

Time: 2 hours

Maximum marks: 60

- N.B. 1. Question Number 1 is compulsory
2. Attempt any three questions from Q.2 to Q.6
3. Draw neat labeled diagrams where necessary.
4. Write chemical reactions where required.
5. Figures to right indicate full marks.

**Additional Data:** H =1, C = 12, N =14, O =16, Na =23, Mg =24, S = 32, Cl =35.5, K =39, Ca = 40

- Q.1]** Attempt any five from the following:- **15**
- (a) Write a brief note on Ultrafiltration.
- (b) Write synthesis, properties and uses of PMMA polymer.
- (c) Write basic postulates of molecular orbital theory.
- (d) Explain the term 'Viscoelasticity' with reference to the polymers.
- (e) A hard water sample was found to have following salts:  $\text{Ca}(\text{HCO}_3)_2 = 132$  mg/L,  $\text{MgSO}_4 = 164$ mg/L,  $\text{CaCl}_2 = 127$  mg/L,  $\text{NaCl} = 98$ mg/L. Calculate temporary, permanent and total hardness of the given sample of water.
- (f) Define the terms involved Gibbs phase rule equation.
- (g) Is cyclopentadiene molecule aromatic in the nature? Why?
- Q.2]** (a) A standard hard water sample was prepared by dissolving 1.8 g  $\text{CaCO}_3$  in 1.5L of distilled water. 50 ml of this water required 46 ml of EDTA. 50 ml of unknown hard water required 36 ml of same EDTA. This unknown hard water was boiled, cooled and filtered. 50 ml of this filtered water required 29 ml of same EDTA, Calculate temporary, permanent and total hardness of unknown hard water sample. **6**
- (b) Describe bonding in benzene molecule and explain why it is aromatic? **5**
- (c) What is the role played by Plasticizer and Catalyst in making of plastic? **4**
- Q.3]** (a) Draw a neat labeled diagram and explain Extrusion Molding of plastic. **6**
- (b) Draw a neat labeled phase diagram of Pb –Ag system and explain the validity of reduce phase rule equation. **5**
- (c) Draw a suitable Molecular Orbital Diagram and explain why  $\text{Be}_2$  does not exist as a molecule? **4**

- Q.4] (a)** Write a short note on 'Ion Exchange method' of demineralization of the hard water. **6**
- (b)** Draw a neat labeled molecular orbital diagram of CO (Carbon monoxide) molecule and explain its bond order and magnetic property. **5**
- (c)** Explain bonding in pyrrole molecule. **4**
- Q.5] (a)** Draw a neat phase diagram of one component water system and explain applicability of Gibbs Phase Rule. **6**
- (b)** A sample of the polymer contains 50 molecules of molecular weight 10000 units each, 30 molecules each with molecular weight of 30000 and 20 molecules each having molecular weight of 60000 units. Calculate number averaged and weight averaged molecular weights of polymer and Polydispersity index (PDI). **5**
- (c)** Define COD. In determination of COD, 25 ml of sewage water was refluxed with 25 ml of 0.5N of  $K_2Cr_2O_7$  in acidic medium. The unreacted  $K_2Cr_2O_7$  required 19 ml of 0.5N FAS (Ferrous ammonium sulphate). In the blank determination, 25 ml of distilled water was refluxed with 25 ml of 0.5N of  $K_2Cr_2O_7$  in acidic medium which required 24 of 0.5N FAS. Calculate COD. **4**
- Q.6] (a)** Write a brief note on 'Conducting Polymers' **6**
- (b)** Draw a molecular orbital diagram of  $O_2$  (oxygen) molecule and explain its bond order and magnetic property. **5**
- (c)** Write Merits and Demerits of Phase Rule. **4**
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