

Time: 2 hours

Maximum marks: 60

NB:

- 1) Question No.1 is Compulsory
- 2) Attempt any Three questions from the remaining Five questions
- 3) Figures to the right indicate full marks
- 4) Atomic weight: Ca = 40, Mg = 24, S = 32, Cl = 35.5, C = 12, H = 1, O = 16, Na = 23.

Q.1 Attempt any **five** of the following: (15)

- a) Calculate the temporary and permanent hardness of water sample having the following impurities in ppm: $\text{Ca}(\text{HCO}_3)_2 = 29.5$, $\text{CaSO}_4 = 13$, $\text{Mg}(\text{HCO}_3)_2 = 7.3$, $\text{NaCl} = 49$.
- b) Explain the term Viscoelasticity.
- c) State Huckel's rule of aromaticity.
- d) Give difference between bonding and antibonding orbitals.
- e) Define the terms: phase, component, and degree of freedom.
- f) Discuss the effect of temperature on polymers.
- g) Write a note on Reverse Osmosis.

Q.2) a) Explain the reduced phase rule. Draw and explain phase diagram of Pb-Ag system. (6)

b) Explain Electrodialysis with the help of principle, process, and diagram. Also give its advantages. (5)

c) Give Preparation, Properties and uses of PMMA. (4)

Q.3) a) Draw the Molecular Orbital diagram of O_2 molecule. Give its electronic configuration. Calculate its bond order and identify its magnetic behaviour. (6)

b) i) Define the terms BOD and COD. (2)

ii) 6 ml of waste water sample was refluxed with 25 ml of $\text{K}_2\text{Cr}_2\text{O}_7$ and after refluxing the excess unreacted dichromate required 20 ml of 0.1N FAS solution. A blank of 10 ml of distilled water on refluxing with 25 ml of $\text{K}_2\text{Cr}_2\text{O}_7$ solution required 35 ml of 0.1N FAS solution. Calculate COD of waste water sample in ppm. (3)

c) A polymer consists of 9 polymer chains as shown below. Calculate the number-average molecular weight of the polymer. (4)

Number of polymer (N_i)	1	3	2	1	2
Molecular weight of each polymer (M_i)	200	100	300	500	400

- Q.4) a) Explain Gibbs phase rule with the help of its mathematical expression. (6)
Write advantages and limitations of phase rule.
- b) Write resonance structure of benzene. Give limitations of Kekule's structure of benzene. (5)
- c) Explain intrinsic and doped conducting polymers with appropriate examples. (4)
- Q.5) a) Define fabrication of plastics. Explain injection moulding process with neatly labelled diagram. Give its advantages. (6)
- b) What are atomic orbitals? Explain the shapes of p-orbitals and d-orbitals with their diagrams. (5)
- c) 0.5g of CaCO_3 was dissolved in HCl and diluted to 500 ml with distilled water. 50 ml of this solution required 45 ml of EDTA solution for titration. 50 ml of hard water sample required 15 ml of EDTA solution for titration. 50 ml of same water sample on boiling and filtering requires 10 ml of EDTA solution. Calculate the total and permanent hardness in ppm. (4)
- Q.6) a) Explain the ion-exchange method for softening of water giving the following details: Principle, diagram, process and Reactions. (6)
- b) i) Explain the term eutectic point. (1)
- ii) Calculate the mass of eutectic when 1 kg an alloy of Cd and Bi contains 25% Cd and eutectic mixture contains 40% of Cd. (4)
- c) i) Give the Molecular Orbital diagram of carbon monoxide (CO) molecule. (2)
- ii) Discuss the role of fillers in compounding of plastics. (2)
