This question paper contains 4 printed pages.]

Your Roll No. .....

506

Subsidiary for B.Sc. Honours/I A

Paper II – CHEMISTRY

(Organic and Physical Chemistry)

Time : 3 Hours **Maximum Marks : 50**

(Write your Roll No. on the top immediately on receipt of this question paper.)

Answers to Sections **A** and **B** should be written in separate answer-books.

SECTION – A
(Organic Chemistry)
(Marks : 33)

Answer any **four** questions.
Question No. 5 carries **nine** marks.

SECTION – B
(Physical Chemistry)
(Marks : 17)

Attempt any **two** questions.
Use of Log tables and scientific calculators are allowed.

SECTION – A

1. (a) How will you distinguish between chloroform and carbon tetrachloride ?
   (b) Why acetic acid is a stronger acid than ethyl alcohol ?
   (c) Define the term diasteromers and enantiomers.
   (d) Why aldehydes are more reactive than ketones towards nucleophillic addition reactions ? **4 × 2**

2. (a) An alkene C_6H_{12} after Ozonolysis yielded two products. One of these gave a positive iodoform reaction but negative Tollens' test. The other product gave a positive Tollens' test but a negative iodoform reaction. Give the structure of alkene and explain the reaction.

(b) What do you understand by the term octane number ?

(c) Why trans 1, 2-dichloroethene has zero dipole moment ? **4, 2, 2**

3. What happens when

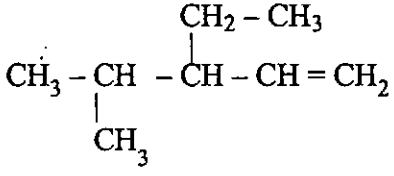
(i) Urea is treated with alkaline hypobromite ?

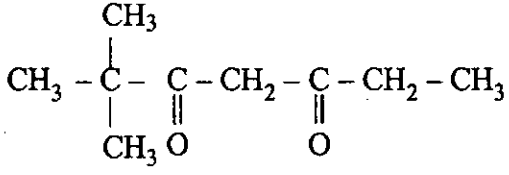
(ii) Citric acid is heated ?

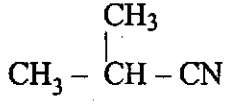
(iii) Glycerol is treated with potassium hydrogen sulphate ?

(iv) Tartaric acid is treated with hydrogen iodide ? **4 × 2**

4. (a) Give the IUPAC name for each compound :

(i) 

(ii) 

(iii) 

(iv) 

(b) Write the structural formula for each compound.
(i) Methyl cyclopentane carboxylate
(ii) 3-Hydroxybutanal **6 + 2**

5. (a) What are organometallic compounds ?
(b) How is pure sample of ethyl magnesium bromide prepared ?
(c) Starting from suitable Grignard reagent how will you synthesise
(i) Trimethyl acetic acid
(ii) Tertiary butyl alcohol
(iii) 2-methyl-2-butanol **1 + 2 + 6**

6. Outline the synthesis of
(i) Methyl ethyl ketone from aceto acetic ester
(ii) Dimethyl acetic acid from malonic ester
(iii) But-2-enoic acid from aceto acetic ester
(iv) 4-methyl uracil from ethyl aceto acetate
2 × 4

SECTION – B

Attempt any **two** questions.
Use of log tables and calculators may be allowed.

1. (a) Define solubility product. How is it determined conductometrically ? **1, 3**
(b) A 0.2 M solution of a weak monobasic acid has the same pH as a 0.02 M solution of HC*l* acid. Assuming that the HC*l* is completely ionized, calculate the pH of these solutions. What is the degree of dissociation of the weak acid in its 0.2 M solution ? Calculate also the ionization constant of the weak acid. **3**
(c) What are the factors on which the conductance of a solution depends ? **1**

2. (a) Discuss the effect of temperature and pressure on the equilibrium composition of the reaction : 3

$N_2O_4(g) \rightleftharpoons 2NO_2(g)$; $\Delta H = 48$ kJ mol^{-1}

(b) If K_p^o is the equilibrium constant of the reaction :

$\frac{1}{2} N_2(g) + \frac{3}{2} H_2(g) \rightleftharpoons NH_3(g)$, then

express the equilibrium constant of the reaction :

$2NH_3(g) \rightleftharpoons N_2(g) + 3H_2(g)$ in terms of K_p^o. 2

(c) The measured resistance of a conductance cell containing 0.555 g of $CaCl_2$ per litre at 25 °C was 1050 Ohm. The same cell with 0.02 M KCl solution gave a resistance of 457 Ohm. If the conductivity of 0.02 M KCl solution is 0.277 Sm^{-1}, calculate (a) the cell constant, (b) the conductivity of the $CaCl_2$ solution and (c) molar conductivity of $CaCl_2$ at this concentration (molar mass of $CaCl_2$ = 0.111 kg). 3

3. Write short notes on any **three** :

(i) Salt hydrolysis and hydrolysis constant.

(ii) Buffer action of a mixture of ethanoic acid and sodium ethanoate.

(iii) Temperature dependence of equilibrium constant.

(iv) Variation of molar conductivity with concentration. $3 \times 3 = 9$