

[Time: 1hr]

[Marks:25]

Please check whether you have got the right question paper

- N.B.: 1. All questions are compulsory.
 2. Figure to the right indicates full marks.
 3. Use of non – programmable scientific calculator is allowed.

Useful constants

$c = 2.998 \times 10^8 \text{ m.s}^{-1}$

$e = 1.602 \times 10^{-19} \text{ C}$

$R = 8.314 \text{ J.K}^{-1}\text{mol}^{-1}$

$k = 1.3811 \times 10^{-23} \text{ J.K}^{-1}$

$= 2.0 \text{ cal.K}^{-1} \text{ mol}^{-1}$

$h = 6.626 \times 10^{-34} \text{ Js}$

$1\text{J} = 6.24 \times 10^{18} \text{ eV}$

$m_e = 9.110 \times 10^{-31} \text{ kg}$

$1\text{eV} = 8.06 \times 10^3 \text{ cm}^{-1}$

$NA = 6.022 \times 10^{23} \text{ mol}^{-1}$

$1 \text{ amu} = 1.66 \times 10^{-27} \text{ kg}$

Atomic mass of H = 1, C = 12, N = 14, O = 16, S = 32, Cl = 35.5

1. A) Attempt **any two** of the following:

- i) Explain the Rice-Ramsperger-Kassel-Marcus theory. 04
 ii) Show that the rate of polymerization reaction is proportional to square root of its initial concentration of the monomer. 04
 iii) The rate of formation of C in the reaction, $2A + B \rightarrow 2C + 3D$ is $5\text{molL}^{-1}\text{s}^{-1}$. State the rate of reaction and the rates of formation or consumption of A, B and D. 04
 iv) Explain the formation and decomposition of phosgene. 04

2. A) Attempt **any two** of the following:

- i) a) Explain the Electrophoretic effect for the conductance of strong electrolytes. 02
 b) Calculate the mean ionic activity coefficient of $0.05\text{m Al}_2(\text{SO}_4)_3$ in aqueous solution at 298K. (Given: $A = 0.509$ at 298 K) 02
 ii) With the help of diagram explain construction and working of Phosphoric acid fuel cell. 04

- iii) Calculate the resting membrane potential for the following: 04

Ion Species	Intracellular concentration in mM	Extracellular concentration in mM
Ca ²⁺	150	5
Cl ⁻	0.002	12

(Given that $\frac{2.303RT}{F}$ at 298K = 61)

- iv) Explain Debye-Falkenhagen effect and Wien effect for the conductance of strong electrolytes. 04
3. A) Attempt **any three** of the following:
- Explain Consecutive reaction with two examples. 03
 - Explain three explosion limits of non – stationary chain reaction. 03
 - Discuss the gas phase combustion reaction between H₂ and O₂. 03
 - Write a note on the electrochemical enzyme – catalysed oxidation of Styrene. 03
 - Write the Debye-Huckel-Onsager equation and explain its validity for aqueous solutions. 03
 - Draw well labelled diagram, one advantage and one application of Solid – Oxide fuel cell. 03
