TOPIC : CHEMICAL KINETIC

1. Which of the following is true for the reaction

$$N_2 + 3H_2 \rightarrow 2NH_3$$

(a) $\frac{d[N_2]}{dt} = 3\frac{d[H_2]}{dt}$ (b) $-\frac{d[N_2]}{dt} = +\frac{1}{3}\frac{d[H_2]}{dt}$

(c) $-\frac{2}{3}\frac{d[H_2]}{dt} = +\frac{d[NH_3]}{dt}$ (d) $-3\frac{d[H_2]}{dt} = 2\frac{d[NH_3]}{dt}$

2. A reaction has rate lass expression as

$$\text{rate} = k\,[A]^{3/2}\,[B]^{-1/2}$$

The order of the reaction is

(a) 1 (b) 2

(c) 3/2 (d) –1/2

3. The unit of rate constant for a third order reaction is

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

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

4. The hydrolysis of ethyl acetate,

$$CH_3COOC_2H_5 + H_2O \xrightarrow{H+} CH_3COOH + C_2H_5OH$$

is a reaction of

(a) Fseudo first order (b) Second order

(c) Third order (d) Zero order

5. Which of the following statements is false ?

(a) First reactions have low activation energy

(b) Activation energy of a reaction depends on the chemical nature of reactants and products.

(c) With increase in temperature the rate of reaction decreases in case of exothermic reactions

(d) A catalyst increases the rate of reaction by decreasing the activation energy of the reaction.

6. Which of the following is an acceptable value of molecularity ?

(a) 5 (b) 0

(c) 3/2 (d) 2

7. For producing the effective collisions, the colliding molecules must posses

(a) a certain minimum amount of energy

(b) energy equal to or greater than threshold energy

(c) proper geometry

(d) threshold energy and proper orientation

8. On increasing the temperature of a slow reaction by 10^o.

(a) threshold energy increases

(b) activation energy decreases

(c) number of collisions gets doubled

(d) value of rate constant increases

9. Which of the following reactions in correct ?

(a) $k = Ae^{E_a/RT}$ (b) $\ln k - \ln A = \frac{E_a}{RT}$

(c) $\ln A - \ln k = \frac{E_a}{RT}$ (d) $\ln A - \ln k = -\frac{E_a}{RT}$

10. For a zero order reaction, $A \rightarrow B$, $t_{1/2}$ is proportional to

(a) [A] (b) $[A]^{1/2}$

(c) $[A]^0$ (d) $[A]^2$

11. $t_{1/2}$ of first order reactions is given by $\frac{0.693}{k}$, $t_{3/4}$ would be equal to

(a) $\frac{0.693}{k}$ (b) $\frac{0.346}{k}$

(c) $\frac{1.386}{k}$ (d) $\frac{0.924}{k}$

12. For which of the following reactions k_{310}/k_{300} would be maximum

(a) $A + B \rightarrow C$; E_a = 50 kJ

(b) $X + Y \rightarrow Z$; E_a = 40 kJ

(c) $P + Q \rightarrow R$; E_a = 60 kJ

(d) $E + F \rightarrow G$; E_a = 100 kJ

13. For a first order reaction $A \rightarrow B$, $t_{1/2}$ is proportional is

(a) $[A]^{1/2}$ (b) [A]

(c) $[A]^o$ (d) $[A]^2$

14. For the reaction,

$$2A + B + C \rightarrow \text{Products}$$

the rate law equation is

$$r = k\,[A]\,[B]^{-1/2}\,\,[C]^o$$

The rate of the reaction increases with increase in the concentration of

(a) A only (b) B only

(c) C only (d) A or B

15. In several experiments on the kinetics of the reaction A + B $\rightarrow$ products, the rate is doubled on doubling the initial concentration of B keeping that of A fixed. On doubling the initial concentration of both A and B, the rate increased by a factor of 8. The rate equation is

(a) $r = k[A]^o [B]$ (b) $r = k[A] [B]$

(c) $r = k[A] [B]^o$ (d) $r = k[A]^2 [B]^2$

16. Phosphorus undergoes slow combustion and glows in dark. This process is called

(a) phosphorescence (b) fluorescence

(c) photosensitization (d) chemiluminscence

17. For the reaction, $N_2 + 3H_2 \rightarrow 2NH_3$, the rate of disappearance of H_3 is 0.01 mol L^{-1} min^{-1}. The rate of appearance of NH_3 would be

(a) 0.01 mol L^{-1} min^{-1} (b) 0.02 mol L^{-1} min^{-1}

(c) 0.007 mol L^{-1} min^{-1} (d) 0.002 mol L^{-1} min^{-1}

18. The dimensions of rate constant in a zero order reaction are

(a) L mol sec^{-1} (b) mol L^{-1} sec^{-1}

(c) dimensionless (d) sec^{-1}

19. A graph of ln k vs $\left(\frac{1}{T}\right)$ has slope equal to

(a) $-\frac{E}{2.303R}$ (b) $+\frac{E_a}{R}$

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

20. For a particular reaction, the rate expression is given as $r = k [A] [B]^{0.5}$. If the volume of vessel is reduced to one-fourth of the initial volume, the rate of reaction would

