Instructions: 1) Answers to the two sections should be written on separate books.

2) All questions are compulsory

3) Use of scientific calculator is permitted

4) Figures to the right indicate full marks

5) For questions 2,3,5,6, there is choice for question A

SECTION A: Physical Chemistry   40 marks

Q1. Answer any **FIVE** of the following: (2x5=10marks)

i. State 2 differences between Ideal and Non-Ideal solutions.

ii. Draw a labelled phase diagram for Pb- Ag system.

iii. Define Equivalent Conductance.

iv. What is Liquid Junction Potential.

v. What are Azeotropic mixtures? Give examples.

vi. Calculate the Degrees of Freedom of sulphur on the transition curve.

vii. An alkali metal has Std. Oxidation Potential +3.045V, will it be able to decompose water to form H_2 gas? Why?

Q2.A) i) State the principle of distillation and explain fractional distillation.   **4 marks**

ii) Describe the carbon dioxide system with a diagram.   **3 marks**

OR

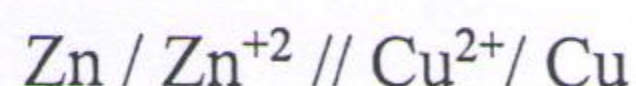Q2.A) iii) With the help of diagram explain system with upper CST.   **4 marks**

iv) State the following: **3 marks**

a. Coordinates of Eutectic point in Zn- Mg System.

b. Polymorphs of Sulphur.

c. Lowest temperature in NaCl - water system.

Q2.B i) Draw the diagram and explain the working of the following cell.   **4 marks**

$$Zn / Zn^{+2} // Cu^{2+}/ Cu$$

ii) Write the construction and working of the calomel electrode.   **4 marks**

Q3. A) i) Explain with the graph the following conductometric titrations: **4 marks**

a) Weak Acid v/s Strong Base

b) Strong acid v/s Weak base

ii) The emf of the cell, Ag / AgCl(s), Cl⁻(a=0.1) // Ag+ (a=0.01) / Ag is 0.3991 volt at 298°K. Calculate the standard potential of the Ag+ / Ag electrode if that of the silver electrode is 0.2224 volt.   **3 marks**

OR

iii) Briefly explain how the solubility of sparingly soluble salts is determined using

iv) Calculate the emf of the following cell at 298°K.   **3 marks**

Ag / AgCl(s), KCl (m=0.1,γ=0.770) / KCl (m=0.01,γ=0.902), AgCl(s) / Ag .The

transport number of the Cl⁻ ions is 0.495 in the given range of

concentrations.

B) i) Describe the water system with diagram   **4 marks**

   ii) The vapour pressure of water at 293K is 18 mm of Hg, lowering of vapour   pressure

   of glucose solution is 0.0810 mm of Hg. Calculate   **4 marks**

   a. Relative Lowering of Vapour Pressure

   b. Vapour pressure of the solution

   c. Mole Fraction of Water

SECTION B: ORGANIC CHEMISTRY   **40 Marks**

Q4. Answer **ANY FIVE** of the following questions   **(2x5=10 marks)**
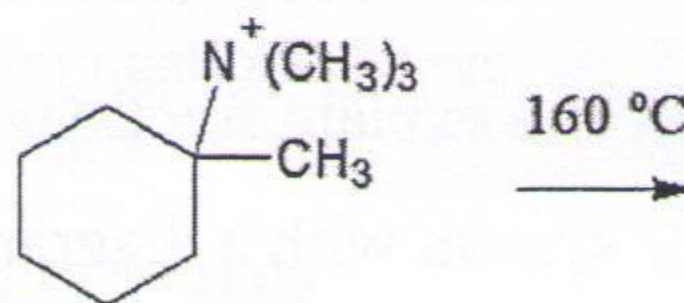
   1. Give the structure for the following:

   a) o-Hydroxybenzoic acid   b) Phenyl benzoate

   2. Draw the structure of the predominant form of Valine at pH 2 and pH 10, given that

      the isoelectric point of valine is 5.96.

   3. Write the major product for the reaction and state the type of elimination involved.

   4. Give the Fischer projection of D-Fructose and determine the number of chiral centers

      present in it.

