

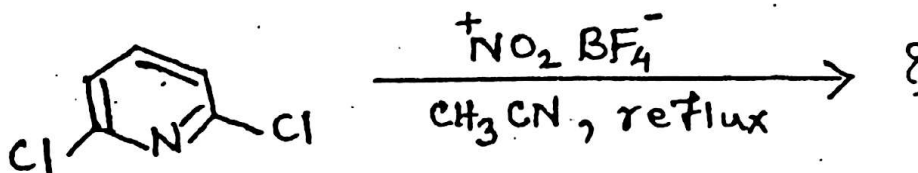
- N. B. : (1) All questions are compulsory.
(2) Figures to the right indicate full marks.

1. (a) Answer any two of the following :-

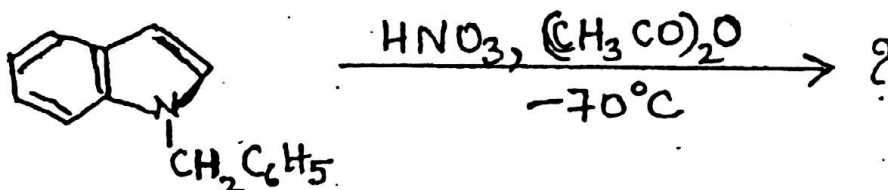
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(i) Complete the following reactions :-

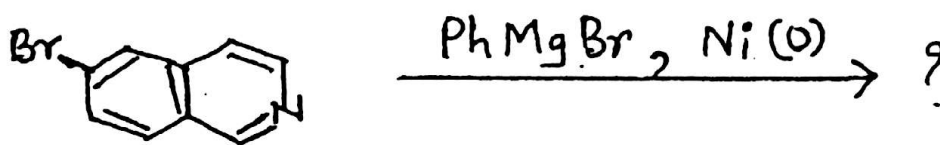
(I)



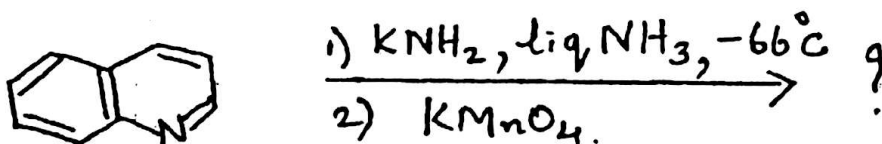
(II)



(III)



(IV)



(ii) (I) Explain the following :-

(A) Electrophilic substitution in quinoline and isoquinoline takes place in the homocyclic ring.

(B) Pyridine N-oxide undergoes both electrophilic and nucleophilic substitution reactions.

(II) Give any one method of preparation of quinoline and isoquinoline.

(iii) How will you prepare pyrazine from

(I) 1,2-dicarbonyl compound

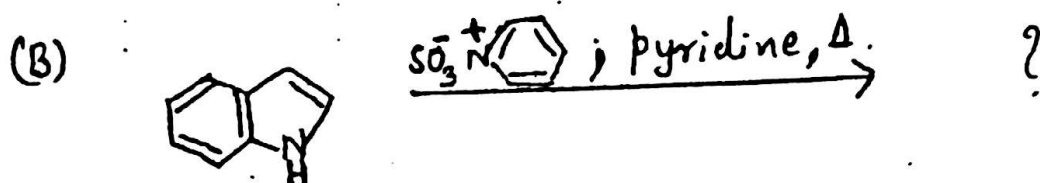
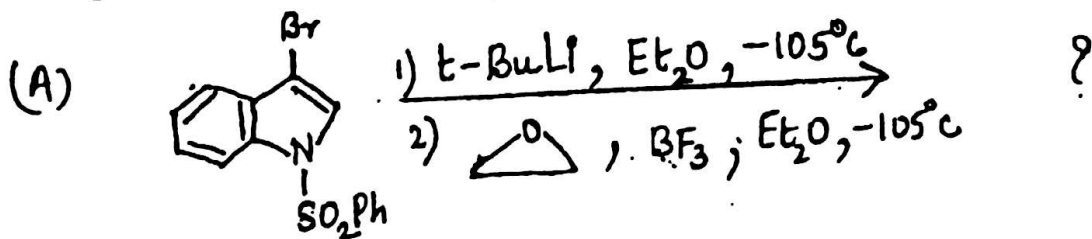
(II) α -aminoketone?

Discuss the electrophilic substitution reactions of diazines.

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(iv) (I) Give any two methods of synthesis of indole.

