{-1} Calculate the rate constant and half-life. (Given: $e^{-30} = 9.35 \times 10^{-14}$)

753) For a reaction, P→Q, the rate becomes 8 times when concentration of P is doubled. What is the order of the reaction?

754) The decomposition of NH_3 on platinum surface is zero order reaction. If rate constant (k) is 4×10^{-3} Ms^{-1} , how long will it take to reduce the initial concentration of NH_3 from 0.1 M to 0.064 M.

755) (a) For a reaction A + B→P, the rate is given by Rate = k[A] $[B]^2$
(i) How is the rate of reaction affected if the concentration of 'B' is doubled?
(ii) What is the overall order of reaction if 'A' is present in large excess?
(b) A first order reaction takes 23.1 minutes for 50% completion. Calculate the time required for 75% completion of this reaction. log 2 = 0.301 log 3 = 0.4771, log 4 = 0.6021.

756) Calculate the rate constant at 400 K for the following reaction:
$2N_2O_5 \rightleftharpoons 4NO_2 + O_2$
Arrhenius factor is 4.3×10^{10} S^{-1} and activation energy is 103.344 kJ mol^{-1}.

757) The rate constant of a reaction quadruples when the temperature changes from 300 K to 320 K. Calculate the activation energy for this reaction.
[log 2 = 0.30, log 4 = 0.60, 2.303 × R = 19.15 JK^{-1} mol^{-1}]

758) A first order reaction takes 40 min for 75% decomposition. Calculate rate constant. [Given: log 2 =0.30, log 4 =0.60]

759) The rate constant of a reaction quadruples when the temperature changes from 700 K to 720 K. Calculate the activation energy for this reaction. [log 2 =0.30, log 4 = 0.60, 2.303 R = 19.15 JK^{-1} mol^{-1}]

760) For a reaction the rate law expression is represented as follows: Rate = k[A][B]/2
(i) Interpret whether the reaction is elementary or complex. Give reason to support your answer.
(ii) Write the units of rate constant for this reaction, if concentration of A and B is expressed in moles/L.2021

761) The following results have been obtained during kinetic studies of the reaction, 2A + B⟶ C + D

Experiment	[A]/mol	[B]/mol	Initial rate of fornmation of D/mol L^{-1} min^{-1}
I	0.1	0.1	6.0×10^{-3}
II	0.3	0.2	7.2×10^{-2}
III	0.3	0.4	2.88×10^{-1}
IV	0.4	0.1	2.4×10^{-2}

Determine rate law and the rate constant for the reaction.

762) The following results have been obtained during the kinetic studies of the reaction
$P + 2Q \longrightarrow R + 2S$

Experiment	Initial P [A]/mol	Initial Q [B]/mol	Initial rate of fornmation of R (M min^{-1}
I	0.10	0.10	3.0×10^{-4}
II	0.30	0.30	9.0×10^{-4}
III	0.10	0.30	3.0×10^{-4}
IV	0.20	0.30	6.0×10^{-4}

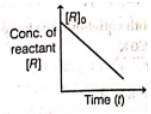
Determine the rate law expression for the reaction.

763) Define order of reaction. Write the condition under which a bimolecular reaction follows first order kinetics.

764) Write the slope value obtained in the plot of log $[R_o]/R$ vstime for a first order reaction.

765) (i) The conversion of molecule A to B followed second order kinetics. If concentration of A increased to three times, how will it affect the rate of formation of B?
(ii) Define Pseudo first order reaction with an example.

766) A reaction, reactant productis represented by (the graph)



(i) Predict the order of the reaction in this case.
(ii) What does the slope of the graph represent?
Write the unit of the represented quantity.

767) The C-14 content of an ancient piece of wood was found to have three tenths of that in living trees. How old is that piece of wood?
(log3 = 0.4771, log7 = 0.8540, half-life of C-14 = 5730 years)

768) The following data were obtained during the first order thermal decomposition of C_2H_5Cl at a constant volume.
$C_2H_5Cl_{(g)} \rightarrow C_2H_4(g) + HCl(g)$

Time/sec	Total pressure/atm
0	0.4
100	0.6

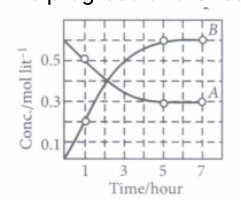
Calculate the rate constant.
(Given: log 2 = 0.3010, log 3 = 0.4771, log 4 = 0.6021)

