

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

2 0 2 2

(May/June)

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 are organometallic compounds?
How are they classified on the basis of
hapticity of the ligands? 4

- (b) What are polyphosphonitrilic chlorides?
Write one method of its preparation.
Explain what happens when poly-
phosphazenes is treated with excess of
ammonia. 4

(2)

- (c) Why I_2 dissolves readily in an aqueous solution of potassium iodide and not in water? Discuss the structure of the product in the solution. 2

OR

2. (a) Describe an important feature of ionic organometallic compounds. Write one method of preparation and its application in organic chemistry. 3
- (b) What are silicones? Describe one method of preparation and write their uses. 3
- (c) What are interhalogen compounds? How do they differ from pseudohalogen compounds? Draw the structure of BrF_5 and IF_7 and discuss the hybridization of each. 4
3. (a) What is photochemical smog? Explain how peroxyacetyl nitrate (PAN) is formed in the atmosphere. What are the consequences of photochemical smog? 4
- (b) Explain the different methods used for the treatment of waste water. 2
- (c) What is radioactive waste? Explain one method for disposal of radioactive waste. 2

(3)

OR

4. (a) Write the different steps to show how nitric acid is formed in the atmosphere. What are its effect on the environment? Explain. 3
- (b) Why is the pH of water in a highly industrial area found to be on the lower side? Discuss the method of purification of water by electrodialysis. 3
- (c) Explain the method of solid waste disposal by anaerobic digestion of biodegradable waste. 2

SECTION—II

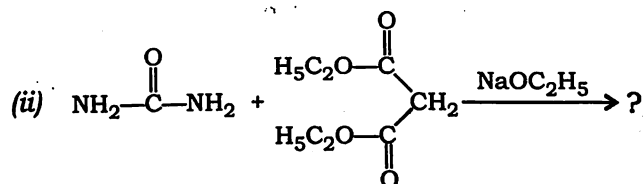
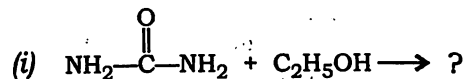
(Organic)

(Marks : 19)

5. (a) Starting from the open-chain structure of D-glucose, how is its cyclic oxide structure established? 3
- (b) Discuss the mechanism of reaction of glucose with excess of phenylhydrazine. 3
- (c) Write the structural formula and name of any one of the α -amino acid. Why are they called L-amino acids? $1\frac{1}{2}$

(4)

(d) Complete the following reactions : $1 \times 2 = 2$



OR

6. (a) Explain the following with necessary chemical reactions : $1\frac{1}{2} \times 3 = 4\frac{1}{2}$

- (i) Fructose reduces Fehling's solution although it is a ketohexose.
- (ii) Fructose gives two isomeric hexahydric alcohols on reduction
- (iii) Methylglucoside is non-reducing

(b) How is phenylalanine prepared by Gabriel phthalimide method? $2\frac{1}{2}$

(c) How is sulphaguanidine synthesized from guanidine? Give two uses of sulphaguanidine. $2\frac{1}{2}$

7. (a) Draw the molecular orbital picture of pyrrole. $1\frac{1}{2}$

(5)

(b) Explain why pyridine undergoes nucleophilic substitution reaction. How does it react with NaNH_2 ? 3

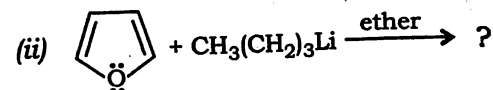
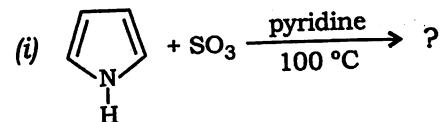
(c) Define RM value and state its significance. 2

(d) Give a method of synthesis of methyl orange. Write the structure of methyl orange in alkaline and acidic solution. 3

OR

8. (a) Electrophilic substitution in pyrrole occurs preferentially at C-2. Explain. 2

(b) Write the products and mechanism of the following reactions : $1\frac{1}{2} \times 2 = 3$



(c) What are the basic requirements of a coloured compound to act as a dye? $2\frac{1}{2}$

(d) Of pyrrole and pyridine, which one is more basic and why? 2

(6)

SECTION—III

(Physical)

(Marks : 19)

9. (a) Define hydrolysis. Obtain an expression for the hydrolysis constant of a salt of weak acid and strong base in terms of dissociation constant of weak acid and ionic product of water. $1+2\frac{1}{2}=3\frac{1}{2}$
- (b) Explain the following terms : $1\frac{1}{2}\times 2=3$
(i) Buffer solution
(ii) pH scale
- (c) Explain how equivalent conductance and specific conductance vary with dilution. $1\frac{1}{2}+1\frac{1}{2}=3$

OR

10. (a) State Ostwald's dilution law and mention its applications. $2+1\frac{1}{2}=3\frac{1}{2}$
- (b) Describe moving boundary method for the determination of transport number of ions. 3
- (c) Discuss the salient features of the Arrhenius theory of electrolytic dissociation. 3

(7)

11. (a) State phase rule and explain the terms involved in it. 3
- (b) Differentiate between electrochemical cell and electrolytic cell. $2\frac{1}{2}$
- (c) What is meant by (i) congruent melting point and (ii) azeotropes? Give suitable examples. $2+2=4$

OR

12. (a) What is upper critical solution temperature? Explain the phase diagram of phenol-water system. $1+3=4$
- (b) Give a schematic representation of an electrochemical cell, using important sign conventions, taking the example of Zn-Cu cell. $3\frac{1}{2}$
- (c) State Nernst distribution law and mention its applications. $1+1=2$

★ ★ ★