FE SemI (R-2019 C scheme) "All Branches" Dec'2023

27/12/2023

Time: 2 hours **Maximum 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, S = 32, Cl = 35.5, C = 12, H = 1, O = 16, Na = 23.

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

a) Write any three advantages of transfer moulding method.

b) What happens when temporary hard water is boiled? Give equations to explain.

c) What is reduced phase rule?

d) Why Be_2 molecule does not exist?

e) What are the characteristics of aromatic compounds?

f) Explain hydrogen bonding.

g) A 25 ml of waste water sample which was refluxed with 0.1 N $K_2Cr_2O_7$ in presence of H_2SO_4 and Ag_2SO_4. The unreacted dichromate required 5.5 ml of 0.1N FAS solution. A blank of distilled water on refluxing with dichromate solution required 15 ml of 0.1N FAS solution. Calculate COD of waste water sample in ppm.

Q.2) a) Draw a neat phase diagram of the one component system and explain with reference to curves, areas, and triple point. **(6)**

b) What is glass transition temperature? Explain the factors influencing glass transition temperature. **(5)**

c) Discuss reverse osmosis in detail. **(4)**

Q.3) a) Explain the bond order and magnetic behaviour of NO molecule on the basis of MOT. **(6)**

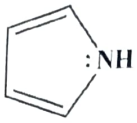
b) What are real gases? Explain the correction in the pressure term in ideal gas equation. **(5)**

c) A polymer consists of 9 polymer chains as shown below. Calculate the number-average molecular weight of the polymer. **(4)**

Number of polymer (N_i)	1	3	2	1	2
Molecular weight of each polymer (M_i)	100	200	400	500	600

Q.4) a) Explain the following terms with one example each. **(6)**
(i) Phase (ii) Component (iii) Degree of freedom
b) Explain Huckel's rule of aromaticity and classify the following molecules in aromatic, anti-aromatic, and non-aromatic. **(5)**

(i)



(ii)

(iii)

c) Write the function of any four additives with one example of each required for compounding of plastic. **(4)**

Q.5) a) Give the preparation, properties, and uses of **(6)**
(i) PMMA (ii) Kevlar
b) Draw the shapes of p-orbitals and d-orbitals. **(5)**
c) 20 ml of standard hard water sample (containing 1.2 mg of pure $CaCO_3$ per ml) required 35 ml of EDTA solution. 50 ml of hard water sample required 30 ml of EDTA solution. 100 ml of hard water sample after boiling required 25 ml of same EDTA solution. Calculate total and permanent hardness of water in ppm. **(4)**

Q.6) a) Explain the ion-exchange method for softening of hard water. What are its advantages and disadvantages? **(6)**
b) i) Draw the Molecular Orbital diagram of O_2 molecule. **(3)**
ii) Distinguish between thermoplastic resins and thermosetting resins (any 2 points). **(2)**
c) i) Identify phase/s present in the system having two miscible liquids. **(1)**
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. **(3)**

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