769) i) A first order reaction is 50% complete in 30 minutes at 300 Kand in 10 minutes at 320 K. Calculate activation energy (E_a)for the reaction.(R =8.314 JK- mol^{-1})
(ii) Write the two conditions for collisions to be effective collisions.
(iii) How order of reaction and molecularity differ towards a complex reaction?
(Given: log 2 = 0.3010, log 3 = 0.4771, log 4 = 0.6021)

770) When the temperature changes from 27°C to 37°C, the rate of the chemical reactions isn doubles. Calculate the energy of activation for the reaction.
(Given, R = 8.314 JK^{-1} mol^{-1} log 2 = 0.3010, log 3 = 0.4771, log 4 = 0.6021)

Case Study Questions 14 x 4 = 56

771) **Read the passage given below and answer the following questions :**
The progress of the reaction, $A \rightleftharpoons nB$ with time is represented in the following figure.



The following questions are multiple choice questions. Choose the most appropriate answer:
(i) What is the value of n?
(a) 1 (b) 2 (c) 3 (d) 4
(ii) Find the-value of the equilibrium constant
(a) 0.6 M (b) 1.2M (c) 0.3M (d) 2.4M
(iii) The initial rate of conversion of A will be
(a) 0.1 mol L^{-1} hr^{-1} (b) 0.2 mol L^{-1} hr^{-1} (c) 0.4 mol L^{-1} hr^{-1} (d) 0.8 mol L^{-1} hr^{-1}
(iv) For the reaction, if $\frac{d[B]}{dt} = 2 \times 10^{-4}$, value of $-\frac{d[A]}{dt}$ will be
(a) 2 x 10^{-4} (b) 10^{-4} (c) 4 x 10^{-4} (d) 0.5 x 10^{-4}

772) **Read the passage given below and answer the following questions:**

For the reaction: $2NO_{(g)} + Cl_{2(g)} \rightarrow 2NOCl_{(g)}$, the following data were collected. All the measurements were taken at 263 K.

Experiment No.	Initial [NO] (M)	Initial [Cl_2] (M)	Initial rate of disapp. of Cl_2 (M/min)
1.	0.15	0.15	0.60
2.`	0.15	0.30	1.20
3.	0.30`	0.15	2.40
4	0.25	0.25	?

The following questions are multiple choice questions. Choose the most appropriate answer:

(i) The molecularity of the reaction is

(a) 1 (b) 2 (c) 3 (d) 4

(ii) The expression for rate law is

(a) r = k[NO][Cl_2] (b) r = k[NO]^2[Cl_2] (c)) r = k[NO][Cl_2]^2 (d) r = k[NO]^2[Cl_2]^2

(iii) The overall order of the reaction is

(a) 2 (b) 0 (c) 1 (d) 3

(iv) The value of rate constant is

(a) 150.32 M^{-2} min^{-1} (b) 200.08 M^{-1} min^{-1} (c) 177.77 M^{-2} min^{-1} (d) 155.75 M^{-1} min^{-1}

773) **Read the passage given below and answer the following questions:**

A reaction is said to be of the first order if the rate of the reaction depends upon one concentration term only. For a first order reaction of the type A $\rightarrow$ Products, the rate of the reaction is given as : rate = k[A]. The differential rate law is given as $\frac{dA}{dt} = -k[A]$ .The integrated rate law : ln $\frac{[A]}{[A]_0} = -kt$ where [A] is the concentration of reactant left at time t and $[A]_o$ is the initial concentration of the reactant, k is the rate constant.

The following questions are multiple choice questions. Choose the most appropriate answer :

(i) The unit of rate constant for a first order reaction is

(a) s^{-1} (b) mol L^{-1} s^{-1} (c) L mol^{-1} s^{-1} (d) L^2 mol^{-2} s^{-1}

(ii) Half-life period of a first order reaction is 10 min. Starting with initial concentration 12 M, the rate after 20 min is

(a) 0.693 x 3 M min^{-1} (b) 0.0693 x 4 M min^{-1} (c) 0.0693 M min^{-1} (d) 0.0693 x 3 M min^{-1}

(iii) For a first order reaction, (A) $\rightarrow$ products, the concentration of A changes from 0.1 M to 0.025 M in 40 minutes. The rate of reaction when the concentration of A is 0.01 M, is

(a) 3.47 x 10^{-4} M/min (b) 3.47 x 10^{-5} M/min (c) 1.73 x 10^{-4} M/min (d) 1.73 x 10^{-5} M/min

(iv) The half-life period of a 1st order reaction is 60 minutes. What percentage will be left over after 240 minutes?

