**CBSE Class 12 Chemistry**
Practice Paper
Chapter-2 Solutions

Very Short Answer Type Questions (1 Marks Questions)

1. A 500 am of tooth paste sample has 0.2 g of fluoride concentration. What is the concentration of fluoride in terms of ppm level?

2. Two liquids A and B boil at 135°C and 185°C respectively. Which of them has a higher vapour pressure at 80°C?

3. Write the possible structural arrangement of a mixture of chloroform and acetone to form a solution.

4. What is Van't Hoffs factor for a compound which undergoes tetramerization in an organic solvent?

5. Aquatic Species are more comfortable in cold waters rather than in warm water. Give reason.

Short Answer Type Questions (2 Marks Questions)

6. RBC's are placed in the given solutions as in figure (i) and (ii). What happens to RBC in test tube (i) and test tube (ii).
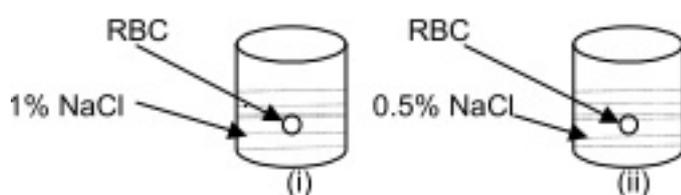
7. Given below is the sketch of a plant carrying out a process.
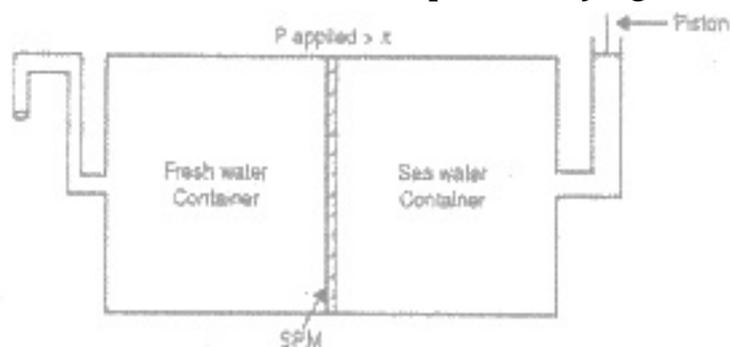
  i. Name the process occurring in the above plant.

ii. To which container does the net flow of the solvent takes place?

iii. Name one SPM which can be used in this plant.

iv. Give one practical use of the plant.

8. A solution of sucrose (Molar mass 342 a mol^{-1}) is prepared by dissolving 68.4 a in 1000g of water. What is the

   i. Vapour pressure of the solution at 293k.

   ii. Osmotic pressure at 293k.

   iii. Boiling point of the solution.

   iv. Freezing point of the solution.

   The vapour pressure of the water at 293k is 0.023atm. k_b =0.52k kg mol^{-1} & k_f = 1,86k kg mol^{-1}. Assume the solution to behave ideally.

9. Why calculations based on colligative properties of solutions sometimes do gives abnormal molecular mass values for solute? What are the nature of the abnormalities. 2a of C_6H_5COOH dissolved in 25a of benzene shows a depression in freezing point equal to 1.62k. Molal depression constant for benzene is 4.9k kg mol^{-1}. What is the Percentage (%) of association of acid, if it forms a dimer in solution?

10. Assuming complete dissociation, calculate the freezing point of a solution prepared by dissolving 6aof glaubers salt ($Na_2SO_4 \cdot _{10}H_2O$} in 0.100 kg of H_2O. Given k_f = 1,86k kg mol^{-1} Atomic mass of H_2O: 18 . Na : 23. S : 32, O : 16, H : 1 ail in amu units.

