PROBLEM SOLVING TECHNIQUES OF PHYSICAL CHEMISTRY FOR NEET

BY

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CHEMICAL KINETICS

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BASIC EXERCISE

Rate of Reaction

1. Consider the chemical reaction :

$N_2(g) + 3H_2(g) \longrightarrow 2NH_3(g)$

The rate of this reaction can be expressed in terms of time of concentration of $N_2(g)$, $H_2(g)$ or $NH_3(g)$. Identify the correct relationship amongst the rate expressions.

(1) Rate $= -\frac{d[N_2]}{dt} = -\frac{1}{3}\frac{d[H_2]}{dt} = \frac{1}{2}\frac{d[NH_3]}{dt}$

(2) Rate $= -\frac{d[N_2]}{dt} = -\frac{3\,d[H_2]}{dt} = \frac{2\,d[NH_3]}{dt}$

(3) Rate $= \frac{d[N_2]}{dt} = \frac{1}{3}\frac{d[H_2]}{dt} = \frac{1}{2}\frac{d[NH_3]}{dt}$

(4) Rate $= -\frac{d[N_2]}{dt} = -\frac{d[H_2]}{dt} = \frac{d[NH_3]}{dt}$

Ans. **(1)**

2. In the formation of sulphur trioxide by the contact process $2SO_2(g) + O_2(g) \rightarrow 2SO_3(g)$ The rate of reaction is expressed as $-\frac{d(O_2)}{dt} = 2.5 \times 10^{-4}$ mol L^{-1} sec^{-1}. The rate of disappearance of (SO_2) will be –

(1) 5×10^{-4} mol L^{-1} S^{-1} (2) -2.25×10^{-4} mol L^{-1} S^{-1}

(3) 3.75×10^{-4} mol L^{-1} S^{-1} (4) 50.0×10^{-4} mol L^{-1} S^{-1}

Ans. **(1)**

3. In a catalytic reaction involving the formation of ammonia by Haber's process $N_2 + 3H_2 \rightarrow 2NH_3$ the rate of appearance of NH_3 was measured as 2.5×10^{-4} mole L^{-1} S^{-1} The rate of disappearance of H_2 will be –

(1) 2.5×10^{-4} mol L^{-1} S^{-1} (2) 1.25×10^{-4} mol L^{-1} S^{-1}

(3) 3.75×10^{-4} mol L^{-1} S^{-1} (4) 5×10^{-4} mol L^{-1} S^{-1}

Ans. **(3)**

4. Which of the following statement is correct for a reaction $X + 2Y \rightarrow$ Product

(1) The rate of disappearance of X = twice the rate of disappearance of Y.

(2) The rate of disappearance of X = ½ rate of appearance of products

(3) The rate of appearance of products = ½ the rate of disappearance of Y

(4) The rate of appearance of products = ½ the rate of disappearance of X

Ans. **(3)**

5. For the reaction, $N_2O_5 \longrightarrow 2NO_2 + ½\ O_2$

Given $-\frac{d[N_2O_5]}{dt} = K_1[N_2O_5]$, $\frac{d[NO_2]}{dt} = K_2[N_2O_5]$

$\frac{d[O_2]}{dt} = K_3[N_2O_5]$

The relation between K_1 , K_2 and K_3 is –

(1) $2K_1 = K_2 = 4K_3$ (2) $K_1 = K_2 = K_3$ (3) $2K_1 = 4K_2 = K_3$ (4) None

Ans. **(1)**

6. Rate of formation of SO_3 according to the reaction $2SO_2+O_2 \rightarrow 2SO_3$ is 1.6×10^{-3} kg.min^{-1} Hence rate at which SO_2 reacts is :–

(1) 1.6×10^{-3} kg. min^{-1} (2) 8.0×10^{-4} kg. min^{-1}

(3) 3.2×10^{-3} kg. min^{-1} (4) 1.28×10^{-3} kg. min^{-1}

Ans. **(4)**

7. For a general chemical change 2A+3B → products, the rate of disappearance of A is r_1 and of B is r_2. The rates r_1 and r_2 are related as :–

(1) $3r_1 = 2r_2$ (2) $r_1 = r_2$ (3) $2r_1 = 3r_2$ (4) $r_1^2 = 2r_2^2$

Ans. **(1)**

8. For the reaction $4A + B \rightarrow 2C + 2D$

The statement not correct is :–

(1) The rate of disappearance of B is one fourth the rate of disappearance of A

(2) The rate of appearance of C is half the rate of disappearance of B

(3) The rate of formation of D is half the rate of consumption of A

(4) The rates of formation of C and D are equal

Ans. **(2)**

9. In a reaction $N_2(g) + 3H_2(g) \longrightarrow 2NH_3(g)$ the rate of appearance of NH_3 is 2.5×10^{-4} mol L^{-1} sec^{-1}. The Rate of reaction & rate of disappearance of H_2 will be (In mol L^{-1} $sec.^{-1}$)

(1) 3.75×10^{-4}, 1.25×10^{-4} (2) 1.25×10^{-4}, 2.5×10^{-4}

(3) 1.25×10^{-4}, 3.75×10^{-4} (4) 5.0×10^{-4}, 3.75×10^{-4}

Ans. **(3)**

10. For gaseous reaction, rate = k [A] [B]. If volume of container is reduced to $\frac{1}{4}$ of initial, then the rate of the reaction will be..... times of initial:-

(1) $\frac{1}{8}$ (2) 8 (3) $\frac{1}{16}$ (4) 16

Ans. **(4)**

Rate Law / Order / Molecularity

11. If the concentration units are reduced by n times then the value of rate constant of first order will

(1) Increases by n times (2) Decreases by factor of n

(3) Not change (4) None

Ans. **(3)**

12. The rate of certain hypothetical reaction

$A + B + C \rightarrow$ products is given by

$r = \frac{-d[A]}{dt} = K[A]^{1/2}[B]^{1/3}[C]^{1/4}$ The order of the reaction –

(1) 1 (2) $\frac{1}{2}$ (3) 2 (4) $\frac{13}{12}$

Ans. **(4)**

13. Which of the following rate law has an overall order of 0.5 for reaction involving substances x,y and z ?

(1) Rate = K (C_x) (C_y) (C_z) (2) Rate = K $(C_x)^{0.5}(C_y)^{0.5}(C_z)^{0.5}$

(3) Rate = K $(C_x)^{1.5}$ $(C_y)^{-1}(C_z)^{\circ}$ (4) Rate = K$(C_x)(C_z)^{\circ} / (C_y)^2$

Ans. **(3)**

14. A chemical reaction involves two reacting species. The rate of reaction is directly proportional to the conc. of one of them and inversely proportional to the concentration of the other. The order of reaction is –

(1) 1 (2) 2 (3) Zero (4) Unpredictable

Ans. **(3)**

15. For the reaction $H_2(g) + Br_2(g) \rightarrow 2HBr(g)$, the experimental data suggests, Rate = $K[H_2][Br_2]^{1/2}$. The molecularity and order of reaction for the reaction is –