(a) 6.25% (b) 4.25% (c) 5% (d) 6%

774) **Read the passage given below and answer the following questions :**

Number of molecules which must collide simultaneously to give product is called molecularity. It is equal to sum of coefficients of reactants present in stoichiometric chemical equation. For reaction,

$m_1A + m_2B \rightarrow \text{ Product}$

Molecularity = [m_1 + m_2]

In complex reaction each step has its own molecularity which is equal to the sum of coefficients of reactants present in a particular step. Molecularity is a theoretical property. Its value is any whole number.

Number of concentration terms on which rate of reaction depends is called order of reaction or sum of powers of concentration terms present in the rate equation is called order of reaction.

If rate equation of reaction is : Rate = $k \cdot C_A^{m_1} \cdot C_B^{m_2}$

Then order of reaction = m_1 + m_2

In simple reaction, order and molecularity are same. In complex reaction, order of slowest step is the order of over all reaction. This step is known as rate determining step. Order is an experimental property. Its value may be zero, fractional or negative.

The following questions are multiple choice questions. Choose the most appropriate answer:

(i) Higher order (> 3) reactions are rare due to

(a) shifting of equilibrium towards reactants due to elastic collisions

(b) loss of active species on collision

(c) low probability of simultaneous collision of all the reacting species

(d) increase in entropy and activation energy as more molecules are involved

(ii) The molecularity of the reaction:

$6\text{FeSO}_4 + 3\text{H}_2\text{SO}_4 + \text{KClO}_3 \rightarrow \text{KCl} + 3\text{Fe}_2(\text{SO}_4)_3 + 3\text{H}_2\text{O}$ is

(a) 6 **(b) 3** **(c) 10** **(d) 7**

(iii) Which of the following statements is false in the following?

(a) Order of a reaction may be even zero

(b) Molecularity of a reaction is always a whole number.

(c) Molecularity and order always have same values for a reaction.

(d) Order of a reaction depends upon the mechanism of the reaction.

(iv) The rate of the reaction $A + B + C \rightarrow \text{ products}$, is given by

$r = -\frac{d[A]}{dt} = k[A]^{1/2}[B]^{1/3}[C]^{1/4}$,The order of the reaction is

(a) $\frac{1}{3}$ **(b)** $\frac{1}{4}$ **(c)** $\frac{1}{2}$ **(d)** $\frac{13}{12}$

775) **Read the passage given below and answer the following questions :**

In a reaction, the rates of disappearance of different reactants or rates of formation of different products may not be equal but rate of reaction at any instant of time has the same value expressed in terms of any reactant or product. Further, the rate of reaction may not depend upon the stoichiometric coefficients of the balanced chemical equation. The exact powers of molar concentrations of reactants on which rate depends are found experimentally and expressed in terms of 'order of reaction'. Each reaction has a characteristic rate constant depends upon temperature. The units of the rate constant depend upon the order of reaction.

The following questions are multiple choice questions. Choose the most appropriate answer :

(i) The rate constant of a reaction is found to be 3 x 10^{-3} mol^{-2} L^2 sec^{-1}.The order of the reaction is

(a) 0.5 **(b) 2** **(c) 3** **(d) 1**

(ii) In the reaction $A + 3B \rightarrow 2C$,the rate of formation of C is

(a) the same as rate of consumption of A

(b) the same as the rate of consumption of B

(c) twice the rate of consumption of A

(d) 3/2 times the rate of consumption of B.

(iii) Rate of a reaction can be expressed by following rate expression, Rate = $k[A]^2$ [B], if concentration of A is increased by 3 times and concentration of B is increased by 2 times, how many times rate of reaction increases?

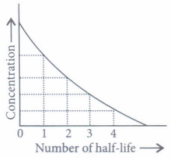
(a) 9 times **(b) 27 times** **(c) 18 times** **(d) 8 times**

(iv) The rate of a certain reaction is given by,rate = $k[H^+]^n$. The rate increases 100 times when the pH changes from 3 to 1. The order (n) of the reaction is

(a) 2 **(b) 0** **(c) 1** **(d) 1.5**

776) **Read the passage given below and answer the following questions :**

The half-life of a reaction is the time required for the concentration of reactant to decrease by half, i.e.,



$[A]_t = \frac{1}{2}[A]$

For first order reaction,

$t_{1/2} = \frac{0.693}{k}$ this means $t_{1/2}$ is independent of initial concentration. Figure shows that typical variation of concentration of reactant exhibiting first order kinetics. It may be noted that though the major portion of the first order kinetics may be over in a finite time, but the reaction will never cease as the concentration of reactant will be zero only at infinite time

The following questions are multiple choice questions. Choose the most appropriate answer:

(i) A first order reaction has a rate constant k = 3.01 x 10^{-3} is. How long it will take to decompose half of the reactant?