Short Answer Type Questions (3 Marks Questions)

11. A. Addition of Hal_2 to aa. Kl solution shows an increase in the vapour pressure why?

    B. A person suffering from high blood pressure is advised to take minimum quantity of common salt. Give reason.

12. A. Why the vapour pressure of a solution of glucose in water lower than that of water?

    B. 0.1 molal solution of glucose and NaCI respectively. Which one will have higher boiling point?

13. H_2S. a toxic gas with rotten egg like smell is used for qualitative analvsis. If the solubility of H_2S in water at STP is 0.195 m. calculate Henrv's law constant (k_H=282 bar)

14. Examine the following illustrations and answer the following Questions
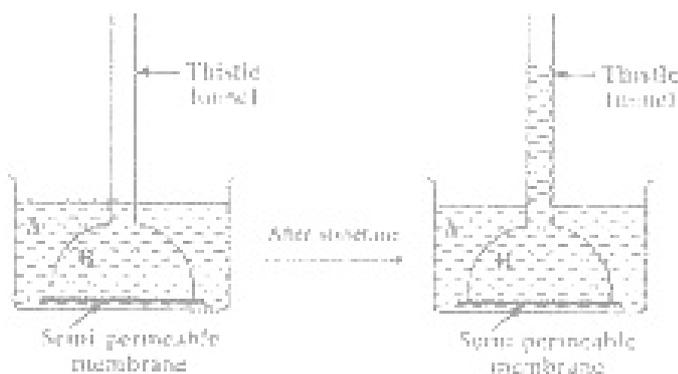
i. Identify the liquid A (pure water or sugar solution).

ii. Identify the liquid B (pure water or sugar solution).

iii. Why the level of liquid in thistle funnel has risen after-sometime?

iv. Name the phenomenon involved in this experiment and define it.

15. A storage battery contains a solution of H_2SO_4 38% by weight. At this concentration van't Hoff factor is 2.50. At what temperature will the battery contents freeze?
(k_f for water =1.86k kg/mol)

16. Following are the graphs for the vapour pressure of two component system as a function of composition. Answer the following Questions.
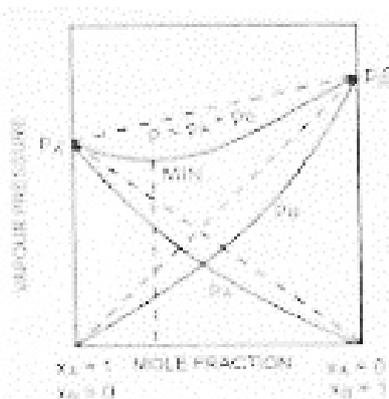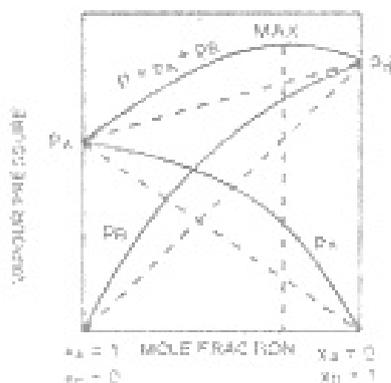

Fig (a)   Fig. (b)

i. What type of deviation is shown in fig. (a) and (b)?

ii. Give one example of solutions showing deviations in fig (a) (b).

iii. What change in the volume and temperature is observed in solutions of this type?

17. How does osmotic pressure depend on temperature and atmospheric pressure. what is the molar concentration of solute particles in the human blood, if the osmotic pressure is 7.2 atm at the body temperature of 37°C?

18. The vapour pressure of dilute aqueous solution of glucose ($C_6H_{12}O_6$) is 750 mm of mercury at 373K. Calculate

    i. Molality

    ii. Mole fraction of the solute

Long Answer Type Questions (5 Marks Questions)

19. The elements A and B form purely covalent compounds having molecular formulae AB_2 and AB_4. When dissolved in 20g of benzene. 1_g of AB_2 lowers the freezing point by 2.3K. whereas 1g of AB_4 lowers it by 1.3K. the molal depression constant for benzene is 5.1 K kg/mol. calculate the atomic mass of A and atomic mass of B. (A=25.59, B=42.641

20.   a. Why constant boiling mixtures behave like a single component when subjected to distillation

    b. What type of Azeotropic mixtures are formed by the following solution

      i. H_2O and HCI

      ii. H_2O and C_2H_5OH

    c. Give one practical application of depression of freezing point?

