Con. 6550-13.   LJ-10103

(2 Hours)   [Total Marks : 75

N.B. : (1)   Question No. **1** is **compulsory**.
      (2)   Attempt any **four** questions from remaining **six**.
      (3)   **Figures** to the **right** indicate **full** marks.

Atomic Weights :

   H = 1, C = 12, O = 16, N = 14, S = 32, Cl = 35·5, Na = 23, Ca = 40, Mg = 24, Al = 27, Fe = 56

1. Answer any **five** :—   15
    (a)   Define BOD and COD. Give their significance.
    (b)   What is crystallinity of a polymer ? How are crystalline polymers different from amorphous polymers ?
    (c)   Under what conditions are semi solid lubricants used ?
    (d)   What are plain carbon steels ? Give their classification with one property each.
    (e)   Distinguish between conventional and non-conventional energy sources.
    (f)   Explain the structure and properties of fullerenes.
    (g)   Find the acid value of a used lubricating oil sample whose 10 ml required 5 ml of N/50 KOH during titration. State whether the oil is suitable for lubrication or not. (Density of oil = 0·91 g/c.c.)

2. (a)   Calculate lime (95% pure) and soda (90% pure) required for softening one million litres of   6
          water containing the folloiwng constituents :—
          $Ca(HCO_3)_2$ = 81 ppm, $Mg(HCO_3)_2$ = 73 ppm, $CaSO_4$ = 68 ppm, H_2SO_4 = 14·7 ppm, CO_2 = 11·1 ppm.
    (b)   Name the different moulding methods for plastics. Explain extrusion moulding with a neat   5
          labelled diagram.
    (c)   Describe the working of solar heating system using Flat plate collector.   4

3. (a)   Give the synthesis, properties and uses of any **two** of the following :—   6
              (i)   Urea formaldehyde
              (ii) Buna-N
              (iii) Polymethylmethacrylate.
    (b)   Explain hydrodynamic lubrication Mechanism with the help of an example.   5
    (c)   Describe the production of carbon nanotubes by the laser ablation method.   4

4. (a)   Expalin the following properties of lubricants with their significance :—   6
              (i)   Viscosity and viscosity index.
              (ii) Cloud point and pour point.
    (b)   What is the reduced phase rule ? Explain its application to the Pb-Ag system with the help   5
          of a phase diagram.
    (c)   0·5 gm of $CaCO_3$ was dissolved in dilute HCl and the solution diluted to 1 litre, with distilled   4
          water. 25 ml of this solution required 24 ml of EDTA. 50 ml of a hard water sample
          required 22·5 ml of same EDTA. 100 ml of the same water sample after boiling required 12 ml
          of same EDTA. Calcualte all types of hardness in the water.

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5.   (a)   Draw the phase diagram of water system. Derive all degrees of freedom from phase rule   **6**
            and correlate with the derivations from the phase diagram.

      (b)   Explain the process of demineralisation of water with the help of diagram and reactions.   **5**

      (c)   Define glass transition temperature. Explain the factors affecting it.   **4**

6.   (a)   Classify carbon nanotubes. Give their applications in the following fields : Catalysis, Electronics   **6**
            and Medicine.

      (b)   Explain activated sludge method of treatment of wastewater with a flow chart.   **5**

      (c)   Write a note on Nickel-Hydrogen batteries.   **4**

7.   (a)   Write short notes on any **two** :—   **6**
            (i)   Conducting polymers.
            (ii)   Compounding of plastics.
            (iii)   Polymer composite materials.

      (b)   Dsicuss the process of reverse osmosis with a diagram. Compare with ulltrafiltration.   **5**

      (c)   Write a short note on special steels.   **4**

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