

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

1. Attempt any five from the following :-

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- (a) Distinguish between Addition polymerisation and Condensation polymerisation.
- (b) What are Nano-materials ? Give two properties of Nano-materials which make them different and superior to Conventional materials.
- (c) What is Grease ? Under which situation it is used as a lubricant ?
- (d) A water sample contains :-
 - (i) $Mg(HCO_3)_2 = 14.6 \text{ ppm}$
 - (ii) $Mg(NO_3)_2 = 29.6 \text{ ppm}$
 - (iii) $Ca(HCO_3)_2 = 8.1 \text{ ppm}$
 - (iv) $MgCl_2 = 19 \text{ ppm}$
 - (v) $MgSO_4 = 24 \text{ ppm}$

Calculate the temporary and permanent hardness of water sample.

(At. wt. C = 40, Mg = 24, H = 1, Cl = 35.5, O = 16, S = 32)

- (e) What is triple point ? Explain it with reference to one component water system.
- (f) Explain Nickel-Hydrogen (Ni-H₂) batteries with the help of chemical reactions.
- (g) Explain the preparation, properties and uses of PMMA.

- 2. (a) What are the main constituent of plastics ? Write the functions and examples of each constituent. 5
- (b) What is condensed phase rule equation ? Explain its application with the help of phase diagram to two Component Lead - Silver (Pb-Ag) system. 6
- (c) 9 ml oil is taken from machine and it requires 1.5 ml of 0.04 N KOH. Find acid value (density of oil = 0.81 g/ml). 4

- 3. (a) How demineralization of water is carried out ? 6
- (b) Explain the following terms : 6
 - (i) Number Average Molecular wt. (\bar{M}_n)
 - (ii) Vulcanization
 - (iii) Liquid crystal properties of polymers.
- (c) Write the classification of plain C steel on the basis of Carbon Content. 3

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4. (a) What is biomass ? Describe the method for production of Bio-gas from Animal Waste. 6
- (b) Calculate the amount of Lime (80 % pure) and Soda (85 % pure) required for softening 10^6 litres of water containing the following constituents :- 6
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| Ca (HCO ₃) ₂ = 162 ppm, | MgCl ₂ = 9.5 ppm |
| NaCl = 58.5 ppm, | Mg (HCO ₃) ₂ = 7.3 ppm |
| HCl = 36.5 ppm, | CO ₂ = 44.0 ppm |
| CaCl ₂ = 111 ppm, | MgSO ₄ = 60 ppm |
- (At wt. : Ca = 40, Mg = 24, S = 32, O = 16, Cl = 35.5, C = 12, H = 1, Si = 28)
- (c) State phase rule equation. Mention any three applications. 3
5. (a) What are Lubricants ? Explain the Extreme Pressure Lubrication. 4
- (b) 0.5 gm of CaCO₃ was dissolved in HCl and the solution made upto 500 ml with distilled water. 50 ml of the solution required 48 ml of EDTA solution for titration. 50 ml of hard water sample required 15 ml of EDTA and after boiling and filtering required 10 ml of EDTA solution. Calculate temporary hardness of water. 5
- (c) Write short notes on (any two) :- 6
- Nano-Wires
 - Fullerence
 - Nano-Cones.
6. (a) Write the preparation and uses of – 6
- Buna-S
 - Urea aldehyde.
- (b) Write the definition and significance of the following terms :- 6
- Flash Point and Fire Point
 - Viscosity Index.
- (c) Give brief account of Ultrafiltration. 3
7. Write short notes on any three of the following :- 15
- Photovoltaic Cell
 - Injection Moulding Process
 - Activated Sludge Process
 - Application of Nano-materials in Medicines and Catalysis.