    d. A Solid solution is formed between two substances. One whose particles are very large and the other particles are very small. What type of solid solution is this likely to be?

    e. Write the Raoults Law for each component of a binary solution and show that the total vapour pressure of the solution may be expressed as $P = P°A + (P°B - P°A) X_B$

21. Vapour pressure of pure benzene at a certain temperature is 640 mm Ha. A non-volatile non-electrolyte solid weighing 2.175a is added to 39.0 of benzene. The vapour pressure of solution is 600 mm Ha. What is the molecular mass of solid substance? ($65.9a\ mol^{-1}$)

22. The degree of dissociation of $Ca(N03)_2$ in dilute solution aqueous solution containing 7.0a of the solute Der 100a of water at 100° C is 70 percent. If the vapour pressure of water at 100° C is 760mm. calculate the vapour pressure of the solution. (746.02mm)

23. What mass of a non-volatile solute urea (NH_2CONH_2) need to be dissolved in 100g of water in order to decrease the vapour pressure of water by 25%? also calculate the molality of the solution. (18.52m)

24. 8.0575×10^{-2} kg of Glauber's salt is dissolved in water to obtain 1 dm^3 of a solution of density 1077.2 ka m"3. Calculate the molarity. molality & mole fraction of Na_2S0_4 in the solution. (0.2508m. 0.0045. 0.25M)

25. To 500 cm^3 of water 3.0 × 10^{-3} kg of acetic acid is added. If 23% of acetic acid is dissociated, what will be the depression in freezing point? K_f and density of water are 1.86 K ka mol^{-1} & 0.997 a cm^{-3} respectively. (0.229K)

CBSE Class 12 Chemistry
Practice Paper
Chapter-3 Electrochemistry

2 Marks Questions

1. How many faraday of charge is required for conversion of $C_6H_5NO_2$ into $C_6H_5NH_2$?

   Explain why Zn dissolves in dil. HCI to liberate $H_2(g)$ but from conc.

2. H_2SO_4. the gas evolved is SO_2.

3. Cu does not dissolve in HCI but dissolves in nitric acid. Explain why?

4. Fluorine has a low electron gain enthalpy compared to chlorine, vet it is a more powerful oxidant. Explain why?

5. If Zn2+/Zn electrode is diluted 100 times, then what will be the change in emf?

6. You are aquainted with the construction and working of a lead-storage battery. Give the plausible reasons for these facts:

   1. There is only a simple compartment unlike other electrochemical cells.

   2. Replacement of water is necessary for maintenance.

7. For what concentration of Ag+(aq). will the emf of given cell be zero at \ 25 °C . if the concentration of Cu(s) I Cu^{2+}(0.1M) II Aa^+(aq.)1Ag(s)?

   Given. $E°_{Ag+/Ag}$=0.80V: $E°_{Cu2+/cu}$=0.34V.

8. In a small town along the costal area, it is observed that iron objects rust easily. Being an industrial town, it also faces air pollution problem. Identify any 4 factors which are contributing to rusting phenomenon.

9. lodinef(l_2) and Brominef(Br_2) are added to a solution containing iodide(l-) and bromide ions(Br-). What reaction would occur if the concentration of each species is 1M? The electrode potentials are $E°_{I2/I}$=0.54V and $E°_{Br2/Br-}$=1 .08V

### 3 Marks Questions

10. In an industrial plant. aluminium is produced bv elecrolysis of alumina dissolved in cryolite. This takes a current of 20000A. If the current efficiency is 90%. how much Al will be produced Der day?

11. In an experiment-0.04 F was passed through 400 mL of 1M soln. of NaCI. What would be DH-of the soln. after elecrolysis.

12. Estimate the minimum P.D. needed to reduce Al_2O_3 at 500 0 C. The free energy change for the decomposition reaction is 960 kJ.

