

1. Attempt any **five** :—
- Distinguish between thermoplastic and thermosetting resins.
  - Find the acid value of a used oil sample whose 6 ml required 2.6 ml of 0.02 N KOH for titration (density of oil = 0.91) and state whether the oil is suitable for lubrication or not.
  - Explain the Nickel-Hydrogen batteries with the help of chemical reactions.
  - State the limitations of the phase rule.
  - What are carbon-nanotubes ? Explain different types of carbon-nanotubes.
  - What is shape memory effect ? Name a few shape memory alloy types.
  - A water sample on analysis has been found to contains :  
 $MgCl_2 = 19 \text{ mg/lit.}$   $CaCO_3 = 05 \text{ mg/lit}$   
 $Ca(HCO_3)_2 = 29.5 \text{ mg/lit}$   $CaSO_4 = 13.0 \text{ mg/lit.}$   
 Calculate temporary, permanent and total hardness.
2. (a) What is meant by fabrication of plastics ? Explain Extrusion moulding with the help of neat diagram. 5
- (b) Define lubrication and explain the mechanism of hydrodynamic lubrication. 5
- (c) Describe the method for production of bio-gas from waste. Give its composition and uses. 5
3. (a) Calculate the amount of lime (90% pure) and soda (95% pure) required to soften 50,000 litres of same water containing the following impurities in ppm : 5
- |                     |               |
|---------------------|---------------|
| $Mg(HCO_3)_2 = 155$ | $MgCl_2 = 23$ |
| $NaCl = 6.9$        | $H_2SO_4 = 5$ |
| $Na_2SO_4 = 18.4$   | $CaCl_2 = 11$ |
- (b) Give the synthesis and uses of :— 5
- Polystyrene
  - Urea formaldehyde.
- (c) State condensed Phase Rule ? Explain the Lead-Silver System with phase diagram. 5
4. (a) 50 ml sample of water required 7.2 ml of N/20 disodium EDTA for titration. After boiling and filtration the same volume required 4 ml of EDTA. Calculate each type of hardness. 5
- (b) Write a note on Solid Lubricants. 5
- (c) What are the main constituents of plastics ? Write the functions and examples of each constituent. 5
5. (a) The hardness of 3500 litres of water was completely removed by zeolite softner. The zeolite had required 25 litres of 100 gm/lit of NaCl to regenerate. Calculate the hardness of the water. 5
- (b) What is solar energy ? Explain the working of solar heating system using flat plate collectors. 5
- (c) Explain the reverse osmosis and ultrafiltration. 5
6. (a) What are stainless steels ? Explain the specific effects of the following elements on the properties of steels :— 5
- Chromium
  - Molybdenum.
- (b) What are nano-materials and explain the structural details of Hackelites. 5
- (c) Write a note on Conducting Polymers. 5
7. Write a short notes on (any **three**) :— 15
- Applications of Nanomaterials in the Medicines and Catalysis.
  - Blended Oils.
  - Nano Cones
  - One Component System.