

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=20, Na=23, Mg=24, S=32, Cl=35.5

Q.1. Attempt any five.

- a. Differentiate thermoplastic and thermosetting polymers. 3M
- b. Boiling point of  $\text{H}_2\text{SO}_4$  is greater than  $(\text{CH}_3)_2\text{SO}_4$ . Give reason. 3M
- c. A 20 ml of wastewater refluxed with 30 ml of potassium dichromate solution and after refluxing excess unreacted dichromate required 18 ml 0.1 N FAS solution. For blank titration with 20 ml of distilled water required 22 ml 0.1N FAS solution. Calculate COD value of wastewater. 3M
- d. Differentiate between bonding and antibonding molecular orbitals. 3M
- e. A hard water sample contains following impurities (in mg/L)  
 $\text{Mg}(\text{HCO}_3)_2 = 7.3$ ;  $\text{NaCl} = 77$ ;  $\text{Ca}(\text{HCO}_3)_2 = 4.86$ ,  $\text{MgSO}_4 = 36$   
 Calculate temporary, permanent and total hardness of the given sample of water. 3M
- f. Draw molecular orbital picture of pyrrole. 3M
- g. Write statement of Gibb's phase rule. Write any two limitations of phase rule. 3M

- Q.2.a. i) Draw diagram of injection molding of plastic and mention the applications of the process. 4M+2M
- ii) Write the essential structural property of intrinsic conducting polymer and mention suitable example.
- b. i) Define the following terms: A) Phase B) Eutectic point C) Degree of freedom 3M+2M
- ii) Draw orbital diagrams for  $p_y$  and  $dx^2 - y^2$  orbitals.
- c. 0.5 g of  $\text{CaCO}_3$  was dissolved in dilute HCl and diluted to 1000 ml. 50 ml of this solution required 30 ml of EDTA solution for titration. 50 ml of hard water sample required 25 ml of EDTA solution for titration. 50 ml water sample after boiling, filtering requires 10 ml of EDTA solution for titration. Calculate the temporary, permanent and total hardness of water. 4M

- Q.3.a. Draw the diagram for ion exchange process and explain the process with suitable reactions. 6M
- b. i) An alloy of tin and lead contains 25% lead. Find the mass of eutectic in 1 kg of solid alloy if the eutectic contains 64% of tin. Calculate the mass of tin separated out. 3M+2M  
 ii) Calculate degree of freedom for following system: in which the products formed in equivalent amounts.  

$$\text{CaCO}_3(\text{s}) \rightleftharpoons \text{CaO}(\text{s}) + \text{CO}_2(\text{g})$$
- c. Write preparation, properties and uses of Kevlar. 4M

- Q 4.a i) Using Huckel's rule, justify whether following compounds are aromatic, antiaromatic and nonaromatic: 3M+3M



- ii) Draw a phase diagram of Pb -Ag and mention the conditions at eutectic point.
- b. i) Define Glass transition Temperature. Discuss any two factors which influence its value? 3M+2M  
 ii) Differentiate between ideal gas and real gas.
- c. Explain Electro dialysis process and mention its applications. 4M
- Q 5.a Draw the molecular orbital structure of O<sub>2</sub> molecule and answer the following: 6M  
 i) Electronic configuration of molecule.  
 ii) Bond order of O<sub>2</sub> molecule.  
 iii) Comment on its magnetism.
- b. i) A polymer with 10 chains has 5 molecules of molecular weight 15000 and 5 molecules of molecular weight 10000. Calculate Weight- average molecular weight of the polymer. 3M+2M  
 ii) List the drawbacks of Kekule's theory of benzene structure.
- c. Discuss the role of following additives in compounding of plastic: 4M  
 I. Plasticizers II. Lubricants

- Q 6.a Draw the phase diagram of one component system. Calculate degree of freedom for areas, curves, and triple point. 6M
- b. i) Explain dipole dipole interaction in HCl. 3M+2M  
 ii) Write the reactions involved when hard water is boiled.
- c. Be<sub>2</sub> molecule does not exist. Justify the statement with the help of molecular orbital diagram. 4M
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