[Time: 2 Hours] **[Marks: 60]**

Please check whether you have got the right question paper.

N.B: 1. Questions No 1 is compulsory.

2. Attempt any three questions from remaining five questions.

3. Figure to the right indicates full marks.

4. Atomic weights : Ca=40, C=12, O=16, H=1, Mg=24

S =32, C1=35,5, Na=23.

Q.1 Attempt **any five** from the following. **15**

a) Differentiate between temporary and permanent hardness.

b) Define lubricant and give its functions.

c) What are plasticizer? Give its functions.

d) Define Gibbs Phase rule. State the number of phases and component in the following equation. $NH_4Cl_{(s)} \rightleftharpoons NH_{3(g)} + HCl_{(g)}$

e) What are nanomaterials? Write the applications of fullerenes.

f) What are thermoplastic polymer? Name any two thermoplastic polymer.

g) 20 ml of sewage water is refluxed with 0.1 N $K_2Cr_2O_7$ in presence of H_2SO_4 & Ag_2SO_4.The unreacted dichromate required 5ml of 0.1 N FAS solution. Blank titration consumed 15ml of 0.1 N FAS solution. Calculate COD of effluent

Q.2 a) Calculate the amount of time (90% pure) and soda (100% pure) required for softening one million liters of water containing following impurities in ppm: $CaSO_4$=136, H_2SO_4=49, $MgCl_2$=95, $MgSO_4$= 60, SiO_2= 50. **06**

b) With the help of phase diagram explain one component system. **05**

c) What is SWCNT and MWCNT? Explain laser method for the production of CNT. **04**

Q.3 a) Define lubrication. Discuss the mechanism of thick film lubrication with neat diagram. **06**

b) What is meant by fabrication of Plastic? Describe a molding method suitable for thermoplastic resins. **05**

c) State the limitations of phase rule. **04**

Q.4 a) Give the preparation, properties and uses of **(any two)** **06**
(i) PMMA (ii) Kevlar (iii) Buna-s

b) Write a note on : **05**
(i) Reverse osmosis (ii) Disinfection of water by Ozone

c) Find the acid value of a vegetable oil. whose 10ml required 4ml of 0.01 N KOH during titration (density of oil = 0.92 gm/m1) **04**

Q.5 a) What is cement? Name the raw materials necessary for the manufacturing of port land cement. Draw the diagram of the rotary kiln and write the chemical reactions with temperature, during the burning process. **06**

b) Write note on : **05**
i) Role of polymers in medicine & surgery
ii) Glass Transition temp

c) An exhausted zeolite sufferer was regenerated by 150 liters of Nacl solution having a strength of 150gm/L of Nacl. If the hardness of water is 500 ppm, calculate total volume of water that is softened by the softener **04**

Q.6 a) Explain activated sludge process with the help of flow sheer diagram. And write the main objectives of sewage treatment. **06**

b) What is valucnigation? Explain giving proper reaction. Write advantages of vulcanized rubber. **05**

c) Define & give the significance of following properties of lubricant. **04**
i. Flash point & fire Point
ii. Cloud point & pour Point

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