Con. 5769-13.   **GX - 10040**

(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 weight :-** Mg = 24, Ca = 40, Si = 28, N = 14, 0 = 16, C = 12

1.   Solve any **five**:-   **15**

(a)   What happens when temporary hard water is boiled? Give equations to explain.

(b)   Give the preparation and uses of Silica refractory.

(c)   Define Gibbs Phase Rule. State the number of Phases, Components and Degrees of freedom for the following equation-

$$CaCO_{3(s)} \rightleftharpoons CaO_{(s)} + CO_{2(g)}$$

(d)   What is the function of plasticiser in the compounding of plastic? Give two examples.

(e)   Two samples of water A and B were analysed for their salt content:

(i)   Sample A was found to contain 168 mg $MgCO_3$ per litre.

(ii)   Sample B was found to contain 820 mg $Ca(NO_3)_2$ per litre and 2 mg SiO_2 per litre. Calculate the total hardness of each sample and state which sample is more hard.

(f)   Discuss the conditions under which semisolid lubricants are used.

(g)   Distinguish between thermoplastic and thermosetting resins.

2.   (a) 50 ml of standard hard water containing 1 mg of pure $CaCO_3$ per ml consumed   **6**
20 ml of EDTA. 50 ml of the water sample consumed 30 ml of same EDTA solution using Erichrome Black T indicator. After boiling and filtering, 50 ml of the water sample required 10 ml of the same EDTA for titration. Calculate the total and permanent hardness of water sample.

(b) Draw a neat phase diagram of the one component water system and explain with   **5**
reference to (i) curves (ii) Triple point.

(c) What are carbon nano tubes? What are their types? Discuss their Electrical and   **4**
Mechanical properties.

3.   (a) Discuss the mechanism of thick-film lubrication.   **6**

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   (b) Define moulding and discuss the Injection moulding method of fabrication of plastic.   **5**

   (c) Discuss the limitations of phase rule.   **4**

4. (a) Give the preparation, properties and uses of: (i) PMMA (ii) Buna-S.   **6**

   (b) Give well balanced equations of the reactions that take place in the Lime soda process.   **5**

   (c) Find the saponification value of an oil sample weighing 1.5 g, refluxed with 25 ml of 0.5 N KOH, required 15 ml of 0.5 N HCl for the residual titration. The blank titration reading was 25 ml of 0.5 N HCl.   **4**

5. (a) Discuss the setting and hardening of portland cement as well as the function of gypsum with balanced equations.   **6**

   (b) What is glass transition temperature? What are the factors that affect it and what is the significance of it.   **5**

   (c) An exhausted zeolite softener was regenerated by passing 150 litres of NaCl solution having a strength of 150 g/L of NaCl. If the hardness of the water is 600 ppm. Calculate the total volume of water that is softened by the softener.   **4**

6. (a) Write short notes on any **two**:-   **6**
     (i) Reverse osmosis
     (ii) Electrodialysis
     (iii) Ultrafiltration

   (b) Define conducting polymers. Explain Intrinsic and Doped conducting polymer with appropriate examples.   **5**

   (c) Define and discuss the significance of the following properties of lubricant (any **two**):-   **4**
     (i) Acid value of oil
     (ii) Cloud and Pour point
     (i) Flash and Fire point