

2/EH-23 (ii) (Syllabus-2015)

2 0 1 9

(April)

CHEMISTRY

(Elective/Honours)

(General Chemistry—II)

(Inorganic, Organic and Physical)

(Chem-EH-201)

Marks : 56

Time : 3 hours

*The figures in the margin indicate full marks
for the questions*

SECTION—I

(Inorganic)

(Marks : 19)

1. (a) How does iodimetry differ from iodometry? Explain with equations. 2½
- (b) Calculate the solubility product of Ag_2CrO_4 , given that its solubility is 2.5×10^{-2} per litre and its molar mass is 332 g/mol. 2½
- (c) What are acid-base indicators? Explain why phenolphthalein cannot be used as an indicator in the titration of aqueous NH_3 against dil. HCl . 3

(Turn Over)

(2)

- (d) Briefly explain the effects of solvents on the relative strengths of acids and bases. 1½

OR

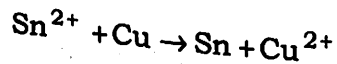
2. (a) Calculate the equivalent mass of $K_2Cr_2O_7$ (mass = 294) and also calculate the strength of the solution prepared by dissolving 1.225 g of $K_2Cr_2O_7$ in 250 c.c. water. 3

- (b) What is solubility product? What is the necessary condition for the precipitation of an electrolyte? 2

- (c) Compare Lewis acids with Brønsted acids. Explain with examples. 2½

- (d) What are primary standards? Give two qualities, a primary standard should have. 2

3. (a) Predict whether the following redox reaction is feasible or not under standard conditions :



Given that $E^\circ_{Sn^{2+}/Sn} = 0.136$ volts and $E^\circ_{Cu^{2+}/Cu} = 0.34$ volts. 3

D9/1598

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(3)

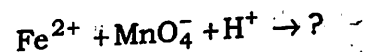
- (b) Explain electrolytic refining of metals using impure copper as an example. 2

- (c) What is the role of gypsum in the setting of cement? 2

- (d) What is leaching? How is it applied in the purification of bauxite for the extraction of aluminium? 2½

OR

4. (a) Complete and balance the following equation : 2



- (b) What are flux and slag? What are the various types of flux? 3

- (c) What are the essential qualities of a good fertilizer? 2½

- (d) What are the main constituents of paints? 2

D9/1598

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(4)

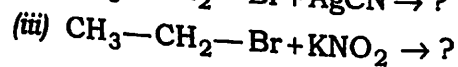
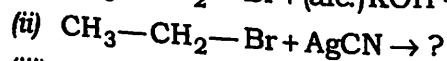
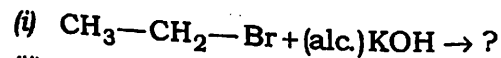
SECTION—II

(Organic)

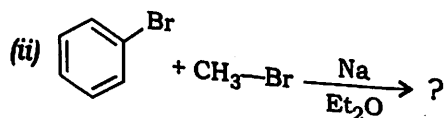
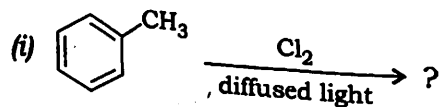
(Marks : 19)

5. (a) Illustrate S_N2 reaction taking the example of the hydrolysis of ethyl bromide. Mention the two factors that determine the rate of an S_N2 reaction. 2+2=4

- (b) Give the major products in the following reactions : $\frac{1}{2} \times 3 = 1\frac{1}{2}$



- (c) Complete the following reactions. Give their mechanisms : $2 \times 2 = 4$



OR

6. (a) S_N1 reaction proceeds with partial inversion of configuration. Explain. 3