    2/3 Al_2O_3 4/3 Al + O_2: DG = 960 kJ

13. A cell with N/50 KCI soln. offered a resistance of 550 ohms at 298 K. The Specific conductance of N/50 KCI at 298 K is 0.002768 ohm-1 cm-1. When the cell is filled with N/10 ZnS04 soln. it offered a resistance of 72.18 ohms at 298 K. Find the cell constant and molar conductance of $ZnSO_4$ soln. at 298K.

14. Which of the following has larger molar conductance:
    a. 0.08 M soln. having conductivity equal to 2×10^{-2} $ohm^{-1}cm^{-1}$.
    b. 0.10 M soln. having resistivity equal to 5.8 ohm cm.

15. The K_{Sp} of AaCI at 298 K is $1x 10^{-10}$. Calculate electrode potential of Ag electrode immersed in 1 M KCI soln..

    [Given: E° Ag^+/Ag = 0.799 V]

16. Tarnished silver contains Ag_2S. Can this tarnish be removed by immersing the tarnished silverware in an Al Dan containing an inert electrolyte soln. such as NaCI?
    Given that standard electrode potentials for half reactions are:

    $Ag_2S(s) + 2e- 2Ag(s) + S^{2-}$(aq.) is -0.71 V

    Al^{3+}(aq.) + 3e- AI(s) is -1.66 V.

5 Marks Questions

17. Observe the diagram carefully and answer the questions below:
    An external Opposite potential is applied such that it exceeds the cell potential.
    a. Is this an electrochemical cell or electrolytic cell?
    b. Which substance gets dissolved?
    c. Which substance gets deposited and where?
    d. Write half cell reactions.
   e. Is the needle in the voltmeter correctly marked?
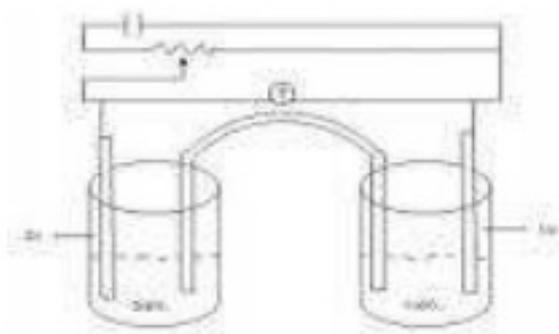
18. 2 beakers A and B contain 1 M $ZnSO_4$ solution. To A Strip of Ma is dipped. while in B. A zinc rod is put. If both are connected to a standard hydrogen electrode, which cell would show a deflection? Explain with suitable reason.

19. The standard electrode potentials of different electrodes are given as
$E^0_{CO^{3+}CO^{2+}}$ = 1 -81 V. $E^0_{Al^{3+}/Al}$ = -1 -66 V. $E^0_{Fe^{2+}/Fe}$ = -0.44 V. $E^0_{Br^2/Br^-}$=1.01 V

    a. Identify all the possible combination for construction of a feasible electrochemical cell?
    b. Write their electrochemical cell representation.
    c. Calculate the emf in each case.

20. a. During electrolysis of NaOH. CI_2 and H_2 while for molten NaCI only Na

    metal and Cl_2 gas are obtained. Explain these observations with suitable eon.

    b. Electrolysis of cone, and dil. sulphuric acid are different. Explain with eqn.

21. An Aa. solution of $AuCI_3$ was electrolysed with a current of 0.5A until 1,20g of Au had been deposited on the cathode. At another electrode in series with this, the only reaction was evolution of 0_2. Find—

    1. The no. of moles
    2. The volume at NTP
    3. The mass of 0_2 liberated
    4. the no. of coulombs passed through the solution and
    5. the duration of electrolysis

CBSE Class 12 Chemistry
Practice Paper
Chapter-4 (Chemical Kinetics)

Very Short Answer Question (1 Mark Questions)

