

Time: 2 Hrs

Marks: 60

NB:

- 1) Question No.1 is Compulsory
- 2) Attempt any **Three** questions from the remaining **Five** questions
- 3) Figures to the right indicate full marks
- 4) Atomic weight: Ca = 40, Mg = 24, N = 14, Cl = 35.5, C = 12, H = 1, O = 16, Na = 23.

1) Attempt any **five** of the following: (15)

- a) What are the characteristics of aromatic compounds?
- b) What happens when temporary hard water is boiled? Explain giving examples
- c) Distinguish between thermoplastic and thermosetting resins.
- d) Give difference between bonding and antibonding orbitals.
- e) What is the temporary and permanent hardness of water sample having the following impurities in ppm:  $\text{Ca}(\text{HCO}_3)_2 = 32.4$ ,  $\text{CaSO}_4 = 13.5$ ,  $\text{Mg}(\text{HCO}_3)_2 = 29.2$ .
- f) Discuss the reduced phase rule.
- g) What is a real gas?

2) a) Explain the application of phase rule to one component system with an appropriate graph, areas and the triple point. (6)

b) What is compounding of plastics? Discuss the below mentioned constituents with appropriate examples: (5)

- i) Fillers
- ii) Pasticizers

c) Write notes on: (4)

- i) BOD
- ii) COD

3) a) Draw the Molecular Orbital diagram of  $\text{Be}_2$ . Give its electronic configuration. Explain why it does not exist. (6)

- b) (1) Identify the most important intermolecular interaction in each of the following: (i)  $\text{CCl}_4$  (ii) HF (2)
- (2) Explain the correction for volume term in the ideal gas equation. (3)

- c) A polymer consists of 9 polymer chains as given below: (4)
- |                                   |     |     |     |     |     |
|-----------------------------------|-----|-----|-----|-----|-----|
| No. of polymer(N <sub>1</sub> ) : | 1   | 3   | 2   | 1   | 2   |
| Mol. Wt. of each polymer:         | 200 | 100 | 300 | 500 | 400 |
- Calculate the number – average molecular weight of the polymer

- Q4) a) Discuss the following with examples: (6)
- i) Phase      ii) Components      iii) degree of freedom

- b) Give the Kekule structure for benzene. Discuss the problems with the structure. (any two) (5)

- c) Write notes on: supercritical fluids and critical temperature (4)

- Q5) a) Give the preparation, properties and uses of: (6)
- i) Kevlar      ii) PMMA

- b) What are atomic orbitals? Explain the *s*-orbitals and *p*-orbitals. (5)

- c) 1gm of CaCO<sub>3</sub> was dissolved in 1 litre of distilled water. 50ml of solution required 45ml EDTA for titration. 50ml of hard water required 25 ml of EDTA for titration. The water sample after boiling and filtering consumed 15ml of EDTA for titration. Calculate the total and permanent hardness of the sample. (4)

- Q6) Explain the ion-exchange method for softening of water giving the following details: (6)
- Diagram, process and Reactions

- b) Calculate the number of phases in the following examples: (1)

i) Rhombic Sulphur → Monoclinic sulphur

- ii) An alloy of tin and lead contains 73% tin. Find the mass of eutectic in 1kg of solid alloy, if the eutectic contains 64% of tin. (4)

- c) i) Give the Molecular Orbital diagram of nitric oxide (NO) molecule. (2)
- ii) Discuss: Glass transition temperature (2)