**Very Short Answer Type Questions. [1 Mark]**
1. Two liquids A and B boil at $145^0C$ and $190^0C$ respectively. Which of them has a higher vapour pressure at $80^0C$?
2. Which as the highest freezing point:
   i) 1 M glucose   b) 1 M NaCl    c) 1 M $CaCl_2$    d) 1 M $AIF_3$
3. What would be the value of van't Hoff factor for a dilute solution of $K_2SO_4$ in water?
4. What possible value of 'i' will it have if solute molecules undergo association in solution?

**Short Answer Type Questions. [2 Mark]**
1. Define the following terms:
   i)      Mole fractions
   ii)     Isotonic solutions
   iii)    Van't Hoff factor
   iv)     Ideal solution
2. 18 g of glucose, $C_6H_{12}O_6$, is dissolved in 1 kg of water in a saucepan. At what temperature will water boil at 1.103 bar? ($K_b$ for $H_2O$ is 0.52 K kg $mol^{-1}$)
3. 1.0 g of non-electrolyte solute dissolved in 50.0 g of benzene lowered the freezing point of benzene by 0.40 K. The freezing point depression constant of benzene is 5.12 K kg $mol^{-1}$. Find the molar mass of the solute.
4. A 1.00 molal aqueous solution of trichloroacetic acid ($CCl_3COOH$) is heated to its boiling point. The solution has the boiling point of 100.18 $^0C$. Determine the van't Hoff factor for trichloroacetic acid.
   ($K_b$ for water = 0.512 Kg $mol^{-1}$)

**Short Answer Type Questions. [3 Mark]**
1. What mass of ethylene glycol (molar mass = 62.0 g $mol^{-1}$) must be added 5.50 kg of water to lower the freezing point of water to lower the freezing point of water from 0 0C to -10.0 0C ($K_f$ for water = 1.86 K kg mol-1)

**Long Answer Type Questions. [5 Mark]**
1. a) State Raoult's law for a solution containing volatile components. Name the solution which follows Raoult's law at all concentrations and temperature.
   b) Calculate the boiling point elevation for a solution prepared by adding 10 g of $CaCl_2$ to 200 g of water. ($K_b$ for water = 0.512 K kg $mol^{-1}$, Molar mass of $CaCl_2$ = 111 g $mol^{-1}$)
2. a) Define the following terms:
       i) Molarity          ii) Molal elevation constant ($K_b$)
   b) A solution containing 15g urea (molar mass = 60 g $mol^{-1}$) per litre of solution in water has the same osmotic pressure (isotonic) as a solution of glucose (molar mass = 180 g $mol^{-1}$) in water. Calculate the mass glucose present in one litre of its solution.
3. a) Non-ideal solutions exhibit either positive or negative deviations from Raoult's law. What are these deviation and how are they caused?
   b) What mass of NaCl (Molar mass = 58.5 g $mol^{-1}$) must be dissolved in 65g of water to lower the freezing point by 7.50 $^0C$? The freezing point depression constant, $K_f$ for water is 1.86 k Kg $mol^{-1}$. Assume van't Hoff factor for NaCl is 1.87.

# CHAPTER – 2 ELECTROCHEMISTRY

**Very Short Answer Type Questions. [1 Mark]**

1. Represent the galvanic cell in which the reactions is

    $Zn(s) + Cu^{2+}(aq) \longrightarrow Zn^{2+}(aq) + Cu(s)$

2. How much charge in Faraday is required for the reduction of 1 mol of $Ag^+$ to $Ag$?
3. What mass of zinc (II) ion will be reduced by 1 mol of electrons?

**Short Answer Type Questions. [2 Mark]**

1. a) Following reaction occur at cathode during the electrolysis of aqueous silver chloride solution:

    $Ag^+(aq) + e^- \longrightarrow Ag(s); E^0 = + 0.80$ V

    $H^+ (aq) + e^- \longrightarrow \frac{1}{2}H_2(g); E^0 = 0.00$V

    On the basis of their standard reduction electrode potential ($E^0$) values, which reaction is feasible at the cathode and why?

    b) Define limiting molar conductivity. Why conductivity of an electrolyte solution decreases with the decrease in concentration?

