

[Time: 2 Hours]

Marks : 60]

- N.B:**
1. Question No. 1 is compulsory.
  2. Attempt any three questions from the remaining questions.
  3. All questions carry equal marks
  4. Atomic weights:

[Ca= 40, C=12, O=16, H=1, Mg= 24, S=32, Cl= 35.5]

**Q.1** Attempt any five of the following: -

15

- a. What is triple point. Explain it with reference to water system?
- b. What are the drawbacks of natural Rubber?
- c. Write synthesis, properties and uses of Kevlar.
- d. 20ml of waste water was refluxed with 30ml of potassium dichromate solution. After refluxing the excess unreacted dichromate required 11 ml of 0.1N FAS solution. A blank of 20ml distilled water on refluxing with 30ml of dichromate solution required 14ml of 0.1 N FAS solution. Calculate the COD value of the waste water.
- e. Define Cloud point and Pour point. Discuss its significance.
- f. List the applications of carbon nanotubes.
- g. What are the limitations of Phase rule? (Any 3 points)
- h. What are the drawbacks of natural rubber (Any 3 points)

**Q.2** a. Calculate the amount of lime (90% pure) and soda (95%) required for softening of 50,000 liters of hard water containing the following impurities:

6

Ca(HCO<sub>3</sub>)<sub>2</sub> = 81 mg/L, MgCl<sub>2</sub> = 95 mg/L, CaSO<sub>4</sub> = 68mg/L, SiO<sub>2</sub> = 50mg/L,  
Mg (HCO<sub>3</sub>)<sub>2</sub> = 146 mg/L, H<sub>2</sub>SO<sub>4</sub> = 49 mg/L

b. (i) Explain the term 'Glass transition temperature'. What is its significance?

3

(ii) Define and write significance of viscosity index.

2

c. Explain with the help of chemical reactions 'setting and hardening' process of cement.

4

**Q.3** a. Write short notes: a) Polymer in medicine and surgery b) Conducting polymers

6

b. (i) State the limitations of phase rule.

3

(ii) Write composition of Portland cement.

2

c. Calculate total hardness in ppm in given water sample (i) 50ml standard hard water containing 1mg of pure CaCO<sub>3</sub> per ml, consumed 20ml EDTA solution. (ii) 50ml water sample consumed 35ml EDTA solution using Erio-Black T indicator.

4

- Q.4**
- a. Explain the Ion exchange process of softening of hard water. What are its advantages and disadvantages. **6**
  - b. (i) Find acid value of vegetable oil whose 6ml required 2.6ml of 0.02N KOH for titration. **3**  
(density of oil= 0.91 g/ml). State whether the oil is suitable for lubrication or not.
  - (ii) Write a note on Deccay of concrete. **2**
  - c. Explain the functions of the following constituents in the compounding of plastics (Any two) **4**  
a) Plasticizers b) Lubricants c) Stabilizers
- Q.5**
- a. (i) What is meant fabrication of plastics? Explain Transfer moulding with labelled diagram. **6**
  - b. (i) Explain Reverse Osmosis. **3**  
(ii) Give the important characteristics of a good Lubricant. **2**
  - c. What is a condensed phase system? Draw a neat labelled phase diagram of Pb-Ag system **4**
- Q.6**
- a. What is Lubrication? Discuss the mechanism of Boundary Film lubrication **6**
  - b. (i) Define Phase, Component and Degree of freedom. **3**  
(ii) Distinguish between Alkaline hardness and Non-Alkaline hardness. **2**
  - c. Describe the wet process for manufacture of Portland cement. **4**
-