   5. How will you prepare the following compound using Gabriel phthalimide synthesis?
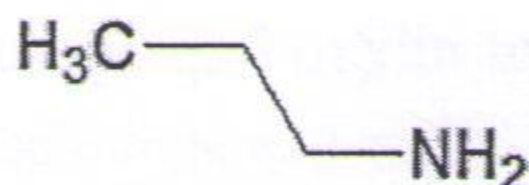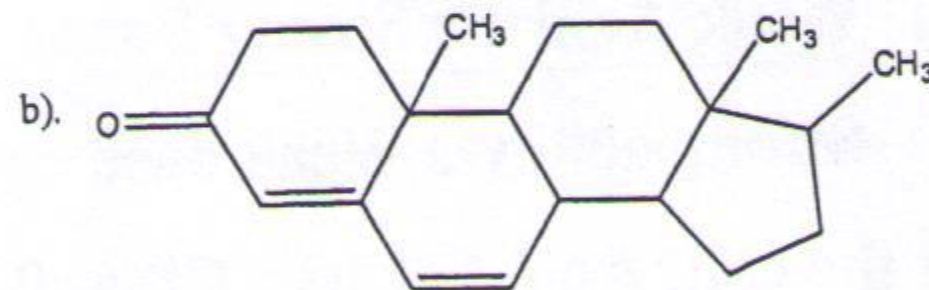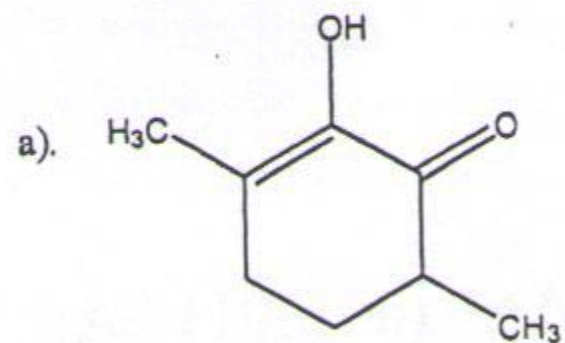

   6. How will you distinguish between cis and trans-1,3,5-hexatriene using uv-visible

      spectroscopy?

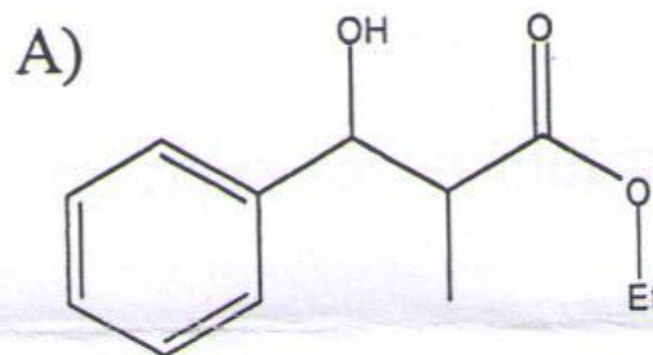   7. Give the osazone reaction of D-Glucose.

Q5 A. i) Using Woodward Fieser rules, calculate the λmax values for the following.

4 marks

a).

b).

ii) Identify the name reaction involved to prepare **A** given below. Also, give the complete reaction.
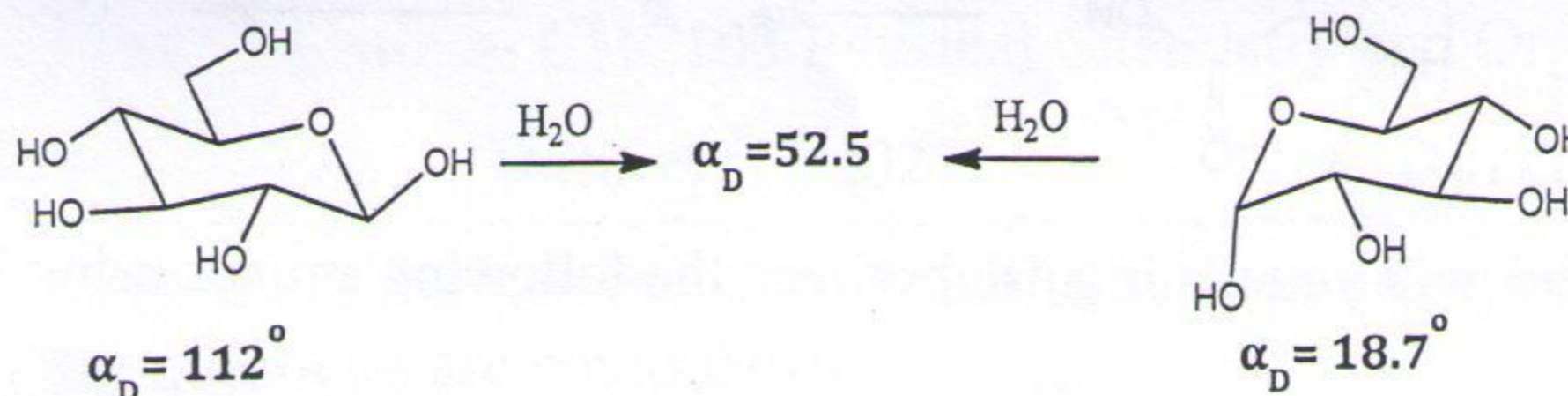
3 marks

