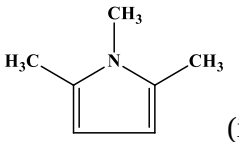
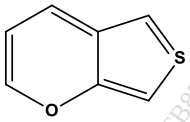
Time: 3hrs

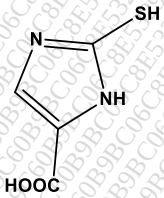
N.B.: 1. All Questions are compulsory **Total Marks: 80**

2. Figures to right indicate full marks

Q**1**. **(a)** Give IUPAC nomenclature of the following: (0**3**)

(i) 

(ii) 

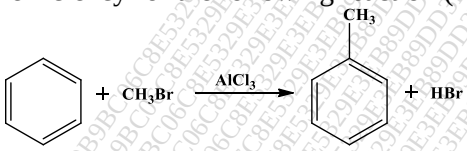
(iii) 

(b) Compare and comment on basicity of quinoline and pyridine. (0**2**)

(c) Explain Conrotatory motion with example. **(02)**

(d) Define following terms: i) Functional Group Addition ii) Synthons (0**2**)

(e) Calculate E-factor and atom efficiency for the following reaction (At. wt. Br=80, C=12, H=1) (0**2**)



(f) What is the strategy used for disconnection in thiophene. (0**2**)

(g) How many chiral centers are there in the basic steroid ring? Give their positions on the basic steroid ring. Also state the number of optically active forms possible. (0**2**)

Q2. (a) Write the following reactions with mechanism (**any two**): (0**4**)

(i) Doebner Miller synthesis

(ii) Pomeranz - Fritsch synthesis

(iii) Hantzsch synthesis for pyridine

(b) Using orbital diagram, explain whether ($2\pi + 2\pi$) cycloaddition photochemical reaction would be suprafacial or antarafacial by giving suitable example. (0**4**)

(c) 5-Cholestene when treated with peracetic acid gives product B, which is hydrolysed by acid and water to give product C. Give the structures of B and C with proper stereochemistry. (0**3**)

Q3. (a) Attempt the following conversions (**any four**) (0**4**)

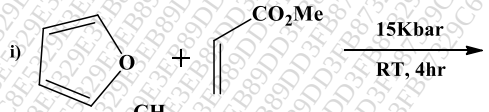
(i) Tartaric acid to imidazole-4,5-dicarboxylic acid **(ii)** Pyridine to 3-nitropyridine

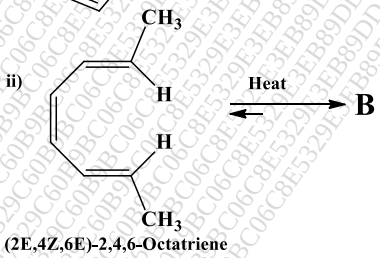
(iii) Benzoyl styrene to 2,4,6-triphenyl pyrimidine **(iv)** Indole to 3-Formylindole

(b) Using synthon approach devise scheme for synthesis of sulfadiazine. (0**4**)

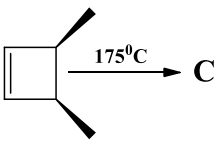
(c) Discuss the role of synthetic hydrotalcite clay in catalysed condensation name reactions (0**3**)

Q4. (a) Write structures of products formed in the following reactions: (0**3**)

i) 

ii) 

(2E,4Z,6E)-2,4,6-Octatriene

iii) 

Q.4 (b) Write structures of products formed for the following reactions (**any eight**): (0**8**)

(i) Indole $\xrightarrow{\text{Benzoyl nitrate}}$

(ii) Furan $\xrightarrow[\text{(b) } CO_2,\ H^+]{\text{(a) } C_4H_9Li}$

(iii) Pyridine $\xrightarrow{NaNH_2}$

(iv) Pyrimidine $\xrightarrow{H_2O_2}$

(v) Thiophene $\xrightarrow{POCl_3,\ DMF}$

(vi) Quinoline $\xrightarrow{\text{Oleum, } 220^{\circ}C}$

(vii) Isoquinoline $\xrightarrow{\text{Na, Liq. } NH_3}$

(viii) Imidazole $\xrightarrow{I_2}$

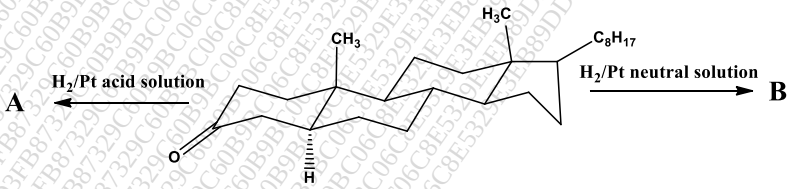
Q5. (a) Write the following reactions with mechanism (**any two**): (0**4**)

(i) Fischer Indole synthesis
(ii) Hinsberg synthesis
(iii) Paal Knorr synthesis for furan.

(b) Give reasonable explanation for the following (**any five**) **(05)**

(i) Indole undergoes electrophilic substitution reaction mainly at its 3-position
(ii) Pyrimidine (pKa: 1.30) is much less basic than pyridine (pKa: 5.2).
(iii) Electrophilic substitution in pyridine takes place at 3 or 5 position
(iv) Hoffmann degradation of 3α-trimethylammonium-5α-cholestane forms 5α-cholest-2-ene.
(v) Furan and pyrrole are aromatic
(vi) Nucleophilic substitution in pyridine takes place at 2 and 4 position

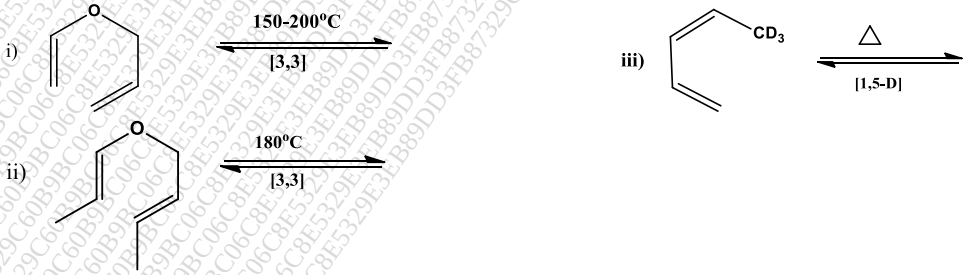
(c) Identify A and B from the following reaction **(02)**



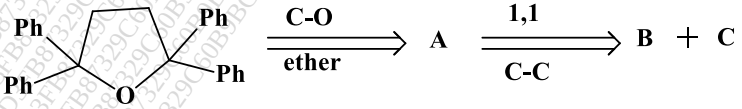
Q6. (a) Draw resonating structures for the following (0**4**)

(i) Thiophene (ii) Indole (iii) Imidazole (iv) Isoquinoline

(b) Complete the following reactions (**any two**): (0**4**)



(c). Identify the synthon equivalents A, B and C from the following retrosynthetic pathway (0**3**)



[**Hint**: Use Grignard reagent to generate the target molecule]

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