

- (b) i) Discuss the advantages and limitations of phase rule. 3  
 ii) What are fullerenes? Write important applications of fullerenes. 2
- (c) The hardness of 50,000 litres of water sample was removed by zeolite softener. The softness required 200 litres of NaCl solution containing 50gm/l. NaCl for regeneration. Calculate the hardness of water sample. 4
4. (a) Draw the diagram for demineralization process and write suitable reactions involved in the process. What are the advantages and disadvantages of the method. 6
- (b) i) 5 gms of an oil was saponified with 50 ml of 0.5 N alcoholic KOH. After refluxing for 2 hrs, the mixture was titrated by 15 ml of 0.5 N HCl. Find the saponification value of oil. 3  
 ii) What are the advantages of RCC over concrete? 2
- (c) Natural rubber requires vulcanization. Give reasons. With appropriate reactions explain how the drawbacks are overcome? 4
5. (a) Write preparation, properties and uses of following polymers: 6  
 i) PMMA ii) Silicone rubber
- (b) i) Define Chemical Oxygen Demand (COD). 25 ml of sewage water required 8.3 ml of 0.001M  $K_2Cr_2O_7$  for its complete oxidation. Calculate COD of this water sample. 3  
 ii) Mention the role of additives used in blended oils. 2
- (c) Draw and explain the phase diagram of Pb- Ag system. 4
6. (a) What are lubricants? Define Lubrication. Explain Hydrodynamic lubrication mechanism with neat diagram. 6
- (b) i) What is the Triple Point? At what conditions triple point exists in water system? 3  
 ii) Write a short note on reverse osmosis. 2
- (c) Explain wet process of preparing the Portland cement. 4

NB: 1. Question No.1 is compulsory.

2. Answer any three questions from remaining five.

3. All questions carry equal marks.

4. Atomic Weight: H=1, C=12, O=16, Ca=40, Na=23, Mg=24, Si=28, S=32, Cl=35.5, N=14, Al=27, K=39

**1. Solve any five.**

- (a) Write the applications of CNT's. 3
- (b) Distinguish between thermoplastic and thermosetting polymer. 3
- (c) Define viscosity and viscosity index. Discuss its significance. 3
- (d) What are conducting polymers? Explain with suitable examples. 3
- (e) Explain Gibb's phase rule. Define the terms involved in it. 3
- (f) Define BOD and COD. 3
- (g) Calculate Temporary and permanent hardness : 3

$Mg(HCO_3)_2 = 73.8 \text{ mg/l}$ ,  $Ca(HCO_3)_2 = 162.8 \text{ mg/l}$ ,  $MgCl_2 = 95.8 \text{ mg/l}$   
 $CaSO_4 = 136 \text{ mg/l}$

2. (a) 1g of  $CaCO_3$  was dissolved in 1 litre of distilled water. 50ml of this solution required 45ml of EDTA solution. 50 ml of hard water required 25 ml of EDTA. The same sample of water after boiling consumed 15 ml of EDTA. Calculate each type of hardness. 6
- (b) i) Write the role of plasticizers and stabilizers in the compounding of polymers. 3  
ii) What are Semi-solid lubricants? Under which conditions they are used. 2
- (c) What are CNT's? Explain chemical vapour deposition method of preparation of CNT's. 4
- 3.(a) What is fabrication of plastic? Explain transfer moulding process with the help of neat labelled diagram. 6