ABHINAV ACADEMY

UDUPI

CET25C3 CHEMICAL KINETICS

Class 12 - Chemistry

Time Allowed: 1 hour and 30 minutes **Maximum Marks: 75**

1. For the reaction $A \leftrightarrow B,\ \triangle H = +40kJ/mol$. IF E_a for the forward reaction is 60 kJ/mol. E_a for the backward reaction is **[1]**

   a) 20 kJ/mol
   b) 80 kJ/mol
   c) 140 kJ/mol
   d) 100 kJ/mol

2. For the reaction A $\rightarrow$ products, at $[A]\ =\ 0.4\ M,\ t_{1/2} = 24\ s$ and at $[A]\ =\ 0.2\ M,\ t_{1/2} =\ 12\ s$. The unit for the rate constant is **[1]**

   a) S^{-2}
   b) mol $L^{-1}s^{-1}$
   c) $L^2/mol^2/s$
   d) S^{-1}

3. Name the order of reaction which proceeds with a uniform rate throughout. **[1]**

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

4. Reaction which takes place in one step is known as **[1]**

   a) Elementary reaction
   b) Unimolecular reaction
   c) Reaction rate
   d) Bimolecular reaction

5. Which among the following is an example of pseudo first order reaction? **[1]**

   a) Decomposition of nitrogen pentoxide
   b) Acid catalysed hydrolysis of ethyl acetate
   c) Dehydration of oxalic acid
   d) Decomposition of hydrogen peroxide

6. Milk turns sour at 40°C three times faster than it does at 0°C. this shows that activation energy of souring of milk (in cal) is **[1]**

   a) $\frac{4.606\times40}{273\times313}\log 3$
   b) $\frac{2.303\times273\times313\times8.314\times\log 3}{40}$
   c) $\frac{4.606\times273\times313}{40}\log\frac{1}{3}$
   d) $\frac{2.303\times273\times313}{40}\log 3$

7. In a chemical reaction X $\rightarrow$ Y, it is found that the rate of reaction doubles when the concentration of X is increased four times. The order of the reaction with respect to X is **[1]**

   a) $\frac{1}{2}$
   b) 2
   c) 1
   d) 0

8. The ionic reactions are generally very fast because **[1]**

   a) It does not involve bond breaking
   b) The number of collisions between ions are very large

c) Reactions are highly exothermic

d) The energy of interaction between charged ion is greater than between neutral molecules

9. In the presence of a catalyst, the activation energy of a reaction is lowered by 2 kcal at 27°C. The rate of reaction will increase by **[1]**

a) 20 times

b) 28 times

c) 14 times

d) 2 times

10. Rate of ionic reactions are generally **[1]**

a) Very fast

b) Slow

c) Moderate

d) Very slow

11. Which of the following represent Arrhenius Equation? **[1]**

a) $k = Ae^{\frac{-Ea}{RT}}$

b) $dk = Ae^{\frac{Ea}{T}}$

c) $k = Ae^{\frac{Ea}{R}}$

d) $k = Ae^{\frac{Ea}{RT}}$

12. The unit of rate constant for the reaction 2A + 2B $\rightarrow$ A_2B_2 which has rate = k $[A]^2[B]$ is: **[1]**

a) s^{-1}

b) mol L^{-1}

c) mol L^{-1} s^{-1}

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

13. The slope in the plot of log $\frac{[R]_0}{[R]}$ vs. time for a first order reaction is **[1]**

a) -k

b) $\frac{-k}{2.303}$

c) $\frac{+k}{2.303}$

d) +k

14. The number of molecules that react with each other in an elementary reaction is a measure of the: **[1]**

a) molecularity of the reaction

b) stoichiometry of the reaction

c) order of the reaction

d) activation energy of the reaction

15. A first order reaction takes 30 minutes for 50% completion. The value of rate constant k would be: **[1]**

a) 2.31×10^{-3} min^{-1}

b) 1.25×10^{-3} min^{-1}

c) 2.75×10^{-4} min^{-1}

d) 2.5×10^{-3} min^{-1}

16. The rate of the first-order reaction is $0.69 \times 10^{-2} mol\, L^{-1} \min^{-1}$ and the initial concentration is $0.2 mol\, L^{-1}$ the half-life period is: **[1]**

a) 1200 s

b) 600 s

c) 0.33 s

d) 1 s

17. Which among the following is an example of first order reaction? **[1]**

a) Inversion of cane sugar

b) Formation and dissociation of ozone

c) Decomposition of nitrogen pentoxide

d) Acid catalysed hydrolysis of ethyl acetate

18. The rate law for a particular reaction is given as rate = $k[A][B]^2$. **[1]**
How is the rate of reaction affected if we double the concentration of B?