(1) 2 and 2 respectively (2) 2 and 1½ respectively

(3) 1½ and 2 respectively (4) 1½ and 1½ respectively

Ans. **(2)**

16. Select the rate law that corresponds to the data shown for the following reaction A + B → C

Exp.	[A]	[B]	Initial rate
1.	0.012	0.035	0.10
2.	0.024	0.070	1.6
3.	0.024	0.035	0.20
4.	0.012	0.070	0.80

(1) Rate = $K[B]^3$ (2) Rate = $K[B]^4$ (3) Rate = $K[A][B]^3$ (4) Rate = $K[A]^2[B]^2$

Ans. **(3)**

17. In a certain gaseous reaction between X and Y, $X + 3Y \rightarrow XY_3$ The initial rates are reported as follows –

[X]	[Y]	Rate
0.1 M	0.1M	0.002 Ms^{-1}
0.2 M	0.1 M	0.002 Ms^{-1}
0.3 M	0.2 M	0.008 Ms^{-1}
0.4 M	0.3 M	0.018 Ms^{-1}

The rate law is –

(1) $r = K[X][Y]^3$ (2) $r = K[X]^{\circ}[Y]^2$ (3) $r = K[X][Y]$ (4) $r = [X]^{\circ}[Y]^3$

Ans. **(2)**

18. Select the law that corresponds to date shown for the following reaction 2A + B → C + D –

Exp.	[A]	[B]	Initial rate (mol L^{-1} min^{-1})
1.	0.1	0.1	7.5×10^{-3}
2.	0.3	0.2	9.0×10^{-2}
3.	0.3	0.4	3.6×10^{-1}
4.	0.4	0.1	3.0×10^{-2}

(1) Rate = $K[A]^2[B]$ (2) Rate = $K[A][B]^2$ (3) Rate = $K[A][B]^3$ (4) Rate = $K[A][B]$

Ans. **(2)**

19. For a hypothetical reaction ; A + B → C the following data was obtained in three different experiments :–

[A] (mol lit^{-1})	[B] (mol lit^{-1})	Rate or reaction (mol lit^{-1} min^{-1})
0.01	0.01	1.0×10^{-4}
0.01	0.03	9.0×10^{-4}
0.03	0.03	2.70×10^{-3}

Suggest rate law :–

(1) $r = K[A]^2[B]$ (2) $r = K[A][B]^2$ (3) $r = K[A][B]$ (4) None of these

Ans. **(2)**

20. Calculate the order of the reaction in A and B :

[A] (mol l^{-1})	[B] (mol^{-1})	Rate
0.05	0.05	1.2×10^{-3}
0.10	0.05	2.4×10^{-3}
0.05	0.10	1.2×10^{-3}

(1) 1 and 0 (2) 1 and 1 (3) 0 and 1 (4) None

Ans. **(1)**

21. For a chemical reaction A + B → product, the order is one with respect to each A and B. Value of x and y from the given data is :–

Rate (mole/lit./sec.)	(A)	(B)
0.10	0.20 M	0.05 M
0.40	x	0.05 M
0.80	0.40 M	y

(1) 0.20, 0.80 (2) 0.80, 0.40 (3) 0.80, 0.20 (4) 0.40, 0.20

Ans. **(3)**

22. Time required to complete a half fraction of a reaction varies inversely to the concentration of reactant then the order fo reaction is –

(1) Zero (2) 1 (3) 2 (4) 3

Ans. **(3)**

23. The rate law for the single step reaction 2A + B → 2C, is given by –

(1) Rate = K[A][B] (2) Rate = $K[A]^2[B]$

(3) Rate = K[2A][B] (4) Rate = $K[A]^2[B]^\circ$

Ans. **(2)**

24. Following mechanism has been proposed for a reaction.

2A + B → D + E

A + B → C + D – (slow)

A + C → E – – (fast) The rate law expression for the reaction is –

(1) $r = K[A]^2[B]$ (2) r = K[A] [B]

(3) $r = K[A]^2$ (4) r = K[A][C]

Ans. **(2)**

25. For a reaction of the type A + B → products, it is observed that doubling the concentration of A causes the reaction rate to be four times as great, but doubling the amount of B does not effect the rate. The rate equation is –

(1) Rate = K [A][B] (2) Rate = $K[A]^2$ (3) Rate = $K[A]^2[B]$ (4) Rate = $K[A]^2[B]^2$

Ans. **(2)**

26. Point out incorrect statement.

(1) Rate law is an experimental valve

(2) Law of mass action is a theoretical proposal

(3) Rate law is more informative than law of mass action for developing mechanism

(4) Rate law is always different from the expression of law of mass action.

Ans. **(4)**

27. For a chemical reaction A → B it is found that the rate of reaction double when the concentration of A is increased four times. The order in A for this reaction is –

(1) Two (2) One (3) Half (4) Zero

Ans. **(3)**

28. For an elementary process 2X + Y → Z + W, the molecularity is –

(1) 2 (2) 1 (3) 3` (4) Unpredictable

Ans. **(3)**

29. The rate law of the reaction A + 2B → product is given by $\frac{d[P]}{dt} = K[A]^2[B]$. If A is taken in large excess, the order of the reaction will be –

(1) Zero (2) 1 (3) 2 (4) 3

Ans. **(2)**

30. The decomposition of N_2O_5 occurs as,

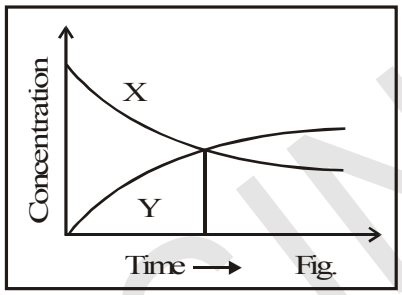
$2N_2O_5 \rightarrow 4NO_2 + O_2$, and follows first order kinetics; hence

(1) The reaction is bimolecular (2) The recation is unimolcular

(3) $t_{1/2}$ α a° (4) None

Ans. **(3)**

31. The accompanying figure depicts the change in concentration of species X and Y for the reaction X → Y as a function of time the point of intersection of the two curves reperesents.



