Time: 2 Hours **Marks: 60**

Note the following instructions.

1. **Question 1** is compulsory. Attempt **any three** questions out of remaining questions.
2. Draw neat diagrams and write chemical reactions wherever necessary.
3. Assume data, if missing, with justification.
4. Atomic Weight: H=1, C=12, O=16, Ca=40, S=32

Q.1. Attempt any five.

a. Draw orbital diagrams for p_x, p_y and p_z orbitals. 3M

b. A 30 ml of wastewater refluxed with potassium dichromate solution and after refluxing excess unreacted dichromate required 15 ml 0.1 N FAS solution. If blank titration is 20 ml, calculate COD value of wastewater. 3M

c. Write merit of Gibb's phase rule. 3M

d. Draw molecular orbital picture of benzene. 3M

e. A hard water sample contains following impurities (in mg/L) 3M
$Ca(HCO_3)_2 = 4.86$; $CaSO_4 = 13.6$ Calculate temporary, permanent and total hardness of the given sample of water.

f. Define glass transition temperature. Discuss any two factors affecting glass transition temperature. 3M

g. Differentiate between bonding and antibonding molecular orbitals. 3M

Q.2.a. i) Define Gibb's phase rule and explain the following terms with suitable example:
A) Phase B) Component C) Degree of freedom 6M

b. Define moulding of Plastic.Explain injection moulding with the help of neat diagram. 5M

c. An alloy of tin and lead contains 25% lead. Find the mass of eutectic in 1 kg of solid alloy if the eutectic contains 62 % of tin. Calculate the mass of tin separated out. 4M

Q.3.a. Draw the diagram for ion exchange process and explain the process with suitable reactions. 6M

b. 1.0 g of $CaCO_3$ was dissolved in dilute HCl and diluted to 1000 ml with distilled water.100 ml of this solution required 28 ml of EDTA solution. 100 ml of hard water sample required 33 ml of EDTA.After boiling, cooling and filtering 100 ml of this water sample required 10 ml of EDTA solution Calculate each type of hardness of water. 5M

c. Explain n-doped conducting and p-doped conducting polymer with suitable examples. 4M

Q 4.a Write preparation, properties and uses of Kevlar. 6M

b. i) Differentiate thermoplastic and thermosetting polymers. 3M

ii) Define BOD and COD. 2M

c. Be_2 molecule does not exist. Explain the reason with the help of molecular orbital diagram. 4M

Q 5.a Draw the molecular orbital structure of O_2 molecule and answer the following:

a) Electronic configuration of molecule 6M

b) Bond order of O_2 molecule.

c) Comment on it magnetism

b. i) If a polymer sample has following population: 5M

5 molecules of molecular mass = 10000

2 molecules of molecular mass = 20000

Calculate Number- average and Weight- average molecular weight of the polymer.

c. Explain Reverse Osmosis method and mention its applications. 4M

Q 6.a Draw the phase diagram of one component system. Calculate degree of freedom for areas, curves, and triple point. 6M

b.Explain Electro dialysis process with the help of diagram. 5M

c.Discuss the role of following compounds in compounding of plastic: 4M

I. Plasticizers II. Stabilizers

****