a) becomes half $(\frac{1}{2})$

b) three times

c) two times

d) four times

19. For a reaction 2A $\rightarrow$ 3B, rate of reaction $-\frac{d[A]}{dt}$ is equal to **[1]**

a) $\frac{+3}{2}\frac{d[B]}{dt}$

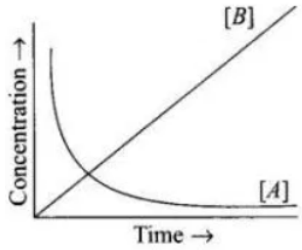
b) $+\frac{2\,d[\,B]}{dt}$

c) $\frac{+1}{3}\frac{d[B]}{dt}$

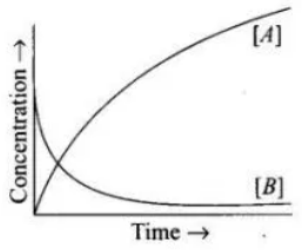
d) $\frac{+2}{3}\frac{d[B]}{dt}$

20. Consider the reaction A $\rightleftharpoons$ B. The concentration of both the reactants and the products varies exponentially with time. Which of the following figures correctly describes the change in concentration of reactants and products with time? **[1]**

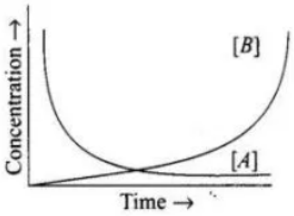
a)



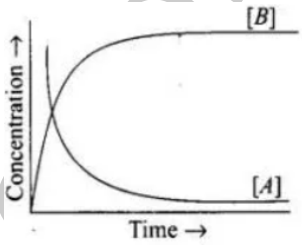
b)



c)



d)



21. Which among the following is an example of photochemistry used in our daily life? **[1]**

a) In photography

b) In inversion of cane sugar

c) All of these

d) In decomposition of hydrogen peroxide

22. If 75% of a first order reaction was completed in 32 min, then 50% of the reaction was completed in_____. **[1]**

a) 24 min

b) 4 min

c) 16 min

d) 8 min

23. Which of the following expressions is correct for the rate of reaction given below? **[1]**

$5Br^{-}(aq) + BrO^{-}_{3}(aq) + 6H^{+}(aq) \rightarrow 3Br_2(aq) + 3H_2O(l)$

a) $\frac{\Delta[Br^-]}{\Delta t} = \frac{5}{6}\frac{\Delta[H^+]}{\Delta t}$

b) $\frac{\Delta[Br^-]}{\Delta t} = 6\frac{\Delta[H^+]}{\Delta t}$

c) $\frac{\Delta[Br^-]}{\Delta t} = 5\frac{\Delta[H^+]}{\Delta t}$

d) $\frac{\Delta[Br^-]}{\Delta t} = \frac{6}{5}\frac{\Delta[H']}{\Delta t}$

24. For the reaction 3A $\rightarrow$ 2B, rate of reaction $-\frac{d[A]}{dt}$ is equal to **[1]**

a) $\frac{+1}{3}\frac{d[B]}{dt}$

b) $\frac{+2}{3}\frac{d[B]}{dt}$

c) $\frac{+1}{2}\frac{d[B]}{dt}$

d) $\frac{+3}{2}\frac{d[B]}{dt}$

25. For a chemical reaction 2X + Y $\rightarrow$ Z, the rate of appearance of Z is 0.05 mol $L^{-1}min^{-1}$. The rate of disappearance of X will be: **[1]**

a) 0.05 mol L^{-1} min^{-1}

b) 0.1 mol$L^{-1}min^{-1}$

c) 0.25 mol L^{-1} min^{-1}

d) 0.05 mol $L^{-1}hour^{-1}$

26. The slope in the plot of [R] vs. time for a zero order reaction is **[1]**

a) -k

b) $\frac{-\mathrm{k}}{2.303}$

c) $\frac{+\mathrm{k}}{2.303}$

d) +k

27. Which of the following relations is incorrect? **[1]**

a) $\mathrm{G} = \mathrm{k}\left(\frac{\mathrm{a}}{l}\right)$

b) $\mathrm{G} = \mathrm{k}\left(\frac{l}{\mathrm{a}}\right)$

c) $\wedge_{\mathrm{m}} = \frac{\mathrm{k}}{\mathrm{c}}$

d) $\mathrm{R} = \frac{1}{\mathrm{k}}\left(\frac{l}{\mathrm{a}}\right)$

28. Value of Henry's constant K_H: **[1]**

a) increases with decrease in temperature.

b) remains constant.

c) increases with increase in temperature.

d) decreases with increase in temperature.