1. Define the term 'rate of reaction'.

2. Mention the units of rate of reaction.

3. Express the rate of reaction in terms of Br- (aq) as reactant and Br_2 (aq) as product for the reaction:

   $5 Br^-(aq) + Br(aq) + 6H^+ (aq) \rightarrow 3 Br_2(a\ q) + 3H_2O(/)$
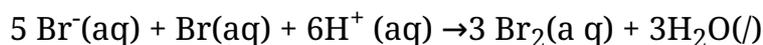
4. For a chemical reaction represented by R → P the rate of reaction is denoted by

 $$\frac{-\Delta[R]}{\Delta t} \ or \ \frac{+\Delta[P]}{\Delta t}$$

   Why a positive sign (+) is placed before $\frac{\Delta[P]}{\Delta t}$ and negative sign (-) before $\frac{\Delta[R]}{\Delta t}$?

5. Express the rate of reaction in terms of disappearance of hydrogen and appearance of ammonia in the given reaction.

   $N_2(g) + 3 H_2 (g) \rightarrow 2NH_3 (g)$
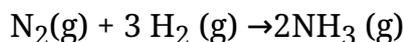
6. Why rate of reaction does not remain constant throughout?

7. Write the unit of first order rate constant of a gaseous reaction if the partial pressure of gaseous reactant is given in bar.

8. For a zero order reaction:

   R → P, the change in concentration of reactant w.r.t. time is shown by following graph.
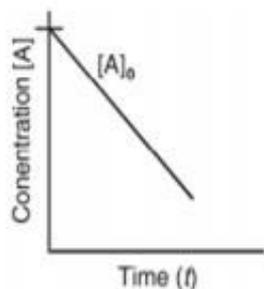
9. What will be the order of reaction, if the rate of reaction does not depend on the concentration of any of the reactant.

10. For the elementary step of a chemical reaction:

    $H_2 + l_2 \rightarrow 2HI$, rate of reaction ∝ $[H_2] [l_2]$

What is the (i) molecularity and (ii) order of the reaction.

Ans. (i) 2 (ii) 1

11. For a chemical reaction A B. The rate of the reaction is given as Rate = k $[A]^n$, the rate of the above reaction quadruples when the concentration of A is doubled. What is value of n?

Ans. n = 2]

12. Mention one example of zero order reaction.

13. What is the value of the order of reaction of radioactive decay?

Ans. First order]

14. Express the relation between the half-life period of a reactant and initial concentration for a reaction of nth order. 1

Ans. $t_{1/2} \, \alpha \, \dfrac{1}{[A]_0^{n-1}}$

15. A reaction is 50% complete in 2 hours and 75% complete in 4 hours. What is the order of reaction?

Ans. [First order]

16. Suggest an appropriate reason for the observation: "On increasing temperature of the reacting system by 10 degrees, the rate of reaction almost doubles or even sometimes becomes five folds."

17. For a chemical reaction, activation energy is zero and at 300K rate constant is 5.9×10^{-5} s^{-1}, what will be the rate constant at 400K?

Ans. $5.9 \times 10^{-5} \, s^{-1}$]

18. Two reactions occuring at the same temperature have identical values of Ea. Does this ensure that also they will have the same rate constant? Explain.
[Hint: Rate depends on the nature and concentrations of reactants and also pre-exponential factor.

19. The rate constant of a reaction is given by the expression k = $Ae^{-Ea/RT}$ Which factor in this expression should register a decrease so that the reaction proceeds rapidly?

20. For a chemical reaction rate constant k = $5.3 \times 10^{-4} \, mol \, L^{-1} \, s^{-1}$, what will be the order of reaction?

Ans. Zero order]

21. Write the rate law and order for the following reaction:

AB$_2$ + C$_2$→AB$_2$C + C (slow)

AB$_2$ + C→ABC (Fast)]

Ans. Rate = k [AB$_2$] [C$_2$]; Order =1+1=2]

Short Answer I Type Questions (2 Marks Questions)

22. List four factors which affect the rate of a chemical reaction. State how each of these factors changes the reaction rate.

23. Differentiate between
    a. Average rate and instantaneous rate of a chemical reaction.
    b. Rate of a reaction and specific rate of reaction, i.e., rate constant.

