

(REVISED COURSE)

QP Code : NP-17714

(2 Hours)

[ Total Marks : 60

- N.B. : (1) Question No. 1 is compulsory.  
(2) Answer any **three** questions from the remaining **five**.  
(3) All questions carry equal marks.  
(4) Atomic weights Ca = 40, Mg = 24, Fe = 56, Cl = 35.5, Na = 23, S = 32, H = 1, C = 12, O = 16

1. Solve any **five** :- 15
- (a) Give the principle of estimation of hardness of water using EDTA method (only equations).
  - (b) Natural rubber needs to be vulcanised. Give reasons for the same.
  - (c) What are the functions of a lubricant?
  - (d) Give the preparation, properties and uses of dolomite bricks.
  - (e) What is a condensed system? State the condensed phase rule equation.
  - (f) Classify the following salts into temporary and permanent hardness causing salts and also calculate their calcium carbonate equivalents.
    - (i) Ca (HCO<sub>3</sub>)<sub>2</sub> - 16.2 mg/L
    - (ii) MgSO<sub>4</sub> - 1.2 mg/L
    - (iii) FeCl<sub>2</sub> - 12.7 mg/L
    - (iv) NaCl - 94 mg/L
  - (g) Name the various ingredients used in the compounding of plastics and give two examples of each.
2. (a) Calculate the quantity of pure lime and soda required for softening 50,000 litres of water containing the following salts per litre - 6  
Ca (HCO<sub>3</sub>)<sub>2</sub> - 8.1 mg; Mg (HCO<sub>3</sub>)<sub>2</sub> - 7.3 mg;  
CaSO<sub>4</sub> - 13.6 mg; MgSO<sub>4</sub> - 12.0 mg;  
NaCl - 4.7 mg; MgCl<sub>2</sub> - 23.75 mg.
- (b) Define (i) Phase (ii) Component (iii) Degrees of freedom. State the number of phases, components and the number of degrees of freedom for the following equilibrium. 5  
$$\text{H}_2\text{O}_{(s)} \rightleftharpoons \text{H}_2\text{O}_{(l)} \rightleftharpoons \text{H}_2\text{O} \text{ (vapour)}$$
- (c) What are carbon nanotubes? Discuss the CVD method of preparation of CNT. 4
3. (a) Discuss the mechanism of boundary film lubrication. 6
- (b) What are thermoplastic polymers? Name any two thermoplastic polymer. Give the preparation, properties and uses of any one thermoplastic polymer. 5

- (c) Draw the phase diagram of one component water system. Explain triple point. 4
4. (a) Write short notes on any two :- 6  
(i) Glass transition temperature  
(ii) Conducting polymers.  
(iii) Polymers used in medicine and surgery.
- (b) With a neat diagram explain the principle of Ion- Exchange method of softening of water and also give the softening and regeneration reactions. 5
- (c) 3g of vegetable oil was mixed with 50ml of 0.5N KOH solution and heated for 1 hour. The mixture required 19ml of 0.5N HCl. The blank titration reading was 49ml. Find the saponification value of the oil sample. 4
5. (a) Name the raw materials necessary for the manufacture of portland cement. Draw a neat labelled diagram of the rotary kiln and write the chemical reactions alongwith the temperature. Also mention the functions of Alumina and gypsum in cement. 6
- (b) What is moulding? Explain with the help of a neat diagram Extrusion moulding of an insulated cable. 5
- (c) The hardness of 50,000 litres of a sample of water was removed by passing it through a zeolite softener. The softener required 200 litres of NaCl solution containing 125g/L of NaCl for regeneration. Calculate the hardness of the sample of water. 4
6. (a) (i) Define and explain the significance of BOD and COD. 6  
(ii) Discuss reverse osmosis.
- (b) Give the preparation and uses of 5  
(i) Kevlar  
(ii) Polyurethane
- (c) Write note on any two :- 4  
(i) Acid value of oil.  
(ii) Flash and fire point.  
(iii) Semi solid lubricant.
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