(1) $t_{1/2}$ (2) $t_{3/4}$

(3) $t_{2/3}$ (4) Data insufficient to predict

Ans. **(1)**

32. For a reaction A + B → products, the rate of the reaction was doubled when the concentration of A was doubled, the rate was again doubled when the conc. of A & B were doubled the order of the reaction with respect to A & B are:–

(1) 1, 1 (2) 2, 0 (3) 1, 0 (4) 0, 1

Ans. **(3)**

33. For the reaction A + B → products, it is found that the order of A is 1 and the order of B is $\frac{1}{2}$. When the conc. of both A and B are increased four times, the rate will increase by a factor of :–

(1) 16 (2) 8 (3) 6 (4) 4

Ans. **(2)**

34. The rate law for a reaction A + B → product is

rate = $K[A]^1[B]^2$. Then which one of the following statements is false :–

(1) If [B] is held constant while [A] is doubled, the reaction will proceed twice as fast

(2) If [A] is held constant while [B] is reduced to one quarter, the rate will be halved

(3) If [A] and [B] are both doubled, the reaction will proceed 8 times as fast

(4) This is a third order reaction

Ans. **(2)**

35. For a chemical reaction A → B, the rate of reaction doubles when the conc. of A is increased 8 times. The order

of reaction w.r.t. A is :–

(1) 3 (2) $\frac{1}{2}$ (3) $\frac{1}{3}$ (4) Zero

Ans. **(3)**

36. The specific rate constant of a first order reaction depends on the :–

(1) Conc. of the reactant (2) Conc. of the product

(3) Time (4) Temperature

Ans. **(4)**

Pseudo First Order Reaction / Mechanism of Reaction

37. The hypothetical reaction $A_2 + B_2 \rightarrow 2AB$ follows the mechanism as given below –

$A_2 \rightleftharpoons A + A$ ..... (fast)

$A + B_2 \rightarrow AB + B$ ..... (slow)

$A + B \rightarrow AB$ ..... (fast)

The order of the over all reaction is –

(1) 2 (2) 1 (3) 1½ (4) Zero

Ans. **(3)**

38. For reaction $NO_2 + CO \rightarrow CO_2 + NO$, the rate expression is, Rate = $K [NO_2]^2$

The number of molecules of CO involved in the slowest step will be –

(1) 0 (2) 1 (3) 2 (4) 3

Ans. **(1)**

39. The acid hydrolysis of ester is –

(1) I order reaction (2) Bimolecular reaction

(3) Pseudo unimolecular reaction (4) All

Ans. **(4)**

40. In the sequence of reaction

$A \xrightarrow{K_1} B \xrightarrow{K_2} C \xrightarrow{K_3} D$;

$K_3 > K_2 > K_1$, then the rate determining step of the reaction is :–

(1) $A \rightarrow B$ (2) $C \rightarrow D$ (3) $B \rightarrow C$ (4) $A \rightarrow D$

Ans. **(1)**

41. The reaction mechanism for the reaction $P \rightarrow R$ is as follows :–

$P \underset{}{\overset{K_1}{\rightleftharpoons}} 2Q$ (fast) ; $2Q + P \xrightarrow{K_2} R$ (slow)

the rate law for the main reaction ($P \rightarrow R$) is :–

(1) $K_1[P][Q]$ (2) $K_1K_2[P]$ (3) $K_1K_2[P]^2$ (4) $K_1K_2[a]$

Ans. **(3)**

42. The reaction $2A + B \rightarrow$ products, follows the mechanism

$2A \rightleftharpoons A_2$ (fast)

$A_2 + B \rightarrow P$ (slow)

The order of the reaction is :–

(1) 1.5 (2) 3 (3) 1 (4) 2

Ans. **(2)**

43. For the reaction $2NO + Cl_2 \rightarrow 2NOCl$ the following mechanism has been proposed

$NO + Cl_2 \rightleftharpoons NOCl_2$ (fast)

$NOCl_2 + NO \rightarrow 2NOCl$ (slow) the rate law for the reaction is :-

(1) Rate = $K[NO]^2[Cl_2]$ (2) Rate = $K[NO][Cl_2]^2$

(3) Rate = $K[NOCl_2]$ (4) Rate = $K[NOCl]^2$

Ans. **(1)**

Zero / First / n^{th} Order Reaction

44. K for a zero order reaction is

2×10^{-2} mol L^{-1} sec^{-1}. If the concentration of the reactant after 25 sec is 0.5 M, the initial concentration must have been.

(1) 0.5 M (2) 1.25 M (3) 12.5 M (4) 1.0 M

Ans. **(4)**

45. If the first order reaction involves gaseous reactants and gaseous products the units of its rate are –

(1) atm. (2) atm - sec. (3) atm – sec^{-1} (4) atm^2 sec^2

Ans. **(3)**

46. Plot of log(a – x) vs time t is straight line. This indicates that the reaction is of –

(1) Second order (2) First order (3) Zero order (4) third order

Ans. **(2)**

47. The units for the rate constant of first order reaction is –

(1) s^{-1} (2) mol L^{-1} s^{-1} (3) mol s^{-1} (4) $Lmol^{-1}$ s^{-1}

Ans. **(1)**

48. The rate constant of a first order reaction is 4×10^{-3} sec^{-1}. At a reactant concentration of 0.02 M, the rate of reaction would be–

(1) 8×10^{-5} M sec^{-1} (2) 4×10^{-3} M sec^{-1}

(3) 2×10^{-1} M sec^{-1} (4) 4×10^{-1} M sec^{-1}

Ans. **(1)**

49. In a first order reaction the concentration of the reactant is decreased from 1.0 M to 0.25 M in 20 min. The rate constant of the reaction would be –

(1) 10 min^{-1} (2) 6.931 min^{-1} (3) 0.6931 min^{-1} (4) 0.06931 min^{-1}

Ans. **(4)**

50. In a first order reaction the a/(a – x) was found to be 8 after 10 minute. The rate constant is

(1) $(2.303 \times 3 \log 2)/10$ (2) $(2.303 \times 2 \log 3)/10$ (3) $10 \times 2.303 \times 2\log 3$ (4) $10 \times 2.303 \times 3\log 2$

Ans. **(1)**

51. 75% of a first order reaction was found to complete in 32 min. When will 50% of the same reaction complete–

(1) 24 min (2) 16 min (3) 8 min (4) 4 min

Ans. **(2)**

52. A first order reaction has a half life period of 69.3 sec. At 0.10 mol lit^{-1} reactant concentration rate will be –

(1) 10^{-4} M sec^{-1} (2) 10^{-3} M sec^{-1} (3) 10^{-1} M sec^{-1} (4) 6.93×10^{-1} M sec^{-1}

Ans. **(2)**

53. What fraction of a reactant showing first order remains after 40 minute if $t_{1/2}$ is 20 minute :

(1) 1/4 (2) 1/2 (3) 1/8 (4) 1/6

Ans. **(1)**

54. For a first order reaction A → products, the rate of reaction at [A] = 0.2 M is 1×10^{-2} mol $lit^{-1}min^{-1}$. The half life period for the reaction is –

(1) 832 min. (2) 440 sec. (3) 416 min. (4) 14 min.

Ans. **(4)**

55. The half life for the first order reaction

$N_2O_5 \rightarrow 2NO_2 + ½\ O_2$ is 24 hrs. at 30°C. Starting with 10g of N_2O_5 how many grams of N_2O_5 will remain after a period of 96 hours ?

(1) 1.25 g (2) 0.63 g (3) 1.77 g (4) 0.5 g

Ans. **(2)**

56. What is the half life of a radioactive substance if 87.5% of any given amount of the substance disintegrate in 40 minutes ?