29. 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]**

a) Equal to ΔH

b) Zero

c) More than ΔH

d) Less than ΔH

30. In a reaction, 2A $\rightarrow$ products, the concentration of A decreases from 0.5 mol/L to 0.4mol/L in 10 mins. Calculate the rate during this interval. **[1]**

a) 2×10^{-2} mol $L^{-1}s^{-1}$

b) 0.005 mol $L^{-1}min^{-1}$

c) 1.33×10^{-4} mol $L^{-1}min^{-1}$

d) 2.22 mol $L^{-1}min^{-1}$

31. The half-life for a zero order reaction equals: **[1]**
where R is the initial concentration.

a) $\frac{R^2}{2k}$

b) $\frac{R}{2k}$

c) $\frac{1}{2}\frac{\mathrm{k}}{\mathrm{R}^2}$

d) $\frac{2\mathrm{k}}{\mathrm{R}}$

32. Unit of rate constant for the zero order reaction is: **[1]**

a) $mol^{-2}\ L^2\ s^{-1}$

b) mol $L^{-1}\ s^{-1}$

c) s^{-1}

d) $mol^{-1}\ L\ s^{-1}$

33. For the reaction A + 2B $\rightarrow$ C + D, the rate law is given by r = k[A] $[B]^2$, the concentration of A is kept constant while that of B is doubled. The rate of the reaction will: **[1]**

a) not change

b) become half

c) quadruple

d) double

34. The reaction $A \rightarrow B$ is a second order process when the initial concentration of A is 0.50 M, the half life is 8.0 minutes. What is the half life if the initial concentration of A is 0.10 M? **[1]**

a) 40.0 minutes

b) 1.6 minutes

c) 8.0 minutes

d) 16.0 minutes

35. The units for the rate constant for the second order reaction (concentration: mol $litre^{-1}$ time: s) are: **[1]**

a) s^{-1}

b) mol $litre^{-1}s^{-1}$

c) mol litre^{-2}s^{-1}

d) mol^{-1}litre s^{-1}

36. Thermal decomposition of a compound is of first order. If 50% of a sample of a compound is decomposed in 120 min, the time taken for 90% completion is **[1]**

a) 1000 min

b) 3988 min

c) 399 min

d) 400 min

37. The order of the reaction **[1]**

$H_2(g) + Cl_2(g) \xrightarrow{h\nu} 2HCl(g)$ is:

a) 3

b) 1

c) 0

d) 2

38. As temperature increases, the reaction rate: **[1]**

a) First decreases then increases

b) Increases

c) Decreases

d) Stays the same

39. Decomposition of H_2O_2 was studied by titration against $KMnO_4$ solution. It was found that 0.4 mol of H_2O_2 was reduced to 0.2 mol in 20 min and to 0.1 mol in 40 min and to 0.05 mol after 1 hr. the order of reaction must be **[1]**

a) 2

b) 1

c) 3

d) 0

40. The half life of a substance in a first order reaction is 15 min. The rate constant is **[1]**

a) $4.62 \times 10^{-2}\ min^{-1}$

b) $6.74 \times 10^{-2}\ min^{-1}$

c) $2.46 \times 10^{2}\ min^{-1}$

d) $7.18 \times 10^{2}\ min^{-1}$

41. Consider the Arrhenius equation given below and mark the correct option. **[1]**

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

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

b) Rate constant increases exponentially with decreasing activation energy and increasing temperature.

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

d) Rate constant decreases exponentially with increasing activation energy and decreasing temperature.

42. The reaction $2A \rightarrow B$ is first order in A with a rate constant of 2.8 determining $10^{-2}s^{-1}$. How long will it take for A to decrease from 0.88 M to 0.14 M? **[1]**

a) 76 s

b) 44 s

c) 66 s

d) 50 s

43. For a zero order reaction, the slope in the plot of [R] vs. time is (where, [R] is the final concentration of reactant) **[1]**

a) -k

b) $\frac{-k}{2.303}$

c) +k

d) $\frac{+k}{2.303}$

[1]

44. The slope in the log k vs. $\frac{1}{T}$ curve is 5.42×10^3. The value of the activation energy is approximately

a) 106 J/mol
b) 102 J/mol
c) 104 kJ/mol
d) 108 J/mol

45. The rate of reaction A + B $\rightarrow$ Products, is given by the equation r = k[A] [B]. If B is taken in large excess, the order of reaction would be: **[1]**