(a) decreases 1/4 times

(b) increase by 8 times

(c) decrease 1/8 times

(d) remains unaffected

21. Which of the following reactions is the fastest ?

(a) $H_2(g) + I_2(g) \rightarrow 2HI(g)$

(b) $CH_4(g) + I_2(g) \rightarrow CH_3I(g) + HI(g)$

(c) $N_2(g) + O_2(g) \rightarrow 2NO(g)$

(d) $AgNO_3(aq) + KI(aq) \rightarrow AgI(s) + KNO_3(aq)$

22. Chemical reactions of the type

$$X \xrightarrow{k_1} Y \xrightarrow{k_2} Z$$

are called

(a) Consecutive reactions

(b) Parallel reactions

(c) Reversible reactions

(d) Chain reactions

23. For a reaction, 2A + 3B $\rightarrow$ 2C + D, the rate of reaction becomes double when conc. of A is doubled and becomes four times when conc. of both A and B are increased four times. The rate law for the reaction may be written as

(a) $r = k[A] [B]$ (b) $r = k [A] [B]^0$

(c) $r = k [A]^2 [B]^2$ (d) $r = k [A] [B]^2$

24. For a first order reaction, half-life of the reaction is independent of

(a) Temperature (b) Catalyst

(c) Conc. of reactants (d) None of these

25. Arrhenius equation may be written as

(a) $\frac{d\ln k}{dT} = \frac{E_a}{RT} f$ (b) $\frac{d\ln k}{dT} = -\frac{E_a}{RT^2}$

(c) $\frac{d\ln k}{dT} = -\frac{E_a}{RT}$ (d) $\frac{d\ln k}{dT} = \frac{E_a}{RT^2}$

26. The equation for the rate constant is

$$k = Ae^{-E_a/RT}$$

The value of k decreases with

(a) Increase in T (b) Decrease in E_a

(c) Decrease ln T (d) None of these

27. If the rate law for a reaction is rate = $k[A] [B]^2$, the units of k would be

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

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

28. For a zero order reaction $t_{1/2}$ = 4 hours when the initial conc. of the reactants is 4 mol L^{-1}, $t_{3/4}$ for the reaction would be

(a) 4 hours (b) 6 hours

(c) 8 hours (d) 12 hours

29. The rate of equation for the reaction $2X + Y \rightarrow C + D$ is found to be, rate = k[X] [Y].Which of the following statements about the reaction is true ?

(a) $t_{1/2}$ is constant

(b) the unit of k is s^{-1}

(c) the value of k depends upon the initial concentration of X and Y

(d) none of these is true.

30. For a hypothetical reaction, 2A + B $\rightarrow$ Productions, the rate constant, k is equal to 5.6×10^{-6} L mol^{-1} s^{-1}. The order of the reaction is

(a) One (b) Two

(c) Three (d) Fractional

31. The following mechanism has been proposed for a reaction :

$A + B \rightarrow C + D$ (Slow)

$A + C \rightarrow E$ (Fast)

$2A + B \rightarrow D + D$

The rate law expression for the reaction is

(a) $r = k [A]^2[B]$ (b) $r = k [A] [B]$

(c) $r = k [A]^2$ (d) $r = k [A] [C]$

32. An endothermic reaction, A $\rightarrow$ B, has an activation energy as x kJ mol^{-1} of A. If energy change of the reaction is y kJ, the activation energy of reverse reaction is

(a) $-x$ (b) $x - y$

(c) $x + y$ (d) $y - x$

33. For a first order reaction, $t_{0.75}$ is 1386 seconds. Therefore, the specific rate constant is

(a) 10^{-1} s^{-1} (b) 10^{-3} s^{-1}

(c) 10^{-2} s^{-1} (d) 10^{-4} s^{-1}

34. Ratio $t_{7/8}/t_{1/2}$ for a first order reaction would be equal to

(a) 7 (b) 2

(c) 8 (d) 3

35. For a zero order reaction, A $\rightarrow$ B, a graph or rate vs time has slope equal to

(a) k (b) – k

(c) zero (d) –2.303 k.

36. In a first order reaction, 75% of the reactants disappeared in 1.386 hr. What is the reat constant?

(a) 3.6×10^{-3} s^{-1} (b) 2.7×10^{-4} s^{-1}

(c) 72×10^{-3} s^{-1} (d) 1.8×10^{-3} s^{-1}

37. The activation energy for the forward reaction

$A + B \rightarrow C + D - 20$ kJ

is 30 kJ. The activation energy for the reverse reaction is

(a) 48 kJ (b) 50 kJ

(c) 10 kJ (d) –10 kJ

38. 75% of a first order reaction was completed in 32 minutes. The half-life of the reaction is

(a) 24 min (b) 16 min

(c) 32 min (d) 8 min

39. A gaseous reaction,

$2A(g) + B(g) \rightarrow 2C(g)$,

shows a decrease in pressure from 120 mm to 100 mm in 10 minutes. The rate of appearance of C is