(a) 2.303 s (b) 23.03 s (c) 230.3 s (d) 2303 s

(ii) The rate constant for a first order reaction is 7.0x 10^{-4} s^{-1}. If initial concentration of reactant is 0.080 M, what is the half life of reaction?

(a) 990 s (b) 79.2 s (c) 12375 s (d) 10.10 x 10^{-4} s

(iii) For the half-life period of a first order reaction, which one of the following statements is generally false?

(a) It is independent of initial concentration. **(b) It is independent of temperature.**

(c) It decreases with the introduction of a catalyst **(d) None of these**

(iv) The rate of a first order reaction is 0.04 mol L^{-1} s^{-1} at 10 minutes and 0.03 mol L^{-1} s^{-1} at 20 minutes after initiation. The half-life of the reaction is

(a) 4.408 min (b) 44.086 min (c) 24.086 min (d) 2.408 min

777) **Read the passage given below and answer the following questions :**

The following reaction, $A_{(g)} \xrightarrow{\Delta} P_{(g)} + Q_{(g)} + R_{(g)}$ follows first order kinetics. The half-life period of this reaction is 69.3 s at 500°C. The gas A is enclosed in a container at 500°C and at a pressure of 0.4 atm

The following questions are multiple choice questions. Choose the most appropriate answer:

(i) The rat constant for the reaction is

(a) 0.4 s^{-1} (b) 0.02 s^{-1} (c) 0.01 s^{-1} (d) 0.3 s^{-1}

(ii) The total pressure of the system after 230 s will be

(a) 2.15 atm (b) 1.12 atm (c) 0.4 atm (d) 3.08 atm

(iii) The plot of ln[A] vs t will be

(a) linear with slope = k **(b) linear with intercept = $\ln[A]_o$**

(c) linear with slope = $\ln[A]_o$ **(d) linear with intercept = $[A]_0$**

(iv) Which of the following is not an example of first order reaction?

(a) $C_2H_{4(g)} + H_{2(g)} \rightarrow C_2H_{6(g)}$ **(b)** $2\ N_2O_{5(g)} \rightarrow 4NO_{2(g)} + O_{2(g)}$

(c) $2NH_{3(g)} \xrightarrow[\Delta]{Pt} N_{2(g)} + 3H_{2(g)}$ **(d)** $2\ N_2O_{(g)} \xrightarrow{\Delta} 2\ N_{2(g)} + O_{2(g)}$

778) **Read the passage given below and answer the following questions:**

A reaction in which rate of reaction is independent of concentration of the reactants is called zero order reaction. Photochemical combination of hydrogen and chlorine to give hydrogen chloride is an example of zero order reaction. The rate constant of a zero order reaction is equal to the rate of reaction. The half life period of a zero order reaction is directly proportional to initial concentration of the reactant. For a zero order reaction,

$k = \frac{1}{t}\{[A]_0 - [A]\}$

In these questions (i-iv), a statement of assertion followed by a statement of reason is given. Choose the correct answer out of the following choices.

(a) Assertion and reason both are correct statements and reason is correct explanation for assertion

(b) Assertion and reason both are correct statements but reason is not correct explanation for assertion.

(c) Assertion is correct statement but reason is wrong statement.

(d) Assertion is wrong statement but reason is correct statement

(i) **Assertion :** For a zero order reaction, plot of rate vs concentration will be a straight line parallel to concentration axis.

Reason : For a zero order reaction, rate is independent of concentration.

(ii) **Assertion :** Photochemical combination of hydrogen and chlorine to give hydrogen chloride is an example of zero order reaction.

Reason : The rate of reaction depends on the concentration of hydrogen and independent of concentration of chlorine.

(iii) **Assertion :** If in a zero order reaction, the concentration of the reactant is doubled, the half-life period is also doubled.

Reason : For a zero order reaction, the rate of reaction is independent of initial concentration

(iv) **Assertion :** In a reaction A -7 products, the concentration of the reactant is reduced to zero after a finite time.

Reason : The order of reaction is zero.