(1) 160 min (2) 10 min (3) 20 min (4) 13 min 20 sec.

Ans. **(4)**

57. For a given reaction of first order it takes 20 minute for the concentration to drop from 1 M to 0.6 M. The time required for the concentration to drop from 0.6 M to 0.36 M will be :

(1) More than 20 min (2) Less than 20 min (3) Equal to 20 min (4) Infinity

Ans. **(3)**

58. A first order reaction is carried out with an initial concentration of 10 mole per litre and 80% of the reactant changes into the product. Now if the same reaction is carried out with an initial concentration of 5 mol per litre for the same period the percentage of the reactant changing to the product is.

(1) 40 (2) 80 (3) 160 (4) Cannot be calculated

Ans. **(2)**

59. In the following first order completing reaction.

A + Reagent → Product, B + Reagent → Product

The ratio of K_1 / K_2 if only 50% of B will have been reacted, When 94% of A has been reacted is –

(1) 4.06 (2) 0.246 (3) 2.06 (4) 0.06

Ans. **(1)**

60. The reaction L → M is started with 10 g of L. After 30 and 90 minute, 5 g and 1.25 g of L are left respectively. The order of reaction is

(1) 0 (2) 2 (3) 1 (4) 3

Ans. **(3)**

61. If doubling the initial concentration of a reactant doubles $t_{½}$ of the reaction, the order of the reaction is–

(1) 3 (2) 2 (3) 1 (4) 0

Ans. **(4)**

62. The half life period for calalytic decomposition of AB_3 at 50 mm is found to be 4 hrs and at 100 mm it is 2 hrs. The order of reaction is –

(1) 3 (2) 1 (3) 2 (4) 0

Ans. **(3)**

63. The rate constant for a reaction is 10.8×10^{-5} mol L^{-1} S^{-1} The reaction obeys –

(1) First order (2) Zero order (3) Second order (4) All are wrong

Ans. **(2)**

64. A substance 'A' decomposes in solution following the first order kinetics flask I contains 1 lit of 1M. solution of A and flask II contains. 100 ml of 0.6 M solution. After 8 hr. the concentration of A in flask. I become 0.25 M, what will be the time for concetration of A in flask II to become 0.3 M.

(1) 0.4 hr. (2) 2.4 hr.

(3) 4.0 hr. (4) Unpredictable as rate constant is not given

Ans. **(3)**

65. The rate constant (K) for the reaction $2A + B \rightarrow$ product was found to be 2.5×10^{-5} litre mol^{-1} sec^{-1} after 15 sec, 2.60×10^{-5} lit mol^{-1} sec^{-1} after 30 sec and 2.55×10^{-5} lit mol^{-1} sec^{-1} after 50 sec. The order of reaction is

(1) 2 (2) 3 (3) Zero (4) 1

Ans. **(1)**

66. If a reaction with $t_{½}$ = 69.3 second; has a rate constant 10^{-2} per second the order is :

(1) Zero (2) 1 (3) 2 (4) 3

Ans. **(2)**

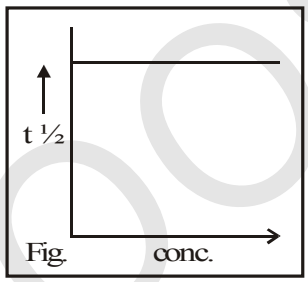
67. The rate constant for a second order reaction is 8×10^{-5} M^{-1} min^{-1} : How long will it take a 1M solution to be reduced to 0.5 M.

(1) 8.665×10^{3} min (2) 8×10^{-3} min (3) 1.25×10^{4} min (4) 4×10^{-5} min

Ans. **(3)**

68. A graph between $t_{1/2}$ and conc. for n^{th} order reaction is a straight line. Reaction of this nature is completed 50% in 10 minutes when conc. is 2 mol L^{-1}. This is decomposed 50% in t minutes at 4 mol L^{-1} n and t are respectively

(1) 0, 20 min.
(2) 1, 10 min.
(3) 1, 20 min.
(4) 0, 5 min.



Ans. **(2)**

69. In the first order reaction 75% of the reactant disappeared in 1.388 h. Calculate the rate constant of the reaction:–

(1) 1 s^{-1} (2) 2.8×10^{-4} s^{-1} (3) 17.2×10^{-3} s^{-1} (4) 1.8×10^{-3} s^{-1}

Ans. **(2)**

70. In the case of first order reaction, the ratio of time required for 99.9% completion to 50% completion is :–

(1) 2 (2) 5 (3) 10 (4) None

Ans. **(3)**

71. From different sets of data of $t_{1/2}$ at different initial concentrations say 'a' for a given reaction, the $[t_{1/2} \times a]$ is found to be constant. The order of reaction is :–

(1) 0 (2) 1 (3) 2 (4) 3

Ans. **(3)**

72. The reaction $2N_2O_5(g) \rightarrow 4NO_2(g) + O_2(g)$

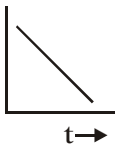
is first order with respect to N_2O_5. Which of the following graph would yield a straight line :–

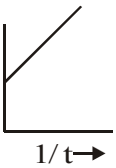
(1) $\log(PN_2O_5)$ versus time with – Ve slope (2) $(PN_2O_5)^{-1}$ versus time

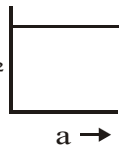
(3) (PN_2O_5) versus time (4) $\log(PN_2O_5)$ versus time with + Ve slope

Ans. **(1)**

73. Which of the following curves represents a Ist order reaction :–

(1) 

(2) 

(3) 

(4) 1 & 3 both

Ans. **(4)**

74. The following data were obtained at a certain temperature for the decomposition of ammonia

p (mm)	50	100	200
$t_{1/2}$	3.64	1.82	0.91

The order of the reaction is :–

(1) 0 (2) 1 (3) 2 (4) 3

Ans. **(3)**

75. A reaction is found to have the rate constant x sec^{-1} by what factor the rate is increased if initial conc. of A is tripled

(1) 3 (2) 9 (3) x (4) Remains same

Ans. **(1)**

76. The half life of a first order reaction is 10 min. If initial amount is 0.08 mol/lit. and conc. at some instant is 0.01 mol/lit. then t =

(1) 10 min. (2) 30 min. (3) 20 min. (4) 40 min.