(a) 2 mm/min (b) 4 mm/min

(c) 10 mm/min (d) 12 mm/min

40. A hypothetical reaction, A_2, $B_2 \rightarrow 2AB$ follows the mechanism as given below :

$A_2 \rightleftharpoons A + A$

$A + B_2 \rightarrow AB + B$ (Slow)

$A + B \rightarrow AB$

$A_2 + B_2 \rightarrow 2AB$

41. The reaction

$2NO + Br_2 \rightarrow 2NOBr$

follows the mechanism given below

I. $NO + Br_2 \rightleftharpoons NOBr_2$ …Fast

II. $NOBr_2 + NO \rightarrow 2NOBr_2$ …Slow

The overall order of this reaction is

(a) 2 (b) 1

(c) 3 (d) None of these

42. For a first order reaction, A $\rightarrow$ B, $t_{1/2}$ = 1 hr. what fraction of the initial conc. of A reacts in 4 hrs ?

(a) 15/18 (b) 1/16

(c) 7/8 (d) 1/8

43. For a first order reaction having the initial conc. a mol L^{-1} and the rate constant k, the half-life period is equal to

(a) $\frac{0.693}{k.\alpha}$ (b) $\frac{\ln 2}{k}$

(c) $\frac{\log 2}{k}$ (d) $\frac{\log 2}{k\sqrt{\alpha}}$

44. A first order reaction is 50% complete in 100 minutes. The time required for 100% completion would be

(a) 100 minutes (b) 200 minutes

(c) 50 minutes (d) Infinite

45. The reaction, $2O_3 \rightarrow 3O_2$, proceeds through he mechanism given below :

$O_3 \rightleftharpoons O_2 + O$ …fast

$O_3 + O \rightarrow 2O_2$ …slow

The rate law expression for the reaction would be

(a) $r = k [O_3]^2 [O_2]^{-1}$ (b) $r = k [O_3]^2 [O_2]$

(c) $r = k [O_3] [O_2]$ (d) $r = k [O_3]^2$

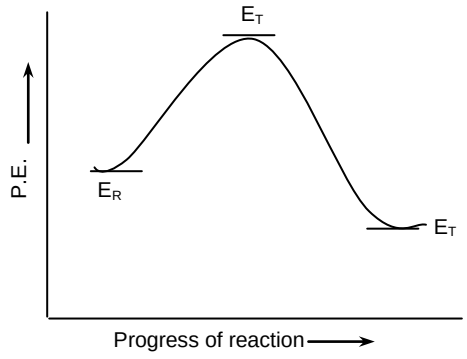
46. In the accompanied diagrams, indicating E_R, E_T and E_P as the energies of reactants, activated complex and products respectively which of the following is correct ?

(a) Forward reaction is slow

(b) Backward reaction is slow

(c) Reaction is exothermic

(d) Reaction is endothermic



47. Consider a reaction A $\rightarrow$B + C. If the initial concentration of A was reduced from 2 M to 1 M in 1 hour and then from 1 M to 0.25 M in 2 hours, the order of the reaction is

(a) 1 (b) 0

(3) 2 (d) 3

48. For reaction $E_a = 0$ and $K = 3.2 \times 10^4\ s^{-1}$ at 300 K. The value of k at 310 K would be

(a) $6.4 \times 10^4\ s^{-1}$ (b) $3.2 \times 10^4\ s^{-1}$

(c) $3.2 \times 10^8\ s^{-1}$ (d) $3.2 \times 10^5\ s^{-1}$

49. For a chemical reaction, 2A + 2B $\rightarrow$ C + D, the order of reaction is one with respect to A and one with respect to B. The initial rate of the reaction is 4×10^{-2} mol L^{-1} s^{-1}. When 50% of the reactants are converted into products, the rate of the reaction would become

(a) 2×10^{-2} mol L^{-2} s^{-1} (b) 1×10^{-2} mol L^{-1} s^{-1}

(c) 4×10^{-2} mol L^{-1} s^{-1} (d) 2×10^{-1} mol L^{-1} s^{-1}

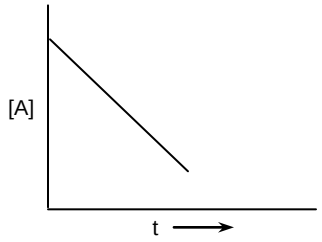
50. For a particular gaseous reaction a graph was plotted as shown below. It shows that the reaction of A is

(a) Zero order w.r.t. A

(b) 1st order w.r.t. A

(c) second order w.r.t. A

(d) a non-integer order w.r.t. A



ANSWERS KEY

1	C	**11**	C	**21**	D	**31**	B	**41**	C
2	A	**12**	D	**22**	A	**32**	B	**42**	A
3	D	**13**	C	**23**	B	**33**	B	**43**	B
4	A	**14**	A	**24**	C	**34**	D	**44**	D
5	C	**15**	A	**25**	D	**35**	C	**45**	A
6	D	**16**	D	**26**	C	**36**	A	**46**	C
7	D	**17**	C	**27**	C	**37**	C	**47**	A
8	D	**18**	B	**28**	C	**38**	B	**48**	B
9	C	**19**	D	**29**	D	**39**	B	**49**	B
10	A	**20**	B	**30**	B	**40**	C	**50**	A