

4/EH-23 (iv) (Syllabus-2015)

2018

(April)

CHEMISTRY

(Elective/Honours)

(General Chemistry—IV)

(Inorganic, Organic and Physical)

(Chem-EH-401)

Marks : 56

Time : 3 hours

The figures in the margin indicate full marks for the questions

SECTION—I

(Inorganic)

(Marks : 18)

1. (a) What is glass transition temperature of a polymer? Discuss the structure and properties of tetrasulphur-tetranitride polymers. 3
- (b) Explain the following : 3
- (i) NaC_5H_5 is more stable than $\text{NaC}_5\text{H}_{11}$.
- (ii) NaC_6H_5 is more reactive than $\text{NaCH}_2\text{C}_6\text{H}_5$.

(Turn Over)

(2)

- (c) What happens when ClF_5 and IF_7 are hydrolyzed? Draw the structure and mention the number of bond pairs and lone pairs in ClF_5 and IF_7 molecules. 4

OR

2. (a) Write down the general properties of inorganic polymers. Discuss various structural aspects of silicones polymers. 3
- (b) Define hapticity of a ligand. Write down the IUPAC name and discuss the structural aspects of $\text{Li}(\text{CH}_3)_4$ and $\text{Fe}(\text{C}_5\text{H}_5)_2$ organometallic compounds. 4
- (c) What are pseudohalogens? Why are they so called? Describe the important characteristics of pseudohalogens. 3

3. (a) What is the function of ozone present in the troposphere? Explain how fluorocarbons tend to deplete the ozone layer. What is the effect of this depletion? 4
- (b) "Industrial wastewater is polluted differently depending upon the industry from which it is obtained." Illustrate on this statement with suitable examples. 2

8D/1775

(Continued)

(3)

- (c) Give a brief account on the method of disposal of radioactive wastes. 2

OR

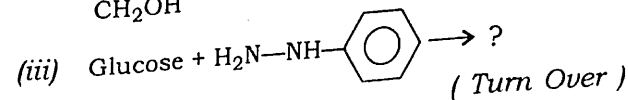
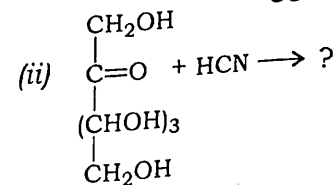
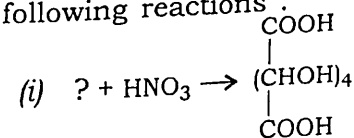
4. (a) Discuss the various methods of discarding solid wastes. What do you mean by anaerobic digestion of biological wastes? 3
- (b) What do you mean by reverse osmosis? How can it be used in the treatment of pollution of domestic wastewater? 2
- (c) Outline the various schemes and guidelines of wastewater treatment. 3

SECTION—II

(Organic)

(Marks : 19)

5. (a) Identify the reactants/products in the following reactions : $1 \times 3 = 3$



8D/1775

(4)

- (b) Draw the Haworth projection formulae of α -D-fructose and β -D-fructose. $\frac{1}{2} + \frac{1}{2} = 1$
- (c) What is epimerization? How will you convert D-glucose to D-mannose? Give reactions. $1 + 1\frac{1}{2} = 2\frac{1}{2}$
- (d) Discuss the classification of α -amino acids with suitable examples. 2
- (e) Give one example each for the following : $\frac{1}{2} \times 2 = 1$
- (i) Tranquilizers
 - (ii) Sulpha drugs

OR

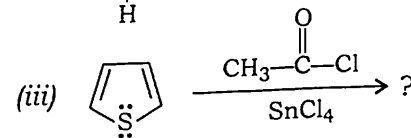
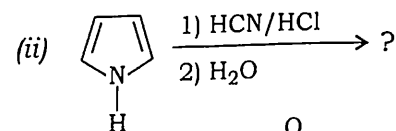
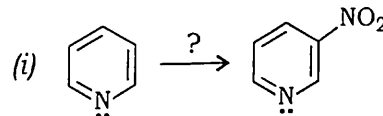
6. (a) How is glucose converted to fructose? 2
- (b) Give a method for the synthesis of phenylalanine. $1\frac{1}{2}$
- (c) What is peptide linkage? Write the general structure of a tripeptide. $1\frac{1}{2}$
- (d) Write a short note on isoelectric point of an amino acid. $1\frac{1}{2}$
- (e) What are antibiotics? Give two examples. 2
- (f) What is a biuret test? 1