779) **Read the passage given below and answer the following questions :**

Decrease in concentration of reactant or increase in concentration of product per unit time is called rate of reaction. It is of two types:

(i) Instantaneous rate of reaction : Rate of change of concentration of reactant or product at a particular time is called instantaneous rate of reaction.

$r_{\text{inst.}} = \frac{dC}{dt}$

where, dC = infinitely small change in concentration

dt = infinitely small change in time.

(ii) Average rate of reaction: Ratio of change in concentration and time required for the change is average rate of reaction.

$r_{av} = \frac{\Delta x}{\Delta t} = \frac{\text{Change in concentration}}{\text{Time required for the change}}$

For a reaction of the type, $m_1A + m_2B \rightarrow n_1C + n_2D$

Rate of reaction is given as

$-\frac{1}{m_1}\frac{d[A]}{dt} = -\frac{1}{m_2}\frac{d[B]}{dt} = +\frac{1}{n_1}\frac{d[C]}{dt} = +\frac{1}{n_2}\frac{d[D]}{dt}$

In these questions (i-iv), a statement of assertion followed by a statement of reason is given. Choose the correct answer out of the following choices.

(a) Assertion and reason both are correct statements and reason is correct explanation for assertion

(b) Assertion and reason both are correct statements but reason is not correct explanation for assertion

(c) Assertion is correct statement but reason is wrong statement.

(d) Assertion is wrong statement but reason is correct statement.

(i) **Assertion :** The kinetics of the reaction,$mA + nB + pC \rightarrow m'X + n'Y + p'Z$ obey the rate expression as $\frac{dx}{dt} = k[A]^m[B]^n$.

Reason : The rate of the reaction does not depend upon the concentration of C.

(ii) **Assertion:** Instantaneous rate of reaction is equal to dx/ dt.

Reason : It is the rate of reaction at any particular instant of time.

(iii) **Assertion :** For the reaction,$R\text{Cl} + \text{NaOH} \rightarrow \text{ROH} + \text{NaCl}$ the rate of reaction is reduced to half on reducing the concentration of RCl to half.

Reason : The sate of reaction is represented by k[RCl].

(iv) **Assertion :** In rate law, unlike in the expression for equilibrium constants, the exponents for concentrations do not necessarily match the stoichiometric coefficients.

Reason: It is the mechanism and not the balanced chemical equation for the overall change that governs the reaction rate.

780) **Read the passage given below and answer the following questions :**

For a first order reaction $A \rightarrow \text{ Products}, k = \frac{2.303}{t} \log \frac{a}{a-x}$ were a is the initial concentration of A and (a-x) is the concentration of A after time t. k is rate constant. Its value is constant at constant temperature for a reaction. The time in which half of the reactant is consumed is called half-life period. Half-life period of a first order reaction is constant. Its value is independent of initial concentration or any other external conditions.

In these questions (i-iv), a statement of assertion followed by a statement of reason is given. Choose the correct answer out of the following choices.

(i) **Assertion :** Rate of reaction doubles when concentration of reactant is doubled if it is a first order reaction.

Reason : Rate constant also doubles,

(a) Assertion and reason both are correct statements and reason is correct explanation for assertion.

(b) Assertion and reason both are correct statements but reason is not correct explanation for assertion

(c) Assertion is correct statement but reason is wrong statement

(d) Assertion is wrong statement but reason is correct statement.

(ii) **Assertion :** Hydrolysis of ethyl acetate in presence of acid is a reaction of first order whereas in presence of alkali, it is a reaction of second order.

Reason : Acid only acts as a catalyst whereas alkali acts as one of the reactants.

(a) Assertion and reason both are correct statements and reason is correct explanation for assertion.

(b) Assertion and reason both are correct statements but reason is not correct explanation for assertion

(c) Assertion is correct statement but reason is wrong statement

(d) Assertion is wrong statement but reason is correct statement.

(iii) **Assertion :** For a first -order reaction, the concentration of the reactant decreases exponentially with time.

Reason : Rate of reaction at any time depends upon the concentration of the reactant at that time.

(a) Assertion and reason both are correct statements and reason is correct explanation for assertion.

(b) Assertion and reason both are correct statements but reason is not correct explanation for assertion

(c) Assertion is correct statement but reason is wrong statement

(d) Assertion is wrong statement but reason is correct statement.

(iv) **Assertion :** Half-life period for a first order reaction is independent of initial concentration of the reactant.

Reason : For a first order reaction, $t_{1/2} = \frac{0.693}{k}$, where k is rate constant.

(a) Assertion and reason both are correct statements and reason is correct explanation for assertion.