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

46. The rate constant for a first order reaction is equal to the initial rate of reaction when the initial concentration of the reactant is **[1]**

a) 0.1 M
b) 10 M
c) 1 M
d) 1×10^{-2} M

47. The role of a catalyst is to change _____. **[1]**

a) gibbs energy of reaction
b) equilibrium constant
c) enthalpy of reaction
d) activation energy of reaction

48. The unit of the rate of reaction is the same as that of the rate constant for a: **[1]**

a) it cannot be same
b) first order reaction
c) zero order reaction
d) second order reaction

49. A reaction is first order in A and second order in B. How is rate affected when concentration of both A and B are doubled? Choose the correct option: **[1]**

a) two times
b) eight times
c) four times
d) three times

50. The value of decay constant of a compound having a half life period of 2.95 days is **[1]**

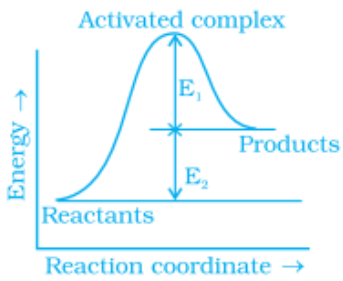
a) $3.0 \times 10^5 s^{-1}$
b) $2.71 \times 10^{-6} s^{-1}$
c) $2.9 \times 10^{-6} s^{-1}$
d) $2.9 \times 10^6 s^{-1}$

51. A reaction follows second order kinetics. How is the rate of reaction affected if the concentration of the reactant is reduced to half? Choose the correct value from the following: **[1]**

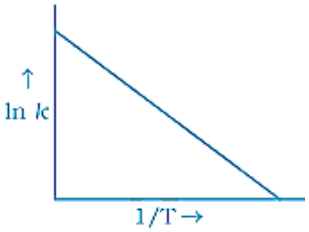
a) four times
b) $\frac{1}{4}$ of the original value
c) three times
d) eight times

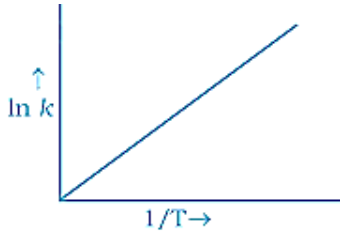
52. According to the Arrhenius equation rate constant k is equal to $Ae^{-E_a/RT}$. Which of the following options represents the graph of ln k vs $\frac{1}{T}$? **[1]**

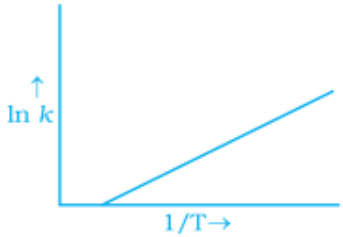
a)



b)



c) 

d) 

53. In the formation of sulphur trioxide $2SO_2(g) + O_2(g) \rightleftarrows 2SO_3(g)$. The rate of reaction is expressed as **[1]**

$-\frac{d[O2]}{dt} = 2.5 \times 10^{-4} mol\ L^{-1}s^{-1}$. The rate of disappearance of SO_2 will be

a) 50.0×10^{-4} mol $L^{-1}s^{-1}$

b) 3.75×10^{-4} mol $L^{-1}s^{-1}$

c) -2.25×10^{-4} mol $L^{-1}s^{-1}$

d) 5×10^{-4} mol $L^{-1}s^{-1}$

54. The half-life periods of a reaction at initial concentration of 0.1 mol/L and 0.5 mol/L are 200 s and 40 s respectively. The order of the reaction is **[1]**

a) 2

b) $\frac{1}{2}$

c) 0

d) 1

55. For the reaction 3A → 2B, rate of reaction $+\frac{d[B]}{dt}$ is equal to **[1]**

a) $\frac{-3}{2}\frac{d[A]}{dt}$

b) $\frac{-1}{3}\frac{d[A]}{dt}$

c) $+\frac{2\,d[A]}{dt}$

d) $\frac{-2}{3}\frac{d[A]}{dt}$

56. The half-life period for a zero order reaction is equal to **[1]**

(where $[R]_0$ is initial concentration of reactant and k is rate constant.)

