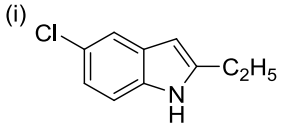
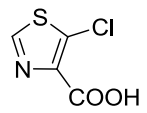
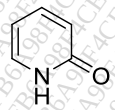
Time: 3hrs **Marks: 80**

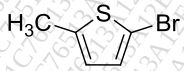
N.B.: 1. All Questions are compulsory
2. Figures to right indicate full marks

Q.1. **A. (i)** Give IUPAC nomenclature of the following: (**Any Three**) **(03)**

(i) 

(ii) 

(iii) 

(iv) 

(ii) Draw the structures for the following :(**Any Two**) **(02)**
a) 3-Ethyl-5-methylquinoline **b)** 2-Methyl-5-bromofuran **c)** 4,5-Dihydro-imidazole-4-carboxylic acid

B. Answer the following in brief: **(10)**
(i) Size exclusion chromatography of monodisperse fractions of a linear polymer A and B, yield molecular weights 4,00,000 and 8,00,000 respectively. Mixture is prepared from 3 parts by weight of A and 5 parts by weight of B. Determine weight average molecular weight.
(ii) During DNA synthesis, A, G and C requires protecting group while thymine does not. Justify.
(iii) Calculate the isoelectric point for Aspartic acid given that pK_{a1} = 1.88, pK_{a2} = 3.65, and pK_{a3} = 9.60. Write the structure of the zwitterion
(iv) Give the structure/s of reduction products of Pyridine.
(v) At which position does electrophilic aromatic substitution occur in pyrrole? Why?

C. Answer the following:
(i) Draw all resonating structures for thiophene **(02)**
(ii) Can imidazole be considered as amphoteric? Justify. **(02)**
(iii) Draw the structure of 5α-androstan-3β-ol (in chair conformation) **(01)**

Q.2. A. Give the products of the following reactions **(Any Six)** **(06)**

(i) Pyrrole $\xrightarrow{H_2 / Ni\ 200\text{-}300\ ^oC}$

(ii) Imidazole $\xrightarrow[100^oC]{H_2SO_4,/SO_3}$

(iii) Thiophene $\xrightarrow{N\text{-Bromo Succinimide}}$

(iv) Pyridine $\xrightarrow[Liq.\ NH_3]{NaNH_2}$

(v) Isoquinoline $\xrightarrow[reflux]{alk\ KMnO_4}$

(vi) Thiazole $\xrightarrow{CH_3Li}$

(vii) Furan $\xrightarrow[DMF]{POCl_3}$

B. Complete the following reactions **(03)**

(i) 2-cholestene $\xrightarrow{Br_2 \text{ in } CHCl_3}$

(ii) Androst-9(11)-ene $\xrightarrow{\text{Hydroboration-oxidation}}$

(iii) **5α-cholestan-3-one** $\xrightarrow[\text{Neutral}]{H_2, Pt}$

C. Illustrate the Edman degradation analysis for the peptide Gly-Phe-Glu-Lys **(03)**

Q.3. A. Write the following synthesis with mechanisms **(Any Three)** **(06)**

(i) Doebner-Miller synthesis
(ii) Robinson-Gabriel synthesis for oxazole
(iii) Hantzsch Pyridine synthesis
(iv) Knorr Pyrrole Synthesis

B. Write all steps required for synthesis of Leu-Ala dipeptide. **(03)**

C. Discuss polymerization reaction of propene using Ziegler Natta catalysis. **(03)**

Q.4. A. Give reasons for the following: **(Any Three)**: **(06)**

(i) 5α-cholestane-3α-ol is oxidized 3 times faster than 5α-cholestane-3β-ol.
(ii) Nucleophilic substitution in pyridine takes place at 2 and 4 position.
(iii) Furan undergoes Diels Alder reaction faster than thiophene.
(iv) Cholesterol gives cis product upon oxidation with $KMnO_4$ while with H_2O_2 it gives trans product

B. Draw the general structures for androstane, pregnane and estrane backbone of steroids **(03)**

C. Briefly discuss the Merrifield solid phase synthesis of DNA **(03)**

Q.5. A. Answer the following questions: **(03)**

(i) Pyrimidine (pKa: 1.30) is much less basic than pyridine (pKa: 5.2). Justify.
(ii) Write method of synthesis of piperazine from oxirane
(iii) Draw resonating structures for Indole.

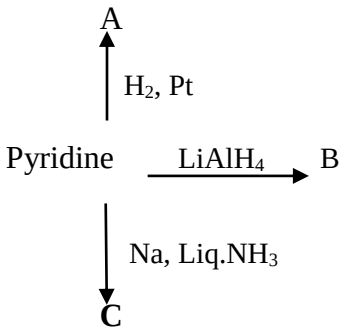
B. Attempt the following conversions **(Any Five)** **(05)**

(i) Furan to furfural
(ii) Pyridine to 4-nitropyridine
(iii) Indole to 3-Formylindole
(iv) Thiazole to thiazole-5-sulphonic acid
(v) Thiophene to Thiophene-2-carboxylic acid
(vi) Acrolein to quinoline

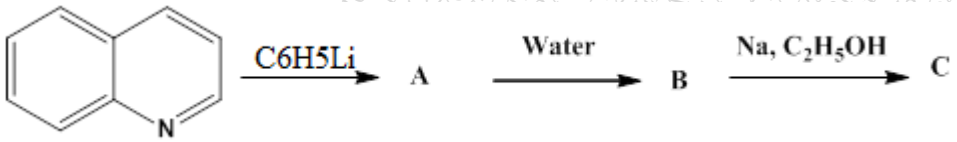
C. Classify polymers on the basis of their physical properties giving one example from each class. Discuss any one in detail **(04)**

Q.6. A. Identify and write the structures of A, B and C in the following reactions **(06)**

(i)



(ii)



B. 5-Cholestene (A) when treated with peracetic acid gives product B, which on treatment with water to give product C. Give the structures of A, B and C with proper stereochemistry. **(03)**

C. What are co-polymers? Explain different types of co-polymers. **(03)**