Ans. **(2)**

77. Which is incorrect :–

(1) Half life of a first order reaction is independent of initial concentration

(2) Rate of reaction is constant for first order reaction

(3) Unit of K for second order reaction is mol^{-1} lit sec^{-1}

(4) None

Ans. **(2)**

78. Hydrolysis of ester in alkaline medium is :–

(1) First order reaction with molecularity one

(2) Second order reaction with molecularity two

(3) First order reaction with molecularty two

(4) Second order reaction with molecularity one

Ans. **(2)**

79. The expression which gives $\frac{1}{4}$th life of Ist order reaction is :–

(1) $\frac{K}{2.303}\log\frac{4}{3}$ (2) $\frac{2.303}{K}\log 3$ (3) $\frac{2.303}{K}\log\frac{3}{4}$ (4) $\frac{2.303}{K}\log\frac{4}{3}$

Ans. **(4)**

80. The rate constant of a zero order reaction is 0.2 mol $dm^{-3}h^{-1}$. If the concentration of the reactant after 30 minutes is 0.05 mol dm^{-3}. Then its initial concentration would be :-

(1) 6.05 mol dm^{-3} (2) 0.15 mol dm^{-3} (3) 0.25 mol dm^{-3} (4) 4.00 mol dm^{-3}

Ans. (2)

81. A reaction is of first order. After 100 minutes 75 gm of the reactant A are decomposed when 100 gm are taken initially, calculate the time required when 150 gm of the reactant A are decomposed, the initial weight taken is 200 gm :-

(1) 100 minutes (2) 200 minutes (3) 150 minutes (4) 175 minutes

Ans. (1)

82. For which of the following, the unit of rate and rate constant of the reaction are identical :-

(1) First order reaction (2) Zero order reaction

(3) Second order reaction (4) Fractional order of reaction

Ans. (2)

83. $2A \rightarrow$ Product, follows the first order kinetics. If the half life period of the reaction at $[A]_{Initial}$ = 0.2 mole lit^{-1} is 20 min. then the value of rate constant would be:-

(1) 4 sec. (2) 20 sec. (3) 4 lit. mol^{-1} $min.^{-1}$ (4) None of these

Ans. (4)

84. Correct statement about first order reaction is:-

(1) $t_{complition\ =\ finite}$ (2) $t_{1/2} \propto \frac{1}{a}$

(3) Unit of K is mole lit^{-1} sec^{-1} (4) $t_{1/2} \times K$ = const. at const. temp.

Ans. (4)

Collision Theory and Factors Affecting Rate

85. According to collision theory of reaction rates –

(1) Every collision between reactant leads to chemical reaction

(2) Rate of reaction is proportional to velocity of molecules

(3) All reactions which occur in gaseous phase are zero order reaction

(4) Rate of reaction is directly proportional to collision frequency.

Ans. (4)

86. Activation energy of a reaction is –

(1) The energy released during the reaction

(2) The energy evolved when activated complex is formed

(3) Minimum amount of energy needed to overcome the potential barrier of reaction

(4) The energy needed to form one mole of the product

Ans. (3)

87. The minimum energy for molecules to enter into chemical reaction is called.

(1) Kinetic energy (2) Potential energy (3) Threshold energy (4) Activation energy

Ans. (3)

88. The rate constant K_1 of a reaction is found to be double that of rate constant K_2 of another reaction. The relationship between corresponding activation energies of the two reactions at same temperature (E_1 & E_2) can be represented as

(1) $E_1 > E_2$ (2) $E_1 < E_2$ (3) $E_1 = E_2$ (4) $E_1 = 4E_2$

Ans. **(2)**

89. At room temperature the reaction between NO and O_2 to give NO_2 is fast while that between CO and O_2 is slow it is due to –

(1) CO is smaller in size than that of NO

(2) CO is poisonous

(3) The activation energy for the reaction

$2NO + O_2 \rightarrow 2NO_2$ is less than $2CO + O_2 \rightarrow 2CO_2$

(4) None

Ans. **(3)**

90. Chemical reaction occurs as a result of collision between reacting molecules. Therefore the reaction rate is given by

(1) Total number of collisions occuring in a unit volume per second

(2) Fraction of molecules which possess energy less than the threshold energy.

(3) Total number of effective collisions

(4) None

Ans. **(3)**

91. An endothermic reaction A $\rightarrow$ B have an activation energy 15 K cal/mol and the heat of the reaction is 5 K cal/mol. The activation energy of the reaction B $\rightarrow$ A is –

(1) 20 k cal/mol (2) 15 kcal/mol (3) 10 kcal/mol (4) Zero

Ans. **(3)**

92. For A + B $\rightarrow$ C + D; $\Delta H = -20$ kJ mol^{-1}. The activation energy of the forward reaction is. 85 $KJmol^{-1}$. The activation energy for backward reaction is _____ KJ mol^{-1}.

(1) 65 (2) 105 (3) 85 (4) 40

Ans. **(2)**

93. A large increase in the rate of a reaction for a rise in temperature is due to –

(1) Increase in the number of collisions

(2) Increase in the number of activated molecules

(3) Lowering of activation energy

(4) Shortening of the mean free path

Ans. **(2)**

94. Rate of which reactions increases with temperature –

(1) Of any (2) Of exothermic reaction

(3) Of endothermic reaction (4) Of None

Ans. **(1)**

95. The rate of a chemical reaction doubles for every 10^0C rise in temperature. If the temp is increased by 60^0C the rate of reaction increases by :

(1) 20 times (2) 32 times (3) 64 times (4) 128 times

Ans. **(3)**

96. According to the arrhenius equation a straight line is to be obtained by plotting the logarithm of the rate constant of chemical reaction (log k) against.

(1) (T) (2) log T (3) $1/T$ (4) log $1/T$

Ans. **(3)**

97. Which plots will give the value of activation energy.

(1) K υsT (2) $1/K$ υsT (3) lnK υsT (4) lnK υs $1/T$

Ans. **(4)**

98. Given that K is the rate constant for some order of any reaction at temp T then the value of $\lim_{T\to\infty} \log K$ _____.

(1) A 2.303 (2) A (3) 2.303 A (4) log A

Ans. **(4)**

99. From the following data; the activation energy for the reaction (cal/mol) $H_2 + I_2 \rightarrow 2HI$

T , (in, K)	1/T, (in, K^{-1})	$\log_{10}K$
769	1.3×10^{-3}	2.9
667	1.5×10^{-3}	1.1

(1) 4×10^4 (2) 2×10^4 (3) 8×10^4 (4) 3×10^4

Ans. **(1)**

100. The rate constant; the activation energy and the arrhenius parameter of a chemical reaction at 25^0C are 3×10^{-4} sec^{-1}; 104.4 KJ mol^{-1} and 6.0×10^{14} sec^{-1} respectively, the value of the rate constant as $T \rightarrow \infty$ is.