A)

OR

iii) Consider the following and answer the following questions: **4 marks**

$$\alpha_D = 112°$$

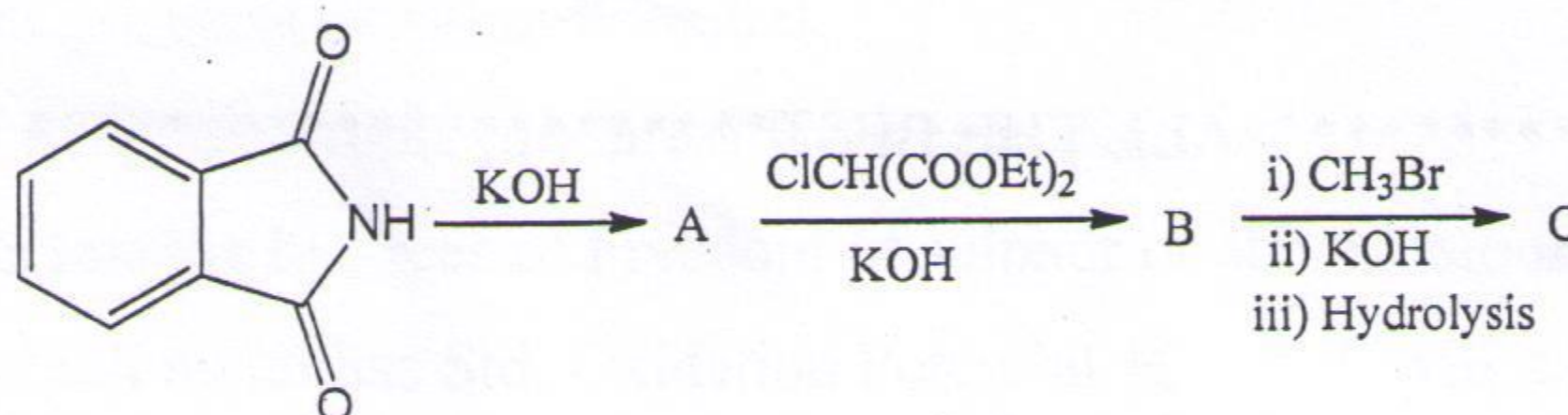$$\xrightarrow{H_2O} \alpha_D = 52.5 \xleftarrow{H_2O}$$

$$\alpha_D = 18.7°$$

a) State the phenomenon responsible for the observed change in the rotation when alpha and beta isomers of D-Glucose are dissolved in a solution. (1/2 mark)

b) How many chiral centers are present in the Fischer and Haworth projection of D-Glucose respectively? (1 mark)

c) What is the relationship between alpha and beta isomers of D-Glucose? (1/2 mark)

d) Assign R/S configuration for the Fischer projection of Glucose. (2 marks)

iv) Identify and write the structures of **A, B** and **C** given below: **3marks**

$$\xrightarrow{KOH} A \xrightarrow[KOH]{ClCH(COOEt)_2} B \xrightarrow[\substack{ii) KOH \\ iii) Hydrolysis}]{i) CH_3Br} C$$

Q5B.i) With respect to uv-visible spectroscopy, answer the following questions. **4 marks**

a) Define λmax. (1 mark)

b) How does increase in extent of conjugation in a double bonded system affect λmax? (2 marks)

c) Give one limitation of Beer-Lambert's law. (1 mark)

ii) Write the complete reaction of acetic anhydride and methanoyl chloride respectively reacting with aniline and determine which reaction will be faster. **4 marks**