(II) Complete the following reactions :-

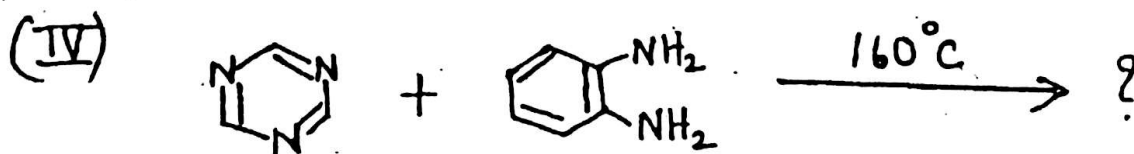
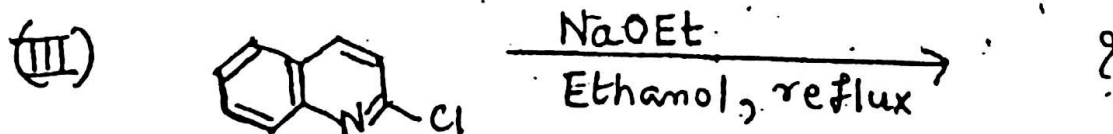
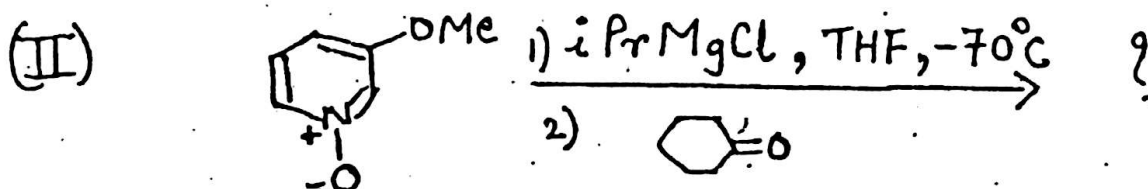
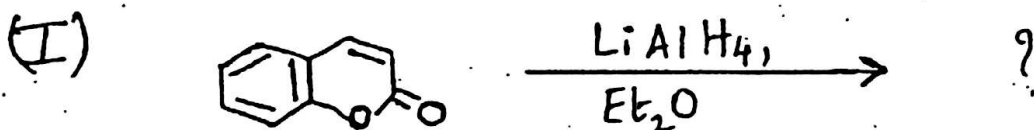


(b) Answer any one of the following :-

(i) (I) Explain giving examples the nucleophilic substitution reactions of diazines.

(II) Discuss electrophilic substitution reactions of pyridine N-oxide.

(ii) Complete the following reactions :-



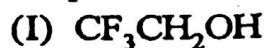
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2. (a) Answer any two of the following :- 8
- (i) Give the occurrence, biological role and structural features of sterols.
 - (ii) Write a note on steroidal alkaloids.
 - (iii) How is cholesterol converted to 16-DPA?
 - (iv) Give the synthesis of testosterone from 16-DPA.
- (b) Answer any one of the following :- 4
- (i) How is androsterone synthesised from 16-DPA?
 - (ii) Give the synthesis of cinerolone. Give the structure of cortisol.
3. (a) Answer any two of the following :- 8
- (i) (I) State the sources and biological importance of
(A) biotin (B) vitamin K₁
(II) Give the synthesis of vitamin K₁
 - (ii) Explain the sources and biological importance of vitamin B₆.
How will you convert ethylester of N-formyl-DL-alanine to vitamin B₆.
 - (iii) How are vitamins classified? Outline the synthesis of riboflavin.
 - (iv) Write the degradative evidences to establish the structure of penicillin.
- (b) Answer any one of the following :- 4
- (i) Explain the biological importance and give the synthesis of vitamin B₁.
 - (ii) DL-penicillamine and tert-butylphthalimide malonaldehyde are the intermediates required for the synthesis of penicillin. Give the synthesis of these intermediates.
4. (a) Answer any two of the following :- 8
- (i) Calculate ¹³C NMR chemical shifts for all the aromatic carbons using the incremental shifts of the aromatic carbon atoms from the table given below, for the following compounds.
(I) 2-nitrophenol
(II) 4-nitroaniline

Substituent	Increments in ppm			
	<i>ipso</i>	<i>ortho</i>	<i>meta</i>	<i>para</i>
NO ₂	19.6	-5.3	0.9	6.0
OH	26.6	-12.7	1.6	-7.3
NH ₂	19.2	-12.4	1.3	-9.5

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- (ii) Explain the HETCOR technique with a suitable example.
 (iii) State the number of ^{13}C peaks and assign the multiplicity of each one in ^{13}C proton decoupled NMR spectrum in the following compound.



- (iv) How will you distinguish between (E)-2-bromo-2-butene and (Z)-2-bromo-2-butene using NOESY spectrum?

4. (b) Answer any one of the following :-

- (i) Draw the proton decoupled, DEPT-45, DEPT-90 and DEPT-135 of the compound, ethyl 2-nitropropanoate using following ^{13}C NMR values :

δ 14 , 16 , 63 , 82 and 165 ppm.

- (ii) What is ESR spectroscopy? Discuss its principle. Give the applications of NMR spectroscopy in medicine.

5. Answer any four of the following :-

- (a) How is coumarin synthesised,

(i) by Pechmann synthesis

(ii) using *o*-hydroxybenzaldehyde and acetic anhydride?

- (b) (i) Give Traube synthesis of purines.

(ii) What is the action of,

(I) CH_3I , CH_3OH , 100°C

(II) conc HNO_3 , AcOH , 120°C

on purine.

- (c) How is exaltone synthesised?

- (d) How is oestrone converted to oestriol?

- (e) (i) State the sources and biological importance of

(I) α -tocopherol

(II) Vitamin B_{12}

(ii) What are natural insecticides?

- (f) Give the synthesis of pyrethrin-I.

- (g) Explain the principle of fluorescence spectroscopy.

- (h) A compound $\text{C}_9\text{H}_{10}\text{O}$ exhibits the following signals in ^{13}C NMR spectrum:

δ 8.2 (q), 31.6 (t), 128.3 (d), 128.6 (d), 132.6 (d), 137.2 (s) and 200 (s).

Predict the structure and justify your answer.