(1) 2×10^8 sec^{-1} (2) 6×10^{14} sec^{-1} (3) Infinity (4) 3.6×10^{30} sec^{-1}

Ans. **(1)**

101. For an endothermic reaction where ΔH represents the enthalpy of the reaction in KJ/mol ; the minimum value for the energy of activation will be

(1) Less than ΔH (2) Zero (3) More than ΔH (4) Equal to ΔH

Ans. **(3)**

102. The rate of reaction increases by 2.3 times when the temperature is raised from 300 K to 310 K. If K is the rate constant at 300 K then the rate constant at 310 K will be equal to –

(1) 2K (2) K (3) 2.3 K (4) $3K^2$

Ans. **(3)**

103. If concentration of reactants is increased by 'x' then the K becomes –

(1) $\ln \frac{K}{x}$ (2) $\frac{K}{x}$ (3) K + x (4) K

Ans. **(4)**

104. Which is used in the determination of reaction rates.

(1) Reaction Temperature (2) Reaction Concentration
(3) Specific rate constant (4) All of these

Ans. **(4)**

105. The rate constant of a first order reaction depends on the :–

(1) Concentration of the reactant (2) Concentration of the product
(3) Time (4) Temperature

Ans. **(4)**

106. For the decomposition of $N_2O_5(g)$ it is given that–

$2N_2O_5(g) \rightarrow 4NO_2(g) + O_2(g)$ activation energy = Ea $N_2O_5(g) \rightarrow 2NO_2(g) + \frac{1}{2}O_2(g)$ activation energy = Ea' then

(1) Ea = 2Ea' (2) Ea > Ea' (3) Ea < Ea' (4) Ea = Ea'

Ans. **(4)**

107. For a reaction for which the activation energies of forward and reverse reactions are equal :–

(1) $\Delta H = 0$ (2) $\Delta S = 0$ (3) The order is zero (4) There is no catalyst

Ans. **(1)**

108. The energy of activation of a forward reaction is 50 Kcal. The energy of activation of its backward reaction is:–

(1) Equal to 50 Kcal. (2) Greater than 50 Kcal.

(3) Less than 50 Kcal. (4) Either greater or less than 50 Kcal.

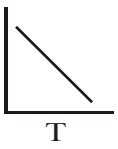
Ans. **(4)**

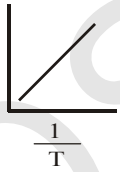
109. An exothermic reaction $X \rightarrow Y$ has an activation energy 30 KJ mol^{-1}. If energy change (ΔE) during the reaction is – 20 KJ, then the activation energy for the reverse reaction is :–

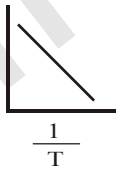
(1) 10 KJ (2) 20 KJ (3) 50 KJ (4) – 30 KJ

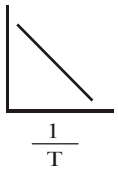
Ans. **(3)**

110. Which of the following plot is in accordance with the arrhenius equation :–

(1) 

(2) 

(3) 

(4) 

Ans. **(3)**

111. For a certain gaseous reaction a 10° C rise of temp. from 25° C to 35° C doubles the rate of reaction. What is the value of activation energy :–

(1) $\frac{10}{2.303R \times 298 \times 308}$ (2) $\frac{2.303 \times 10}{298 \times 308R}$

(3) $\frac{0.693R \times 10}{290 \times 308}$ (4) $\frac{0.693R \times 298 \times 308}{10}$

Ans. **(4)**

112. The activation energy for the forward reaction $X \rightarrow Y$ is 60 KJ mol^{-1} and ΔH is - 20 KJ mol^{-1}. The activation energy for the backward reaction $Y \rightarrow X$ is:-

(1) 80 KJ mol^{-1} (2) 40 KJ mol^{-1} (3) 60 KJ mol^{-1} (4) 20 KJ mol^{-1}

Ans. **(1)**

113. For producing the effective collisions, the colloiding molecules must posses:-

(1) A certain minimum amount of energy

(2) Energy equal to or greater than threshold energy

(3) Proper orientation

(4) Threshold energy as well as proper orientation of collision

Ans. **(4)**

114. The half life for a reaction is --------of temperature:-

(1) Independent (2) Increased with increase

(3) Decreased with increase (4) Increased or decreased with increase

Ans. **(3)**

115. The activation energy for a chemical reaction depends upon :-

(1) Temperature (2) Nature of reacting species

(3) Concentration of the reacting species (4) Collision frequency

Ans. **(2)**

116. The rate of reaction increases by the increase of temperature because :–

(1) Collision is increased

(2) Energy of products decreases

(3) Fraction of molecules possessing energy $\geq E_T$ (Threshold energy) increases

(4) Mechanism of a reaction is changed

Ans. **(3)**

ANALYTICAL EXERCISE

1. Consider the data below for a reaction $A \rightarrow B$

Time (sec)	0	10	20	30
Rate	1.60×10^{-2}	1.60×10^{2}	1.60×10^{-2}	1.59×10^{-2}

From the above data the order of reaction is

(1) Zero (2) 1 (3) 2 (4) 1

Ans. **(1)**

2. The graph between the log K versus $\frac{1}{T}$ is a straight line. The slope of the line is

(1) $-\frac{2.303R}{E_a}$ (2) $-\frac{E_a}{2.303R}$ (3) $\frac{2.303R}{E_a}$ (4) $\frac{E_a}{2.303R}$

Ans. **(2)**

3. The temperature coefficient for most of the reaction lies between

(1) 1 & 3 (2) 2 & 3 (3) 1 & 4 (4) 2 & 4

Ans. **(2)**

4. If the volume of closed vessel in which the following simple reaction is carried out is reduced to one third of original volume, the rate of reaction becomes

$2NO(g) + O_2(g) \rightarrow 2NO_2(g)$

(1) One third (2) Three times

(3) Nine times (4) Twenty seven times

Ans. **(4)**

5. For the reaction $A + B \rightarrow$ Products, it is found that order of A is 2 and the order of B is 3 in the rate expression. When the concentration of both A and B are doubled the rate will increase by a factor

(1) 10 (2) 16 (3) 32 (4) 28

Ans. **(3)**

6. Nitric oxide (NO) reacts with oxygen to produce nitrogen dioxide

$2NO(g) + O_2(g) \rightarrow 2NO_{2(g)}$, If the mechanism of reaction is

$NO + O_2 \underset{}{\overset{K}{\rightleftharpoons}} NO_3$ (fast), $NO_3 + NO \xrightarrow{K_1} NO_2 + NO_2$ (slow) then rate law is

(1) Rate = K'[NO][O_2] (2) Rate = K'[NO][O_2]^2

(3) Rate = K'[NO]^2[O_2] (4) Rate = K'[NO]^3[O_2]

Ans. **(3)**

7. For a first order reaction, the time taken to reduce the initial concentration to a factor of $\frac{1}{4}$ is 10 minute. If the reduction in concentration is carried out to a factor of $\frac{1}{16}$, then time required will be

(1) 10 minutes (2) 20 minutes (3) 40 minutes (4) 60 minutes

Ans. **(2)**

8. For the reaction,

$N_2O_5 \longrightarrow 2NO_2 + \frac{1}{2}O_2$. Given : $-\frac{d[N_2O_5]}{dt} = K_1[N_2O_5]$