(b) Assertion and reason both are correct statements but reason is not correct explanation for assertion

(c) Assertion is correct statement but reason is wrong statement

(d) Assertion is wrong statement but reason is correct statement.

781) Chemical kinetics deals with rate of chemical reactions, how fast reactants get used up or how fast products are formed in the reaction. Differed chemical reactions have different speed. Rate of reaction depends upon concentration of reactants, temperature, pressure especially in gaseous reactions and presence of catalyst. Chemical reaction takes place as a results of collision between reacting molecules. The rate of reaction does not depend upon total number of coUisions rather it depends upon number of effective coUisions. In a redox reaction, if $\mathbf{E}^{\circ}_{\text{cell}} \text{ is } + \mathbf{ve}, \Delta \mathbf{G}^{\circ}$ will be -ve and 'K' equilibrium constant will be high i.e. products formed will be more than the reactants.

(a) k (The rate constant), (Activation Energy) Ea and 'A' (Arrhenius constant) are 3 x 10^{-4} s^{-1}, 104.4 k.J mol^{-1} and 6.0 x 10^{14} S^{-1} respectively. What is value of 'k' when T $\mathbf{T} \rightarrow \infty$?

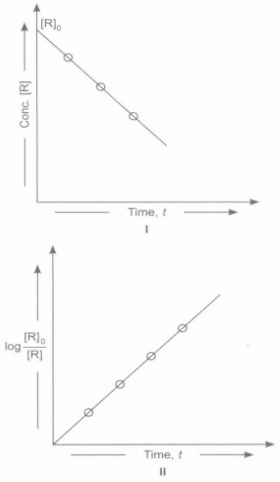
(b) What is meant by activation energy?

(c) What does $e^{Ea/RT}$ represent?

(d) If $Fe^{3+} + 2I^{-} \rightarrow Fe^{2+} + I_2$ has E^{o} = 0.24V, what is the value of log K? What does value of 'K' indicate?

(e) What type of molecules undergo effective collisions?

782) Observe the following graphs and answer the questions based on these graphs.



(a) What is order of reaction shown in graph I?
(b) What is slope in graph II?
(c) How does $t_{1/2}$ varies with initial concentration in zero order reaction.
(d) If $t_{1/2}$ of first order reaction is 40 minute, what will be $t_{99.9\%}$ for first order reaction?
(e) What is $t_{1/2}$ of zero order reaction in terms of 'k'?

783) Observe the table given' showing volume of CO_2 obtained by reaction of $CaCO_3$ and dilute HCl after every minute. Answer the questions that follow:

Table showing volume of CO_2 at one minute interval by reaction of $CaCO_3$ with dilute HCl.

Time/mmm	Volume of CO_2/cm^3
0	0
1	24 cm^3
2	34 cm^3
3	38 cm^3
4	40 cm^3
5	40 cm^3
6	40 cm^3

(a) What happens to rate of reaction with time?
(b) Why does $CaCO_3$ powder react faster than marble chips?
(c) What happens to rate of reaction if concentrated HCl is used?
d) In manufacture of NH_3 ,

$$\mathbf{N}_2(\mathrm{g}) + 3\mathrm{H}_2(\mathrm{g})2 \rightleftharpoons \mathrm{NH}_3 + \mathrm{heat}$$

what is effect of pressure on rate of reaction?
(e) Why does rate of reaction becomes almost double for energy 10° rise in temperature?

784) The oxidation number of the central atom in a complex is defined as the charge it would carry if all the ligands are removed along with the electron pairs that are shared with the central atom. Similarly the charge on the complex is the Sum of the charges of the constituent parts, i.e. the sum of the charges on the central metal ion and its surrounding ligands. Based on this, the complex is called neutral if the sum of the charges of the constituents is equal to zero. However, for an anion or cationic complex, the sum of the charges of the constituents is equal to the charge on the coordination sphere.

Based on the above information, answer the following questions.

(a) what is the secondary valence of Co in $[Co(NH_3)_4Cl_2]^+$?
(b) What type of isomerism is shown by the complex $Cr(H_2O)_6]Cl_3$ and $[Co(H_2O)_5Cl]Cl_2.H_2O$?
(c) Write the electronic configuration of d^4 ion on the basis of crystal field theory when
(i) $\Delta_o < P$
(ii) $\Delta_o > P$
Or
(c) Find the oxidation state and coordination number of the central metal ion in $[Co(H_2O)(CN)(en)_2]^{2+}$.