24. The rate law for the reaction: A + B→P is given by Rate = k [A]^n [B]^m

    On doubling the concentration of A and reducing the concentration of B to half of its original concentration, calculate the ratio of the new rate to the previous rate of reaction.

    Ans. 2^{n-m}]

    $$\left[H\operatorname{int} : \frac{New\ rate}{\Pr ivious\ rate} = \frac{K[2A]n\left[\frac{B}{2}\right]^m}{k[A]^n[B]^m} \right]$$

25. For the reaction in a closed vessel:

    $2NO(g) + O_2(g) \rightarrow 2NO_2(g)$; Rate $= k[NO]^2[O_2]$

    If the volume of the reaction vessel is doubled, how would it affect the rate of the reaction?

    Ans. Diminish to 1/8 of initial value]

26. Explain with an example, what is a pseudo first order reaction?

27. Show that time required for 99.9% completion of the first order reaction is 10 times of t1/2 for first order chemical reaction.

28. The graphs (1 and 2) given below are plots of rate of reaction verses concentration of the reaction. Predict the order from the graphs.

i.

ii.
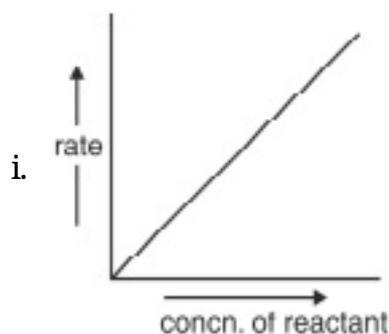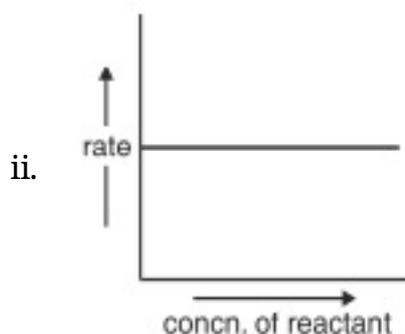
29. a. For a reaction A + B Products, the rate law is given by

    $r = k[A]^{1/2}[B]^2$

    What is the order of reaction?

    b. 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?

    Ans. (a) 5/2; (b) 9 times]

Short Answer II Type Questions (3 marks Questions)

31. What is meant by zero order reaction? Derive an integrated rate equation for a zero order reaction.

32. a. Write two points of difference between order of reaction and molecularity of a reaction.

    b. Write one point of difference between rate of reaction and rate constant.

33. Draw a graph between fraction of molecules and kinetic energy of the reacting species for two different temperatures:

    a. Room temperature

   b. Temperature 10°C higher than the room temperature

    c. Indicate the fraction of additional molecules which react at (t +10)°C.

Long Answer Type Questions (5 Mark Questions)

34. a. A chemical reaction is of second order w.r.t. a reactant. How will the rate of reaction be affected if the concentration of this reactant is: (a) doubled; (b) reduced to 1 /8th.

    Ans (a) Four times (b) 1/64]

    b. For the reaction

    2NO (g) + Cl2 (g) →2 NOCl (g)
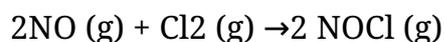
    the following data were collected. All the measurements were taken at 263k

Experiment No.	Initial [NO] / M	Initial [Cl₂]/M	Initial rate of disappearance of Cl₂ [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 units.

   iii. What is the initial rate of disappearance of Cl in exp. 4?

Ans. (i) Rate = $k[NO]_2[Cl_2]$, (ii) k = 177.7 $L^2 mol^{-2} min^{-1}$, (iii) 2.7765 M/min

35. a. Draw a plot between log k and reciprocal of absolute temperature (T).

   b. The energy of activation for a chemical reaction is 100 kJ/mol. Presence of a catalyst lowers the energy of activation by 75%. What will be effect on the rate of reaction at 20°C, if other factors are equal?