2. Determine the values of equilibrium constant (Kc) and $\Delta G^0$ for the following reaction:

    $Ni(s) + 2Ag^+(aq) \rightarrow Ni^{2+}(aq) + 2Ag(s), \ E^0 = 1.05V(1 \ F = 96500 \ C \ mol^{-1})$

3. The conductivity of 0.20 M KCl at 298 K is 0.025 S $cm^{-1}$. Calculate its molar conductivity.
4. Calculate the time to deposit 1.27 g of copper at cathode when a current of 2 A was passed through the solution of $CuSO_4$. (Molar mass of Cu = 63.5 g $mol^{-1}$, 1 F = 96500 C $mol^{-1}$)

**Short Answer Type Questions. [3 Mark]**

1. a) Calculate $\Delta_r G^0$ for the reaction:

    $Mg(s) + Cu^{2+}(aq) \longrightarrow Mg^{2+}(aq) + Cu(s)$

    Given $E^0_{cell} = + 2.71$ V, 1 F = 96500 C $mol^{-1}$

    b) Name the type of cell which was used in Apollo space programme for providing electrical power.

2. What is corrosion? What are the factors which affect corrosion? $CO_2$ is always present in natural water. Explain its effect (increases, stop or no effect) on rusting of Fe.

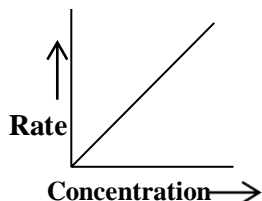**Long Answer Type Questions. [5 Mark]**

1. a) State Faraday's first law of electrolysis. How much charge in terms of Faraday is required for the reduction of 1 mol of $Cu^{2+}$ to Cu?

    b) Calculate emf. of the following cell at 298 K:

    $Mg(s) \mid Mg^{2+} (0.1 \ M) \mid\mid Cu^{2+} (0.01) \mid Cu(s)$

    **(Given $E^0_{Cell} = + 2.71$ V, 1 F = 96500 C $mol^{-1}$)**

2. a) State Kohlrausch law of independent migration of ions. Write an expression for the molar conductivity of acetic acid at infinite dilution according to Kohlrausch law.

3. b) Give $\wedge^0_m$ for acetic acid.

    Give that $\wedge^0_m (HCl) = 426$ S $cm^2 \ mol^{-1}$

    $\wedge^0_m (NaCl) = 126$ S $cm^2 \ mol^{-1}$

    $\wedge^0_m (CH_3COONa) = 91$ S $cm^2 \ mol^{-1}$

# CHAPTER – 3 CHEMICAL KINETICS

**Very Short Answer Type Questions. [1 Mark]**

1. Why does the rate of a reaction not remain constant throughout the reaction process?
2. **Calculate the overall order of a reaction which has the rate expression**

    **a)** Rate = k $[A]^{1/2}[B]^{1/2}$          b) Rate = k $[A]^{3/2} \ [B]^{-1}$

**3.** Following graph is plot of the rate of reaction vs concentration of the reactant. What is the order of the reaction?



### Short Answer Type Questions. [2 Mark]

1. **The reaction** $2NO_2 + F_2 \rightarrow 2NO_2F$ involves the following steps:

   $NO_2 + NO_2 \underset{\longleftarrow}{\overset{K}{\longrightarrow}} N_2O_4(Fast)$

   $N_2O_4 + F_2 \rightarrow 2NO_2F(Slow)$
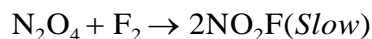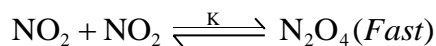
   Write the rate law. Calculate the overall order of the reaction and what is the rate determining step?