5 Marks 47 x 5 = 235

785) Identify the reaction order from each of the following rate constants.
(i) k = 2.3 $\times$ 10^{-5} L mol^{-1} s^{-1}
(ii) k = 3 10^{-4} $\times$ s^{-1}

786) The initial concentration of N_2O_5 in the following first order reaction:
$N_2O_5(g) \rightarrow 2NO_2(g) + 1/2O_2$ (g) was 1.24 $\times$ 10^{-2} mol L^{-1} at 318 k. The concentration of N_2O_5 after 60 minutes was 0.20 $\times$ 10^{-2} mol L^{-1}. Calculate the rate constant of the reaction at 318 K.

787) The half-life for decay of radioactive ^{14}C is 5730 years. An archaeological artefact containing wood had only 80% of ^{14} C activity as found in a living tree. Calculate the age of the artefact

788) The decomposition of N_2O_5 in CCl_4 at 318K has been studied by monitoring the concentration of N_2O_5 in the solution. Initially the concentration of N_2O_5 is 2.33 mol L^{-1} and after 184 minutes, it is reduced to 2.08 mol L^{-1}. The reaction takes place according to the equation
2 N_2O_5 (g) $\rightarrow$ 4 NO_2 (g) + O_2 (g)
Calculate the average rate of this reaction in terms of hours, minutes and seconds. What is the rate of production of NO_2 during this period?

789) Calculate the overall order of a reaction which has the rate expression
(a) Rate = $k[A]^{1/2}[B]^{3/2}$
(b) Rate = $k[A]^{3/2}$ $[B]^{-1}$

790) For the reaction 2 A +B $\longrightarrow$ A_2B, rate = k [A] $[B]^2$ with k = 2.0 $\times 10^{-6}$ mol^{-2} s^{-1}. Calculate the initial rate of the reaction when [A] = 0.1 mol L^{-1} and [B] = 0.2 mol L^{-1} . Calculate the rate of reaction after [A] is reduced to 0.06 mol L^{-1}.

791) The time required for 10% completion of a first order reaction at 298 K is equal to that required for its 25% completion at 308 K. If the value of A is $4 \times 10^{10} s^{-1}$, calculate k at 318 K and E_a.

792) The following data were obtained during the first order thermal decomposition of $N_2O_5(g)$ at constant volume:
$2N_2O_2(g) \longrightarrow 2N_2O_4(g)+O_2(g)$

S.No	Time/s	Total pressure(atm)
1	0	0.5
2	100	0.512

Calculate the rate constant

793) The following results have been obtained during the kinetic studies of the reaction:
2A+B $\rightarrow$ C+D

EXPERIMENT NO	[A]	[B]	INITIAL RATE OF FORMATION OF D
1	0.1 M	0.1 M	6.0 x 10^{-3} M min^{-1}
2	0.3 M	0.2 M	7.2 x 10^{-2} M min^{-1}
3	0.3 M	0.4 M	2.88 x 10^{-1} m min^{-1}
4	0.4 M	0.1	2.40 x 10^{-2} M min^{-1}

Determine rate law and the rate constant for the reaction.

794) The experimental data for the decomposition of N_2O_5,

[$2N_2O_5 \rightarrow 4NO_2+O_2$]

in gas phase of 318 K are given below:

t/s	10^{-2} x [N_2O_5] /mol L^{-1}
0	1.63
400	1.36
800	1.14
1200	0.93
1600	0.78
2000	0.64
2400	0.53
2800	0.43
3200	0.35

(i) Plot [N_2O_5]against t.

(ii) Find the half-life period for the reaction.

(iii) Draw a graph between log[N_2O_5] and t.

(iv) What is the rate law?

(v) Calculate the rate constant.

(vi) Calculate the half-life period from k and compare it with (ii).

795) From the concentrations of C_4H_9Cl (butyl chloride) at different times given below, calculate the average rate of the reaction:

$$C_4H_9Cl + H_2O \rightarrow C_4H_9OH + HCl$$

during different intervals of time.

t/s	0	50	100	150	200	300	400	700	800
$[C_4H_9Cl]\ /\mathrm{mol L^{-1}}$	0.100	0.0905	0.0820	0.0741	0.0671	0.0549	0.0439	0.0210	0.017

796) (a) what is meant by rate of a reaction.

(b) In a pseudo first order hydrolysis of ester in water, the following results are obtained:

t in seconds	0	30	60	90
[Ester] M	0.55	0.31	0.17	0.085

(i) Calculate the average rate of reaction between the time interval 30 to 60 seconds.