Q6A i) Using Merrifield synthesis how will you synthesize the following? **4 marks**
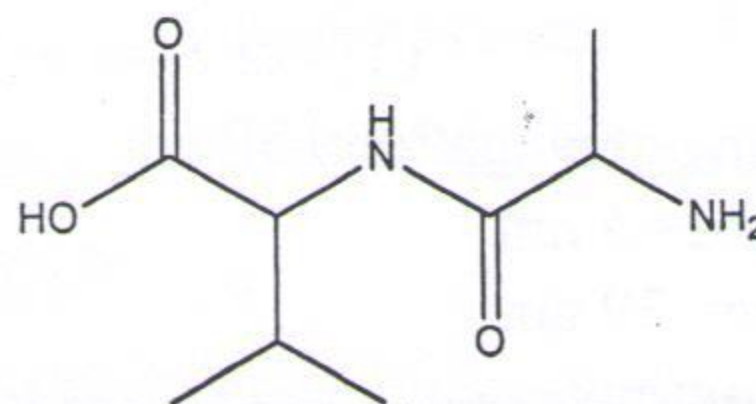
ii) Answer the following: **3 marks**
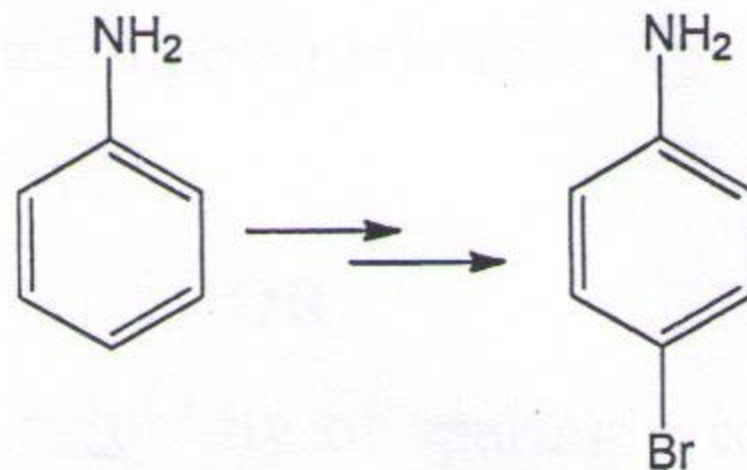
a) Define 1. Auxochrome 2. Bathochromic shift (2 marks)
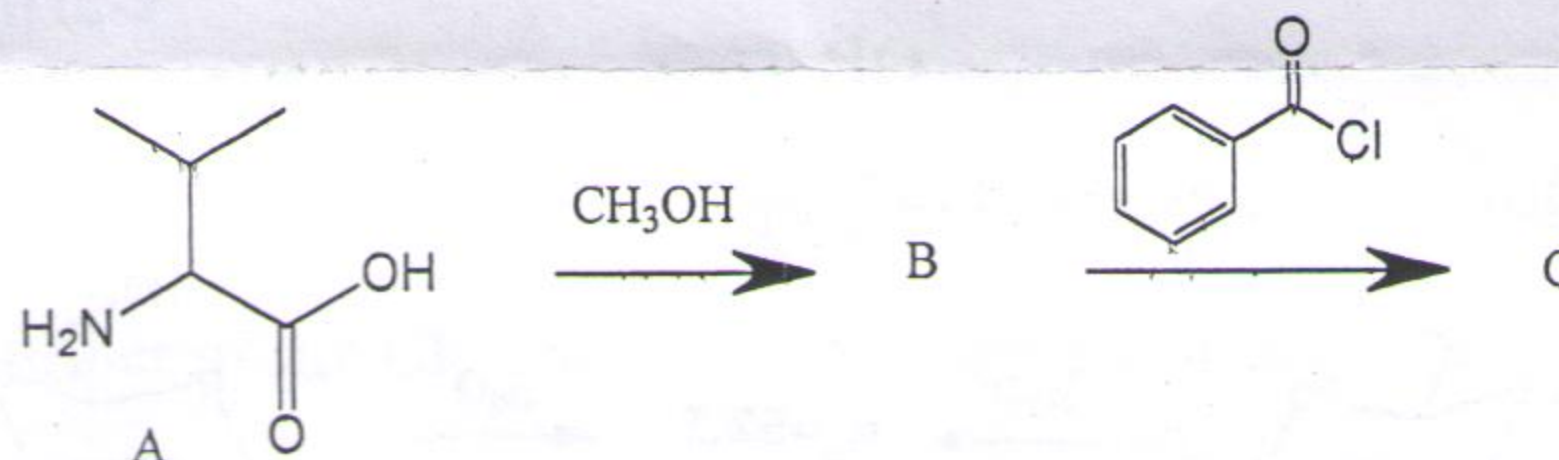b) What is electromagnetic spectrum? (1 mark)