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

3. What do you understand by the rate law and rate constant of a reaction? Identify the order of a reaction if the units of its rate constant are:

4. i) $L^{-1}$ mol $s^{-1}$                ii) L $mol^{-1}$ $s^{-1}$

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

### Short Answer Type Questions. [3 Mark]

1. For the reaction:

   2NO(g) + $Cl_2$(g)     2NOCl(g),
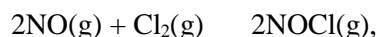
   The following data were collected. All the measurements were taken at 263 K.

   | Exp. No. | Initial [NO] (M) | Initial [$Cl_2$](M) | Initial rate of disappearance of $Cl_2$(M/min) |
   |----------|------------------|---------------------|-----------------------------------------------|
   | 1 | 0.15 | 0.15 | 0.60 |
   | 2 | 0.15 | 0.30 | 1.20 |
   | 3 | 0.30 | 0.15 | 2.40 |
   | 4 | 0.25 | 0.25 | ? |

   a) Write the expression for rate law.

   b) Calculate the value of rate constant and specify its units.

   c) What is the initial rate of disappearance of $Cl_2$ in experiment no. 4?

### Long Answer Type Questions. [5 Mark]

1. a) Define the following terms:
   i) Activation energy                ii) Rate constant

   b) A first order reaction takes 10 minutes for 25% decomposition. Calculate $t_{1/2}$ for the reaction. [Given log 2 = 0.3010, log 3 = 0.4771, log 4= 0.6021)

2. a) What is rate of reaction? Write two factors that affect the rate of reaction.

   b) The rate constant of a first order reaction increases from 4 x $10^{-2}$ to 8 x $10^{-2}$ when temperature changes from $27^0$C to $37^0$C. Calculate the energy of activation ($E_a$). log 2 = 0.3010, log 3 = 0.4771, log 4 = 0.6021)

3. a) For a reaction A + B $\longrightarrow$ P, the rate is given by Rate = k[A] $[B]^2$
   i) How is rate reaction affected if the concentration of 'B' is doubled?
   ii) What is overall order of reaction if 'A' is present in large excess?

   b) A first order reaction takes 23.1 minutes for 50% completion. Calculate the time required for 75% completion of this reaction. log 2 = 0.301 log 3 = 0.4771, log 4 = 0.6021

# CHAPTER –4 SURFACE CHEMISTRY

**Very Short Answer Type Questions. [1 Mark]**

1. What is the effect of temperature on chemisorption?'
2. Out of $BaCl_2$ and KCl, which one is more effective in causing coagulation of a negatively charged colloidal Sol? Give reason.
3. Name the temperature above which the formation of micelles take place.
4. Give one example each of lyophobic sol and lyophilic sol.
5. Write the name of the state of (i) dispersed phase (ii) dispersion medium in the case of butter.
6. Write the dispersed phase and dispersion medium in smoke.

**Short Answer Type Questions. [2 Mark]**

1. Write the difference between physisorption and chemisorption with respect to the following:
   i) Specificity    ii) Temperature dependence          iii) Reversibility    iv) Enthalpy change
2. **a)** What happens when a freshly precipitated $Fe(OH)_3$ is shaken with water containing a small quantity of $FeCl_3$?
   **b)** Why is finely divided substance more effective as an adsorbent?
3. What is the difference between a colloidal solution and emulsion? What is the role of emulsifier in forming emulsion?

**Short Answer Type Questions. [3 Mark]**

1. What are the characteristics of the following colloids? Give one example of each:
   i) Multi-molecular colloids                ii) Lyophobic sols                iii) Emulsions
2. Explain the following:
   a) Same substance can act bot has colloids and crystalloids.
   b) Artificial rain is caused by spraying slat over clouds.
   c) When beam of light is passed through a colloidal sol, the path of the beam gets illuminated.
3. Give reasons for the following observation:
   a) A delta is formed at the meeting point of sea water and river water.
   b) $NH_3$ gas adsorbs more readily than $N_2$ gas on the surface of charcoal.
   c) Powdered substances are more effective adsorbents.