INTER B.SC. EXAMINATION, 2018

(2nd Semester)

CHEMISTRY (SUBSIDIARY)

PAPER - VIIS

Time : Two hours   Full Marks : 50

Use a separate answer script for each group

GROUP -A

1. a) What is meant by the molar conductance of an electrolyte solution ? Express its relation with the specific conductance ?   3

   b) Show pictorially and explain how the conductance varies during conductometric titration of a mixed solution of HCL and CH_3COOH (in 1:1 molar ratio) with a solution of NaOH added from a burette.   3

   c) The resistance of a conductivity cell is 702 Ω when filled with 0.1N KCl solution (specific conductance = 0.14807 Sm^{-1}) and 6920 Ω when filled with 0.01N acetic acid solution. Calculate the cell constant and Λ_m (molar conductance) for the acid solution.

OR

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The resistance of a 0.02 mol dm^{-3} solution of acetic acid in a cell (cell constant, $k = 0.2063$ cm^{-1}) is found to be 888 Ω at 298K. What is the degree of ionization of the acid at this concentration ? (Given Λ_m^0 of acetic acid $= 390.7 \times 10^{-4}$ $\Omega^{-1}m^2mol^{-1}$ at 298K).

2. a) Explain how you can determine the pH of an unknown solution by EMF measurement using standard hydrogen electrode.   3

   b) Represent the cell for the overall cell reaction,

$$2Al(s) + 3Br_2 + 3Br_2(p = 1atm) \rightarrow 2Al^{3+}(a = 1) + 6Br^-(a = 1)$$
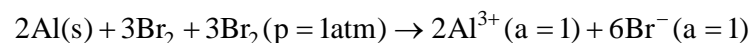
   and indicate whether it will operate spontaneously or not (Given, $E^0_{Al^{3+}|Al} = -1.76V$ and

   $E^0_{Br^-|Br_2|Pt} = +1.09V$ at 298 K).

   c) The standard electrode potential for $Hg_2^{2+}|Hg$ and $Hg^{2+}|Hg$ are 0.799 V and 0.855V, respectively. Calculate the equilibrium contant for the reaction $Hg^{2+} + Hg \rightleftharpoons Hg_2^{2+}$ at 298K.   2
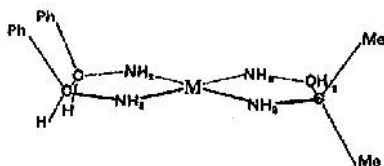
e) Applying Valence Bond theory, predict the geometry of diamagnetic $[PtCl_4]^{2-}$ complex.

f) Draw all possible stereoisomers of (i) [MABCD] and (ii) $[M(A \wedge A)_2B_2]$, where A, B, C and D represent monodentate, and $A \wedge A$ stands for symmetrical bidentate ligand.

GROUP -B

3. a) In vapor phase or non polar solvent enol content of

$$CF_3CH_2 - \overset{\overset{\textstyle O}{\|}}{C} - CH_3 \quad \text{is} \quad \text{more} \quad \text{than} \quad \text{that} \quad \text{of}$$

$$CH_3CH_2 - \overset{\overset{\textstyle O}{\|}}{C} - CH_3 \text{ explain.} \qquad 2$$

b) How will you carry out the following transformations ? 2×3

i) $H_2C \overset{COOEt}{\underset{COOEt}{\diagdown}} \longrightarrow Me_2CH - COOH$

ii)

iii)

4. a) Isoelectric point of glycine is 6.0 whereas that of lysine is 9.8 – explain. 2

b) Ninhydrin reacts with L-alanine to produce a purple compound. Write down the structure of the product with mechanism. 3

[Turn over

5. a) What is Ziegler-Natta catalyst and how does it function? 3
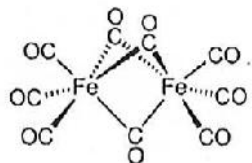
b) What is Bakelite ? 1

GROUP -C

6. Comment on the optical activity of Mills Quibell complex :

1

7. Answer *any five* questions : 3×5

a) How did Alfred Werner establish the geometry of six-coordinated complexes ?

b) Assign the possible and most stable oxidation states (OS) of scandium, vanadium and chromium with justification.

c) What do you mean by ambidentate and bridging ligands ? Give examples.

d) Write the IUPAC nomenclature of the following complexes (any three) :
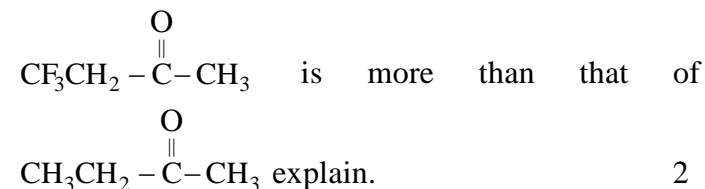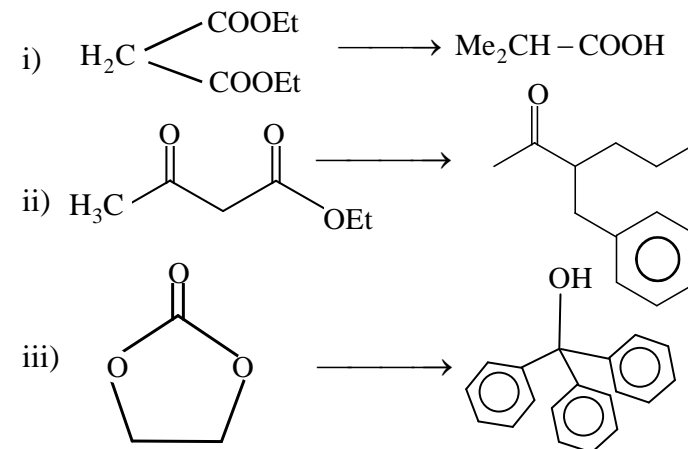

Li[AlH$_4$], [Co(py)$_6$][CoCl$_6$],

K$_2$[Ni(CN)$_4$], H[[AuCl$_4$],