OR

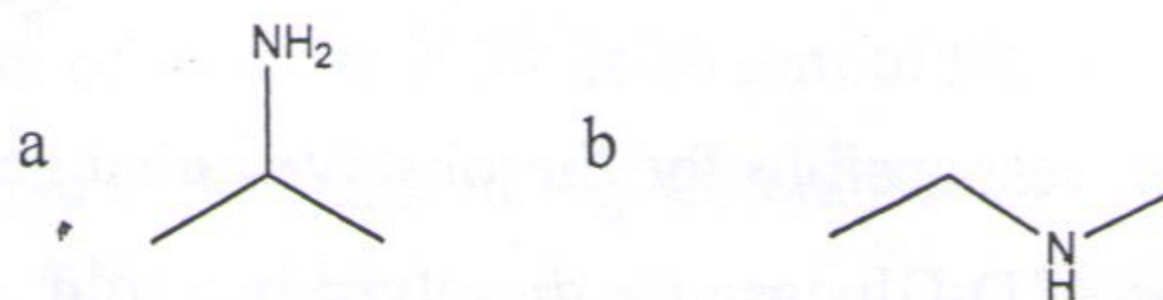iii) Complete the following reaction.   **4 marks**

iv) Give the IUPAC name for **A** and predict the product B and C.   **3 marks**

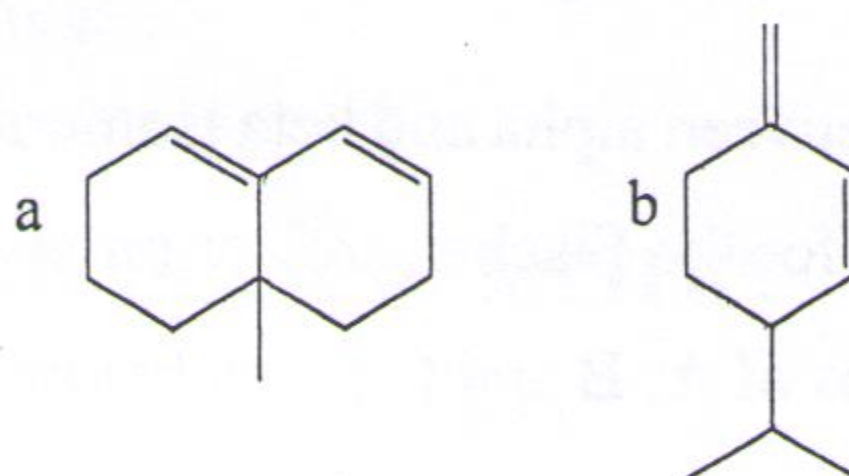A $\xrightarrow{\text{CH}_3\text{OH}}$ B $\xrightarrow{}$ C

Q6B i) How will you distinguish between the following amines using Hinsberg's test?

a

b

4marks

ii) Using Woodward Fieser rules, calculate the λmax values for the following dienes.

a

b

4 marks

***************************ALL THE BEST***************************

Woodward Fieser rules

I] Conjugated diene
1) Base value for hommoannular diene=253 nm
2) Base value for heteroannular diene=215nm
3) Alkyl substituent or ring residue=5 nm
4) Double bond extending conjugation= 30 nm
5) Exocyclic double bond= 5 nm

II] α,β- unsaturated carbonyl compounds
1) Base value: a) Acyclic α,β unsaturated ketones=215 nm

b)6-membered cyclic α,β unsaturated ketones=215nm

c) 5 membered cyclic α,β unsaturated ketones=202 nm

d) α,β unsaturated aldehyde= 210 nm

e) α,β unsaturated carboxylic acid and esters= 195 nm

2) Alkyl substituent/ ring residue at a)α-position= 10 nm

b) β-position = 12 nm

c) γ- or δ- or higher= 18 nm

3) Double bond extending conjugation= 30 nm
4) Exocyclic double bond= 5 nm
5) Hommoannular diene= 39 nm
6) Increments for substitution

	α	β	γ	δ
-R	10	12	18	18
-OH	35	30	50	50
-OAc	6	6	6	6
-Cl	15	12	12	12
-Br	25	30	25	25