8D/1775

(Continued)

(5)

7. (a) Complete the following reactions and give mechanisms (any two) : $1\frac{1}{2} \times 2 = 3$



- (b) Describe Witt's theory of colour and constitution. 2
- (c) Give the synthesis of methyl orange. $1\frac{1}{2}$
- (d) Write notes on the following : $1\frac{1}{2} \times 2 = 3$
- (i) RM value
 - (ii) Iodine value

OR

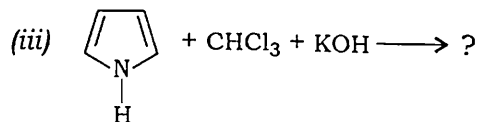
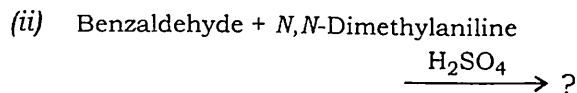
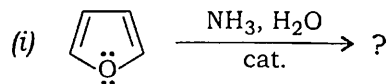
8. (a) Draw resonance forms of furan. Why is furan less reactive than pyrrole towards electrophilic substitution reactions? $2\frac{1}{2}$
- (b) What is the difference between a fat and an oil? 1

8D/1775

(Turn Over)

(6)

(c) Complete the following reactions : $1 \times 3 = 3$



(d) Name one azo and one triphenyl-methane dyes. Draw their structures and also mark the chromophore and auxochrome in them. $1+1+1=3$

SECTION—III

(Physical)

(Marks : 19)

9. (a) What is hydrolysis? Derive an expression for the hydrolysis constant of a salt of a weak acid and strong base in terms of dissociation constant of a weak acid and ionic product of water. $3\frac{1}{2}$
- (b) Explain how equivalent conductance and specific conductance vary with dilution. 3

8D/1775

(Continued)

(7)

(c) Explain the following terms : $1\frac{1}{2} \times 2 = 3$

- (i) Buffer solution
(ii) Common ion effect

OR

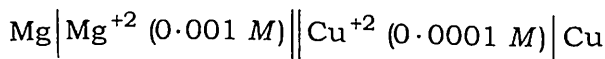
10. (a) What are the salient features of the Arrhenius theory of electrolytic dissociation? Mention the limitations of this theory. $3\frac{1}{2}$
- (b) Describe the moving boundary method for the determination of transport number of ions. 3
- (c) What is meant by pH of a solution? Calculate the pH of—
(i) 10^{-4} N aqueous HCl solution;
(ii) 10^{-6} N aqueous NaOH solution. $1+1+1=3$
11. (a) Give a schematic representation of an electrochemical cell, mentioning important sign conventions, taking suitable example of Zn-Cu cell. $3\frac{1}{2}$
- (b) Differentiate between electrochemical cell and electrolytic cell: 2
- (c) What are meant by congruent melting point and azeotropes? Give examples. $2+2=4$

8D/1775

(Turn Over)

OR

12. (a) What is upper critical solution temperature? Explain the phase diagram of phenol-water system. 3
- (b) Explain the following terms : 3
- (i) Phase
- (ii) Degrees of freedom
- (iii) Components
- (c) Write the Nernst equation and calculate the EMF of the following cell at 25 °C :



Given, $E_{\text{Mg}^{+2}|\text{Mg}}^{\circ} = -2.37 \text{ V}$ and

$E_{\text{Cu}^{+2}|\text{Cu}}^{\circ} = +0.34 \text{ V}$. 3½

★ ★ ★