$\frac{d[NO_2]}{dt} = K_2[N_2O_5]$ and $\frac{d[O_2]}{dt} = K_3[N_2O_5]$

The relation between K_1, K_2 and K_3 is

(1) $2K_1 = K_2 = 4K_3$ (2) $K_1 = K_2 = K_3$ (3) $2K_1 = 4K_2 = K_3$ (4) $K_1 = 2K_2 = 3K_3$

Ans. **(1)**

9. For the reaction, $N_2O_4(g) \underset{K_2}{\overset{K_1}{\rightleftharpoons}} 2NO_2(g)$, the rate of disappearance of NO_2 will be

(1) $K_1[N_2O_4] - K_2[NO_2]^2$ (2) $2K_1[N_2O_4] - 2K_2[NO_2]^2$

(3) $K_2[NO_2]^2 - K_1[N_2O_4]$ (4) $2K_2[NO_2]^2 - 2K_1[N_2O_4]$

Ans. **(4)**

10. For a homogeneous gaseous reaction $A \rightarrow B + C + D$, the initial pressure was P_0 while pressure after time 't' was P if $(P > P_0)$. The expression for the rate constant K is

(1) $K = \frac{2.303}{t}\log\left(\frac{2P_0}{3P_0 - P}\right)$ (2) $K = \frac{2.303}{t}\log\left(\frac{3P_0}{2P_0 - P}\right)$

(3) $K = \frac{2.303}{t}\log\left(\frac{P_0}{P_0 - P}\right)$ (4) $K = \frac{2.303}{t}\log\left(\frac{2P_0}{4P_0 - P}\right)$

Ans. **(1)**

11. For a gaseous phase reaction $2A + B_2 \rightarrow 2AB$, the following rate date was obtained at 300K

Rate of disappearance concentration of B_2 (mole/litre min)

	[A]	**[B_2]**
(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

The rate constant for the reaction is

(1) 0.5 mol^{-1} min^{-1} litre (2) 0.8 mol^{-1} min^{-1} litre

(3) 1.5 mol^{-1} min^{-1} litre (4) 2 mol^{-1} min^{-1} litre

Ans. **(2)**

12. Inversion of a sugar follows first order rate equation which can be followed by noting the change in rotation of the plane of polarization of light in the polarimeter. If r_∞, r_t and r_0 are the rotations at $t = \infty$, $t = t$ and $t = 0$ then, first order reaction can be written as

(1) $K = \frac{1}{2}\log_e\frac{r_t - r_\infty}{r_0 - r_\infty}$ (2) $K = \frac{1}{t}\ln\frac{r_0 - r_\infty}{r_t - r_\infty}$ (3) $K = \frac{1}{t}\ln\frac{r_\infty - r_0}{r_t - r_\infty}$ (4) $K = \frac{1}{t}\ln\frac{r_\infty - r_t}{r_\infty - r_0}$

Ans. **(2)**

13. Which of the following correct ?

(1) $\log\frac{K_2}{K_1}=\frac{E_a}{2.303}\left[\frac{\Delta T}{T_1T_2}\right]$

(2) For zero order $t_{1/2}$ is inversely proportional to initial concentration

(3) Catalyst decreases the activation energy

(4) All of these

Ans. **(3)**

14. 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. What is the value of activation energy?

(1) $2.2 \times 10^3\ J\ mol^{-1}$ (2) $2300\ J\ mol^{-1}$ (3) $2.2 \times 10^4\ J\ mol^{-1}$ (4) $220\ J\ mol^{-1}$

Ans. **(3)**

15. In Arrhenius equation, $k = Ae^{-E_a/RT}$, A may not be termed as rate constant

(1) When 100% reactant will convert into the product

(2) When the temperature becomes infinite

(3) When the fraction of molecule crossing over the energy barrier becomes unity

(4) At very low temperature

Ans. **(4)**

16. The rate constant of the production of 2B(g) by the reaction,

$A(g) \xrightarrow{\Delta} 2B(g)$ is $2.48 \times 10^{-4}\ s^{-1}$

A 1:1 molar ratio of A to B in the reaction mixture is attained after

(1) 26.25 minute (2) 27.25 minute (3) 28.25 minute (4) 0 minute

Ans. **(2)**

17. Two substances A and B are present such that $[A]_0 = 4[B]_0$ and half life of A is 5 minute and that of B is 15 minute. If they start decaying at the same time following first order kinetics how much time will the concentration of both of them would be the same ?

(1) 15 minute (2) 10 minute (3) 5 minute (4) 12 minute

Ans. **(1)**

18. If the rate of reaction increases by 27 times, when temperature is increased by 30 K, then temperature coefficient of the reaction is

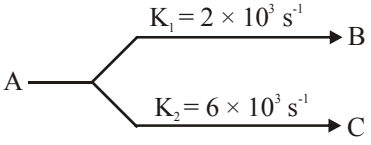
(1) 3 (2) 2 (3) 1 (4) 2.5

Ans. **(1)**

19. The reaction $A \rightarrow B$ follows first order kinetics. The time taken for 0.80 mole of A to produce 0.60 mole of B is 1 hour. What is the time taken for conversion of 0.90 mole of A to produce 0.675 mole of B ?

(1) 1 hour (2) 30 min (3) 15 min (4) 5 min

Ans. **(1)**

20. If, 

find B%

(1) 25% (2) 50% (3) 75% (4) 80%

Ans. **(1)**

21. For a first order reaction :–

(1) The degree of dissociation is equal to $(1–e^{-KT})$

(2) The preexponential factor in the arrhenius equation has the dimension of $time^{-1}$

(3) A plot of reciprocal concentration of the reaction v/s time gives a straight line

(4) 1 & 2 both

Ans. **(4)**

22. Azo isopropane decomposes according to the equation :–

$$(CH_3)_2CHN=NCH(CH_3)_2\,(g) \xrightarrow{250-290^0\,C} N_2(g)+C_6H_{14}(g)$$

It is found to be a first order reaction. If initial pressure is P_o and pressure of the mixture at time t is (P_t) then rate constant K would be :–

(1) $K = \frac{2.303}{t} \log\frac{P_o}{2P_o - P_t}$ (2) $K = \frac{2.303}{t} \log\frac{P_o - P_t}{P_o}$

(3) $K = \frac{2.303}{t} \log\frac{P_o}{P_o - P_t}$ (4) $K = \frac{2.303}{t} \log\frac{2P_o}{2P_o - P_t}$

Ans. **(1)**

23. Arrhenius equation may be written as :–

(1) $\frac{d}{dT}(\ell n\ K) = -\frac{Ea}{RT}$ (2) $\frac{d}{dT}(\ell n\ K) = -\frac{Ea}{RT^2}$

(3) $\frac{d}{dT}(\ell n\ K) = +\frac{Ea}{RT^2}$ (4) $\frac{d}{dT}(\ell n\ K) = \frac{Ea}{RT}$

Ans. **(3)**

24. A reagent undergoes 90% decomposition in 366 min. According to first order reaction. It's half life is :–

(1) $366 \times 100\left(\frac{\ell n\ 2}{90}\right)$ (2) $366\left(\frac{\ell n\ 2}{\ell n\ 10}\right)$ (3) $\frac{1}{366}$ (4) 183