a) $\frac{0.693}{k}$

b) $\frac{2.303}{k}$

c) $\frac{2k}{[R]_0}$

d) $\frac{[R]_0}{2k}$

57. Which of the following rate laws is third order overall? **[1]**

a) rate $= K[A]^5[B]^2$

b) rate $= K[A][B]^2$

c) rate $= K[A]^3[B]^3$

d) rate $= K[A]^3[B]^1$

58. The unit of rate constant depends upon the: **[1]**

a) temperature of the reaction

b) molecularity of the reaction

c) activation energy of the reaction

d) order of the reaction

59. For a zero order reaction of the type A → products, the rate equation may be expressed as: **[1]**

a) $k = \frac{[A]_0 - [A]}{2t}$

b) $k = \frac{[A]_0 - [A]}{2} \cdot t$

c) $k = \frac{[A] - [A]_0}{t}$

d) $k = \frac{[A]_0 - [A]}{t}$

60. The reaction A+2B → C+D obeys the rate equation, Rate = $k[A]^x[B]^y$ what would be the order of this reaction? **[1]**

a) x

b) x + y

c) x – y

d) Cannot be predicted with the equation

61. Consider the reaction **[1]**

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

The equality relation between $\frac{d[NH_3]}{dt}$ and $\frac{-d[H_2]}{dt}$ is:

a) $\frac{d[NH_3]}{dt} = -\frac{1}{3}\frac{d[H_2]}{dt}$

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

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

d) $\frac{d[NH_3]}{dt} = -\frac{d[H_2]}{dt}$

62. The temperature coefficient of most of the reactions lies between **[1]**

a) 2 and 4

b) 1 and 4

c) 2 and 3

d) 1 and 3

63. When 10 g of radioactive isotope is reduced to 1.25 g in 12 years, the half life period of the isotope is **[1]**

a) 4 years

b) 24 years

c) 16 years

d) 8 years

64. The slope in the plot of ln[R] vs. time for a first order reaction is **[1]**

a) $\frac{-k}{2.303}$

b) -k

c) $\frac{+k}{2.303}$

d) +k

65. The expression which gives 3/4th life of the first-order reaction is: **[1]**

a) $\frac{2.303}{k}\log 4$

b) $\frac{2.303}{k}\log 3$

c) $\frac{k}{2.303}\log 4/3$

d) $\frac{k}{2.303}\log 3/4$

66. E_a for the reaction is 1.18×10^5J/mol. The slope of the graph of log k vs. 1/T is **[1]**

a) – 672.1

b) – 6162

c) – 6721

d) – 1036

67. If the initial concentration is reduced to $\frac{1}{4}^{th}$ in a zero order reaction, then the time taken for half the reaction to complete: **[1]**

a) remains the same

b) doubles

c) increases four times

d) reduces to one-fourth

68. The reaction $2\ NO\ +\ Br_2 \rightarrow 2NOBr$ follows the mechanism given below: **[1]**

$NO + Br_2 \rightleftarrows NOBr_2(fast)$

$NOBr_2$ + NO $\rightarrow$ 2NOBr (slow)

If the concentration of both NO and Br_2 is increased two times, the rate of reaction would become:

a) 2 times

b) 8 times

c) 4 times

d) 6 times

69. A first order reaction is 50% completed in 1.26×10^{14} s. How much time would it take for 100% completion? **[1]**

a) infinite

b) 1.26×10^{15} s

c) 2.52×10^{28} s

d) 2.52×10^{14} s

70. If the reaction 2 A + 3 D $\rightarrow$ product is first order in A and second order in D, then the rate law will have the form: rate = **[1]**

a) $k[A][D]^2$

b) K [A] [D]

c) $K[A]^2[D]^2$

d) $K[A]^2[D]$

71. Activation energy of a reaction is **[1]**

a) The energy released during the reaction

b) Energy evolved when activated complex is formed

c) The minimum amount of energy required to overcome the barrier

d) The energy absorbed during a reaction

72. The half-life of a reaction is halved as the initial concentration of the reactant is doubled. The order of the reaction is: **[1]**

a) 1

b) 0

c) 2

d) 3

73. The rate constant of the reaction at temperature 200 K is 10 times less than the rate constant at 400 K. The activation energy of the reaction is: **[1]**

a) 460.6R

b) 921.2 R

c) 1842.4R

d) 230.3R

74. The slope of the line in the plot of concentration [A] Vs. time (s) indicate **[1]**

a) +k

b) -k

c) $\frac{+k}{2.303}$

d) $\frac{-k}{2.303}$

75. The following experimental rate data were obtained for a reaction carried out at 25°C: **[1]**

$A_{(g)} + B_{(g)} \rightarrow C_{(g)} + D_{(g)}$

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 $A_{(g)}$ - Second
Order with respect to $B_{(g)}$ - First

b) Order with respect to $A_{(g)}$ - Zero
Order with respect to $B_{(g)}$ - Second

c) Order with respect to $A_{(g)}$ - First
Order with respect to $B_{(g)}$ - Zero

d) Order with respect to $A_{(g)}$ - Second
Order with respect to $B_{(g)}$ - Zero