(ii) Calculate the pseudo first order rate constant for the hydrolysis of ester.

797) (a) Express clearly what you understand by 'rate expression' and 'rate constant' of a reaction.

(b) Nitrogen pentoxide decomposes according to the equation

$2N_2O_5(g) \rightarrow 4\ NO_2\ (g) + O_2\ (g)$

This first order reaction was allowed to proceed at 40^oC and the data given below were collected:

[N_2O_5] (M)	Time (min)
0.400	0.00
0.289	20.00
0.209	40.00
0.151	60.00
0.109	80.00

(i) Calculate the rate constant for the reaction. Include units with you answer.

(ii) Calculate the initial rate of reaction.

(iii) After how many minutes will [N_2O_5] be equal to 0.350 M?

798) (a) Define the following:

(i) Order of a reaction

(ii) Elementary step in a reaction

(b) A first order reaction has a rate constant value of 0.00510 min^{-1}. If we begin with 0.10 M concentration of the reactant, how much of the reactant will remain after 3.0 hours?

799) (a) Explain the following terms:
(i) Rate of a reaction
(ii) Activation energy of a reaction
(b) The decomposition of phosphine (PH_3) proceeds according to the following equation:
$4PH_3(g) \rightarrow P_4(g) + 6H_2(g)$
It is found that the reaction follows the following rate equation:
Rate = k $[PH_3]$
The half-life of PH_3 is 37.9 s at 120 °C.
(i) How much time is required for $3/4^{th}$ of PH_3 to decompose?
(ii) What fraction of the original sample of PH_3 remains behind after 1 minutes?

800) (a) Explain the following terms:
(i) Order of a reaction
(ii) Molecularity of a reaction
(b) The rate of a reaction increases four times when the temperature changes from 300 k to 320 K. Calculate the energy of activation of the reaction, assuming that it does not change with temperature.
($R = 8.314\ J\ K^{-1}\ mol^{-1}$)

801) (a) Distinguish between molecularity an order of a reaction.
(b) The activation energy for the reaction
$2HI(g) \rightarrow H_2(g) + I_2(g)$
is 209.5 kJ mol^{-1} at 581 K. Calculate the fraction of molecules having energy equal to or greater than activation energy.
[$R = 8.314\ JK^{-1}\ mol^{-1}$]

802) Hydrogen peroxide, $H_2O_2(aq)$ decomposes to $H_2O(l)$ and $O_2(g)$ in a reaction that is of first order in H_2O_2 and has a rate constant, $k = 1.06 \times 10^{-3}\ min^{-1}$.
(i) How long will it take 15% of a sample of H_2O_2 to decompose?
(ii) How long will it take 85% of a simple of H_2O_2 to decompose?

803) The half time of first order decomposition of nitramide is 2.1 hour at 15°C. $NH_2NO_2(aq) \longrightarrow N_2O(g) + H_2O(l)$
If 6.2 g of MH_2NO_2 is allowed to decompose, calculate
(i) time taken for NH_2NO_2 to decompose 99% and
(ii) volume of dry N_2O produced at this point, measured at STP.

804) The time required for 10% completion of a first order reaction at 298 K is equal to that required for its 25% completion at 318 K. If the pre-exponential factor for the reaction is 3.56 $\times 10^9 s^{-1}$, calculate its rate constant at 318 K and also the energy of activation.

805) For the reaction, $N_2O_5(g) = 2\ NO_2(g) + 0.5\ O_2(g)$, calculate the mole fraction of $N_2O_5(g)$ decomposed at a constant volume and temperature, if the initial presure is 600 mm Hg and the pressure at any time is 960 mm Hg. Assume ideal gas behaviour.

806) At constant temperature and volume, X decomposes as $2\ X(g) \longrightarrow 3\ Y(g) + 2\ Z(g)$. P_x is the partial pressure of X.

OBSERVATION NO.	TIME (IN MINUTES)	P_X (IN MM OF HG)
1	0	800
2	100	400
3	200	200

(i) What is the order of reaction with respect to X?
(ii) Find the time for 75% completion of the reaction.
(iii) Find the total pressure when pressure of X is 700 mm of Hg.

807) The values of the rate constant for the decomposition of H_1 into H_2 and I_2 at different temperatures are given below :

T/K	633	667	710	738
$10^4\ k/M^{-1}s^{-1}$	0.19	1.00	8.31	25.1

Draw a graph between ln k against 1/T and calculate the values of Arrhenius parameters.