

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

2017

(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 are meant by pi-bonded organo-metallic compounds? Give one example. Write down one method of its preparation. 2+1=3

(Turn Over)

(2)

- (b) What are silicones? Write down the action of water on $(\text{CH}_3)_2\text{SiCl}_2$. 1+1=2
- (c) Give one method of preparation of BrF_5 . Discuss the structure of BrF_5 and also mention the hybridization involved. 1+2=3
- (d) Write down one method of preparation of triphosphonitrilic chloride and one use of phosphonitrilic halides. 2

OR

2. (a) Write down any one method of preparation and one use of organometallic compound of lithium. 2
- (b) Mention any three points of difference between inorganic and organic polymers. 3
- (c) What are polyhalides? Give one example of polyhalide of iodine and one method of its preparation. 3
- (d) Explain why interhalogen compounds are more reactive than the halogens. 2
3. (a) What is smog? What are the harmful effects of smog? 1+1=2
- (b) What is the aim of the tertiary treatment process for depollution of domestic wastewater? Discuss the process of electro dialysis of wastewater. 1+2=3

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(Continued)

(3)

- (c) What is radioactive waste? Write down one method of disposal of radioactive waste from nuclear reactors. 1+2=3

OR

4. (a) Write down the chemical equations for the formation of nitric acid rain. How does it affect the environment? 2+1=3
- (b) Discuss solid-waste disposal by anaerobic digestion of biological waste. 3
- (c) Write a short note on e-pollution. 2

SECTION—II

(Organic)

(Marks : 19)

5. (a) Giving appropriate equations, show how you would bring about the following conversions : 1½×2=3
- (i) D-glucose to D-fructose
- (ii) D-glucose to D-mannose
- (b) Explain briefly the utility of HIO_4 in determining the size of the ring in glucose. 2

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(Turn Over)

(4)

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

(i) Glucose reacts with conc. HNO_3

(ii) Urea reacts with diethylmalonate

(iii) Fructose reacts with phenylhydrazine

(d) What are epimers? Explain giving suitable example. $1\frac{1}{2}$

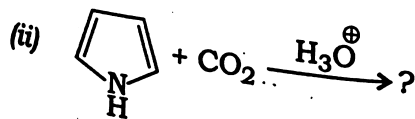
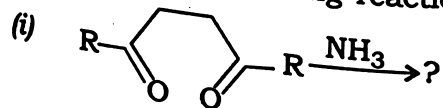
OR

6. (a) What are peptides? Write the structures of all the possible dipeptides obtainable from glycine and phenylalanine. 2

(b) Describe the Wohler's synthesis of urea. 2

(c) Electrophilic substitution in pyrrole takes place at 2-position, whereas in pyridine it is at 3-position. Explain. $2\frac{1}{2}$

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



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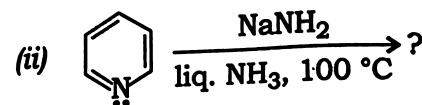
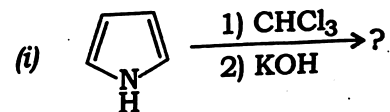
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7. (a) Why are animal fats solid and vegetable oils liquid? 2

(b) Write the structure of Bismarck brown indicating the auxochromic and chromophoric groups in it. $2\frac{1}{2}$

(c) Why is furan less reactive than pyrrole towards electrophilic substitution reaction? 2

(d) Give the products of the following reactions with mechanisms (any two) : $1\frac{1}{2} \times 2 = 3$



OR

8. (a) What are antipyretic-analgesic drugs? Write its classification with appropriate examples. $2\frac{1}{2}$

(b) What are the characteristics of a good dye? 2

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(Turn Over)

(6)

- (c) Define the following terms : 3
(i) Isoelectric point
(ii) Zwitterion
(iii) Saponification value
- (d) Compare the basicities of pyridine and piperidine. 2

SECTION—III

(Physical)

(Marks : 19)

9. (a) What is Ostwald's dilution law? What are its uses? 4
- (b) State and explain Kohlrausch law. Discuss its applications. $2+1\frac{1}{2}=3\frac{1}{2}$
- (c) Calculate the hydrogen ion concentration of a solution of formic acid containing 0.092 g of acid per litre. The dissociation constant at 25 °C is 2.14×10^{-4} . 2

OR

10. (a) Discuss the curves obtained by conductometric titration of—
(i) a weak acid with a strong base;
(ii) a strong acid with a weak base. $2+2=4$

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(Continued)

(7)

- (b) Describe Hittorf's method for the determination of transport number. What are the factors that influence the transport number of ions? $2+1\frac{1}{2}=3\frac{1}{2}$
- (c) Determine the pH of a solution obtained by mixing equal volumes of a 0.10 N ammonium nitrate and 0.02 N ammonium hydroxide. K_b for NH_4OH is 1.8×10^{-5} . 2

11. (a) Explain how Gibbs-Helmholtz equation can be utilized for calculating the enthalpy change of a reaction occurring in a reversible cell. $3\frac{1}{2}$
- (b) Give the labelled phase diagram of the water system and discuss the importance of various points, lines and areas. 4
- (c) Calculate the free energy change of the following cell at 25 °C : 2
 $\text{Sn} | \text{Sn}^{++} (a=0.6) || \text{Pb}^{++} (a=0.3) | \text{Pb}$
The standard EMF of the cell is 0.014 volt.

OR

12. (a) (i) Derive Nernst equation for measuring the EMF of a cell.

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(Turn Over)

(ii) What is electro-chemical series?

$$2\frac{1}{2} + 2 = 4\frac{1}{2}$$

(b) Draw a labelled phase diagram of KI-H₂O system and describe the main features. 3

(c) Calculate the equivalent conductivity at 20 °C of NH₄OH at infinite dilution. 2
Given :

$$\lambda_0 (\text{NH}_4\text{Cl}) = 1.30 \text{ S m}^2 \text{ mol}^{-1}$$

$$\lambda_0 (\text{OH}^-) = 174 \text{ S m}^2 \text{ mol}^{-1}$$

$$\lambda_0 (\text{Cl}^-) = 66 \text{ S m}^2 \text{ mol}^{-1}$$