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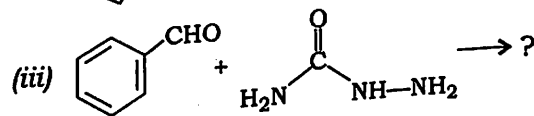
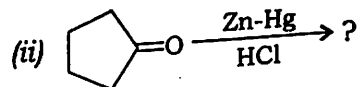
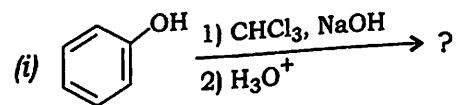
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- (b) How does the strength of a nucleophile affect the rate of nucleophilic substitution reaction? 2

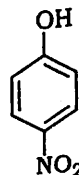
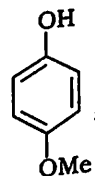
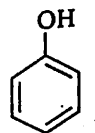
- (c) Discuss the mechanism which follows the E1cB pathway. Why is the mechanism designated as E1cB ? $2 + \frac{1}{2} = 2\frac{1}{2}$

- (d) How does ring substituent affect the reactivity of aryl halides towards nucleophilic substitution reaction? 2

7. (a) Write the product(s) of the following reactions with their mechanisms : $2\frac{1}{2} \times 3 = 7\frac{1}{2}$



- (b) Arrange the following phenols in their increasing order of acid strength and explain the order : 2



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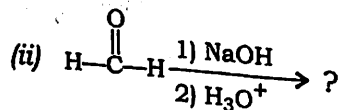
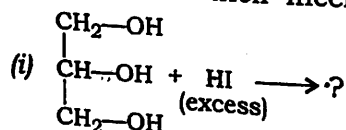
(6)

OR

8. (a) How will you distinguish among primary, secondary and tertiary alcohols by Victor Meyer's method? Give reactions. 3

- (b) How can you distinguish between an aldehyde and a ketone? Give reactions. 2½

- (c) Predict the product(s) in the following reactions with their mechanisms : 2×2=4



SECTION—III

(Physical)

(Marks : 18)

9. (a) Describe the viscometric method for the determination of the molecular mass of macromolecules. 4

- (b) State the first law of thermodynamics and derive its mathematical equation. 1+1½=2½

D9/1598

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(7)

- (c) Three moles of an ideal gas ($C_v = 5 \text{ cal deg}^{-1} \text{ mol}^{-1}$) at 10.0 atm and 0 °C are converted to 2.0 atm at 50 °C. Calculate ΔE and ΔH for the change. (Given, $R = 1.987 \text{ cal deg}^{-1} \text{ mol}^{-1}$).

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

OR

10. (a) Define Joule-Thomson coefficient. Prove that Joule-Thomson coefficient for an ideal gas is zero. 1+2½=3½

- (b) What are extensive and intensive variables? Give one example of each. 2½

- (c) Equal number of macromolecules, each of molar mass 10000 and 100000 are mixed. Calculate the number average and weight average molecular weights. 1½+1½=3

11. (a) Derive the Kirchhoff's equations in terms of ΔE and ΔH of a reaction. 4

- (b) Define the following : 3
- (i) Enthalpy of formation
 - (ii) Enthalpy of combustion
 - (iii) Enthalpy of dilution

D9/1598

(Turn Over)

- (c) The heats of formation of methane, carbon dioxide and water are -74.8 kJ , -393.5 kJ and -286.2 kJ respectively. Calculate the heat of combustion of methane.

2

OR

12. (a) Write the Freundlich adsorption isotherm and Langmuir adsorption isotherm, and explain the terms involved. Under what condition they become identical? $1\frac{1}{2} + 1\frac{1}{2} + 1 = 4$
- (b) The enthalpy of neutralization of a strong acid with a strong base is always constant. Explain why.
- (c) The heat of combustion of ethyl alcohol is $1366.9 \text{ kJ mol}^{-1}$ at 25°C . If the heats of formation of carbon dioxide and water are $-393.5 \text{ kJ mol}^{-1}$ and $-286.2 \text{ kJ mol}^{-1}$ respectively, calculate the heat of formation of ethyl alcohol.

2

3