Ans. **(2)**

25. Which of the following statement is flase :-

(1) A fast reaction has a larger rate constant and short half life

(2) For a first order reaction, succession half lives are equal

(3) For a first order reaction, the half life is independent of concentration

(4) The half life of a reaction is half the time required for the reaction to go to completion

Ans. **(4)**

26. The reaction

$CH_3COOC_2H_5 + NaOH \rightarrow CH_3COONa + C_2H_5OH$ is :-

(1) Bimolecular reaction (2) II order reaction (3) Both (1) & (2) (4) None

Ans. **(3)**

27. Correct expression for the first order reaction is:-

(1) $C_t = C_0\ e^{k_1 t}$ (2) $C_t\ e^{k_1 t} = C_0$ (3) $\ell n\ \frac{C_0}{C_t} = -k_1 t$ (4) $\ell n\ \frac{C_t}{C_0} = k_1 t$

Ans. **(2)**

28. In a first order reaction, the concentration of the reactant, decreases from 0.8 M to 0.4 M in 15 minutes. The time taken for the concentration to change from 0.1 M to 0.025 M is

(1) 7.5 min (2) 15 min (3) 30 min (4) 60 min

Ans. **(3)**

29. The rate equation for the reaction 2A +B $\rightarrow$ C is found to be : rate= k[A][B]. The correct statement in relation to this reaction is that the

(1) rate of formation of C is twice the rate of disappearance of A.

(2) Half life is a constant

(3) unit of k must be s^{-1}

(4) value of k is independent of the initial concentrations of A and B

Ans. **(4)**

30. The half-life of a radio isotope is four hours. If the initial mass of the isotope was 200 g, the mass remaining after 24 hours undecayed is :

(1) 3.125 g (2) 2.084 g (3) 1.042 g (4) 4.167 g

Ans. **(1)**

31. For the reaction A + 2B $\rightarrow$ Product, the differential rate equation is :-

(1) $-\frac{1}{2}\frac{d[A]}{dt} = \frac{-d[B]}{dt} = K[A][B]^2$ (2) $\frac{1}{2}\frac{d[A]}{dt} = \frac{d[B]}{dt} = K[A][B]^2$

(3) $\frac{-d[A]}{dt} = -\frac{1}{2}\frac{d[B]}{dt} = K[A][B]^2$ (4) $\frac{dA}{dt} = \frac{1}{2}\frac{d[B]}{dt} = K[A][B]^2$

Ans. **(3)**

32. The $t_{1/2}$ of a reaction is halved as the initial concentration of the reactant is doubled. What is the order of reaction?

(1) First order (2) Zero order (3) Second order (4) Third order

Ans. **(3)**

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

(1) 32 times (2) 64 times (3) 10 times (4) 24 times

Ans. **(1)**

34. A reactant (A) forms two products :

$A \xrightarrow{k_1} B$, Activation Energy Ea_1

$A \xrightarrow{k_2} C$, Activation Energy Ea_2

If $Ea_2 = 2\ Ea_1$, then k_1 and k_2 are related as :-

(1) $k_1 = 2k_2e^{Ea_2/RT}$ (2) $k_2 = k_1e^{Ea_1/RT}$ (3) $k_2 = k_1e^{Ea_2/RT}$ (4) $k_1 = k_2e^{Ea_1/RT}$

Ans. **(4)**

35. For a first order reaction, (A) $\rightarrow$ products, the concentration of A changes from 0.1 M to 0.025M in 40 minutes. The rate of reaction when the concentration of A is 0.01 M is :-

(1) 1.73×10^{-4} M/min (2) 1.73×10^{-5} M/min (3) 3.47×10^{-4} M/min (4) 3.47×10^{-5} M/min

Ans. **(3)**

ASSERTION & REASON EXERCISE

These questions consist of two statements each, printed as *Assertion* and *Reason.* While answering these Questions you are required to choose any one of the following four responses.

A. If both Assertion & Reason are True & the Reason is a correct explanation of the Assertion.

B. If both Assertion & Reason are True but Reason is not a correct explanation of the Assertion.

C. If Assertion is True but the Reason is False.

D. If both Assertion & Reason are False.

1. ***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.
Ans. (C)

2. ***Assertion*** : The reaction having low value of activation energy are generally fast.
Reason : Temperature coefficient for reaction having low activation energy is large.
Ans. (C)

3. ***Assertion*** : Half life period is always independent of initial concentration.
Reason : Half life period is directly preportional to rate concentration.
Ans. (D)

4. ***Assertion*** : The molecularity of a reaction is a whole number other than zero, but generally less then 3.
Reason : The order of a reaction is always whole number
Ans. (C)

5. ***Assertion*** : In a reversible endothermic reaction activation energy of the forward reaction is higher than that of the backward reaction.
Reason : The threshold energy of the forward reaction is more than that of the backward reaction.
Ans. (C)

6. ***Assertion*** : The molecularity of the reaction $H_2 + Br_2 \longrightarrow 2HBr$ is 2 :

Reason : The order of the reaction is $\frac{3}{2}$

Ans. (B)

7. ***Assertion*** : Acid catalysed of ethyl acetate is a first order reaction.

Reason : Water does not take part in the reaction.
Ans. (C)

8. ***Assertion*** : For a first order reaction $t_{1/2}$ is independent of the inital concentration of reactants.

Reason : For a first order reaction $t_{1/2}$ is twice the t_{34}.
Ans. (B)

9. ***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.
Ans. (B)

10. ***Assertion*** : Formation of HI is a biomolecular reaction.

Reason : Two molecules of reactants are involved in this reaction.
Ans. (A)

11. ***Assertion :-*** In a first order reaction the rate constant double on doubling the initial concentration of the reaction. **[AIIMS 2010]**

Reason :- The rate constant varies directly with the concentration of the reactants in a first order reaction.
Ans. (D)

12. ***Assertion :-*** Two different reaction can never have same rate of reaction **[AIIMS 2011]**

Reason :- Rate of reaction always depends only on frequency of collision and Arrhenious factor

Ans. **(D)**

13. ***Assertion* :-** Rate of reaction double when concentration of reactant is double if it is a first order reaction.
***Reason* :-** Rate constant also double. **[AIIMS 2012]**

Ans. **(C)**

14. ***Assertion :-*** The order of a reaction can have fractional value. **[AIIMS - 2008]**

Reason :- The order of a reaction cannot be written from balanced equation of a reaction.

Ans. **(B)**

15. ***Assertion :-*** Average life of a radioactive element is that period in which 63% of it is decayed. **[AIIMS - 2007]**

Reason :- Average life : $\tau = 1.44t_{1/2}$

Ans. **(B)**

16. ***Assertion :-*** The hydrolysis of methyl acetate by dil. HCl is a pseudo first order reaction. **[AIIMS - 2007]**

Reason :- HCl acts as a catalyst for the hydrolysis.

Ans. **(B)**