36. a. Derive the equation for rate constant of a first order reaction. What would be the units of the first order rate constant if the concentration is expressed in moles per litre and time in seconds?

   b. For first order chemical reaction half-life period ($t_{1/2}$) is concentration independent. Justify the statement by using integrated rate equation.

Numericals

37. The reaction SO₂CI₂(g) $\xrightarrow{k}$ SO₂(g) + Cl₂(g) is a first order reaction with half-life of 3.15 × 10⁴ s at 575 K. What percentage of SO₂CI₂ would be decomposed on heating at 575K for 90 min.

Ans. 11.2%

38. A certain reaction is 50% complete in 20 min at 300K and the same reaction is again 50% complete in 5 min at 350K. Calculate the activation energy if it is a first order reaction.

(R = 8.314J K⁻¹ mol⁻¹, log 4 = 0.602)

Ans. 24.206 kJ/mol

39. For a chemical reaction A→B, it was found that concentration of B increases by 0.2 mol L⁻

[1] in half an hour. What is the average rate of reaction.

Ans. 0.0066 mol L^{-1} min^{-1}

40. In the reaction R →P, the concentration of R decreases from 0.03M to 0.02 M in 25 minutes. Calculate the average rate of reaction using unit of time both in minutes and seconds.

    Ans. 4×10^{-4}M min^{-1}, 6.66×10^{-6} M s^{-1}]

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

    Ans. t = 444 s

42. The rate of reaction triples when the temperature changes from 20°C to 50°C. Calculate the energy of activation. [R = 8.314 J K^{-1} mol^{-1}, log 3 = 0.48]

    Ans. 12.59 kJ

43. A hydrogenation reaction is carried out at 550 K. If the same reaction is carried out in the presence of a catalyst at the same rate, the temperature required is 400 K. Calculate the activation energy of the reaction if the catalyst lowers the activation barrier by 20 kJ mol^{-1}.

    Hint: k = Ae $^{-Ea/RT}$. In the absence of catalyst, E_a = x kJ mol^{-1}. In the presence of catalyst, Ea = (x - 20) kJ mol^{-1}

    Ans. Ea = 100 kJ mol^{-1}

44. The rate constant for the first order decomposition of H_2O_2 is given by the following equation log k = 14.34 - 1.25×10^4 K/T. Calculate E^a for this reaction and at what temperature will its half-life be 256 minutes.

    Ans. Ea = 239.34 kJ; T = 670K

45. Show that for a first order reaction, time required for 99% completion is twice for the time required for the 90% completion of reaction.

46. The experimental data for the reaction: 2A + B$_2$→2AB, are as follows. Write probable rate expression.

[A] mol/L-1	[B2] mol/L-1	Initial rate (mol L-1 sec-1)
0.5	0.5	1.6×10-4
0.5	1.0	3.2×10-4

| +6. | 1.0 | $3.2 \times 10\text{-}4$ |

47. A reaction is 20% complete in 20 minutes. Calculate the time required for 80% completion of reaction, If reaction follows the first order kinetics.

    Ans. 144 min

48. The decomposition of phosphine $4PH_3(g)$ $P_4(g) + 6H_2(g)$ has rate law;

    Rate = k $[PH_3]$. The rate constant is 6.0×10^{-4} s^{-1} at 300K and activation energy is 3.05×10^5 J mol-1. Calculate the value of the rate constant at 310K. (R = 8.314 J K^{-1} mol^{-1}).

    Ans. 30.97×10^{-3} s^{-1}

49. For the decomposition of azoisopropane to hexane and nitrogen at 543K, the following data is obtained.

t (sec.)	0	360	720
Pressure (atm.)	35.0	54.0	63.0

    Calculate the rate constant.

    Ans. k_{360} = 2.17 x 10^{-3} s^{-1}; k_{720} = 2.24 x 10^{-3} s^{-1}]

50. The decomposition of hydrocarbon follows the equation

    k = $(4.5 \times 10^{11}$ $s^{-1})$ e-28000 K/T,

    Calculate activation energy (Ea).

    Ans. 232.79 kJmol^{-1}