

PG Semester IV

Alkaloids

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Alkaloids:

What are Alkaloids?

How would you determine the chemical constitution of the main alkaloid present in tobacco leaves?

OR

Establish the structure of Nicotine.

Alkaloids (Alkali-like compounds):

Alkali + Oid \rightarrow Alkaloid
(means life)

Alkaloids, any of the class of naturally occurring organic nitrogen containing bases.

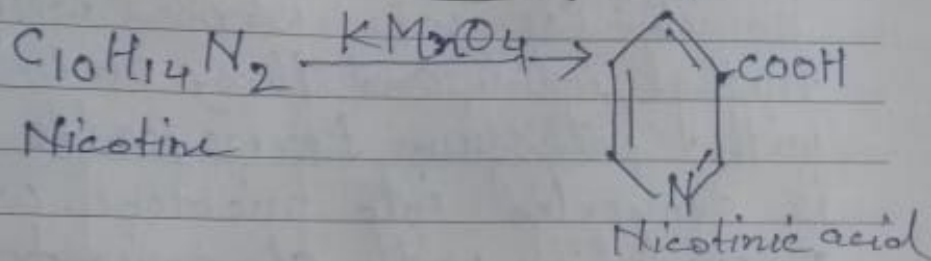
Alkaloids have diverse and important physiological effects on humans and other animals - includes Atropine, Quinine, Nicotine, etc.

Nicotine, is the best known and most widely distributed of the tobacco alkaloids.

Molecular formula of Nicotine is found to be $C_{10}H_{14}N_2$, b.p. 247°C .

Structure:

* When Oxidised with dichromate-sulphuric acid (or KMnO_4 or HNO_3) Nicotine forms Nicotinic acid.



This shows that it is a pyridine derivative with side chain at position 3.

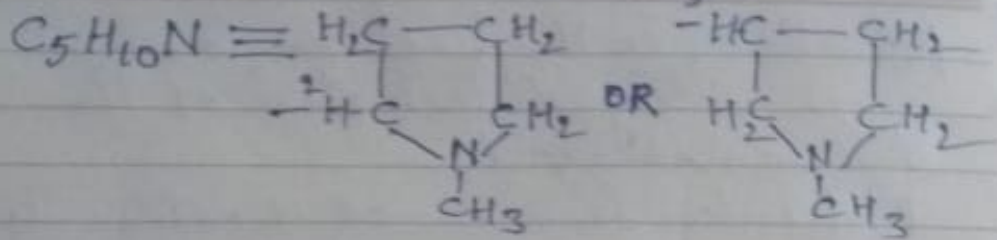
* Nature and Position of the side chain:

When Nicotine is heated with conc. hydroiodic acid at 150°C

(Herzig-Meyer method), methyl-iodide is formed. Thus the side-chain could be N-methylpyrrolidine.

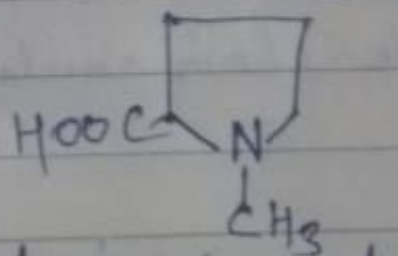
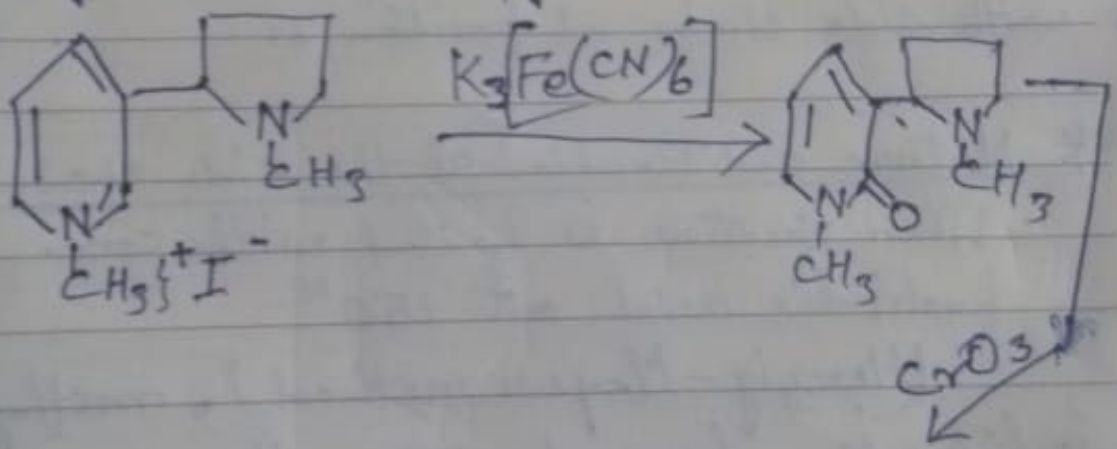
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The side-chain to the pyridine nucleus may be at C₃ OR C₂.

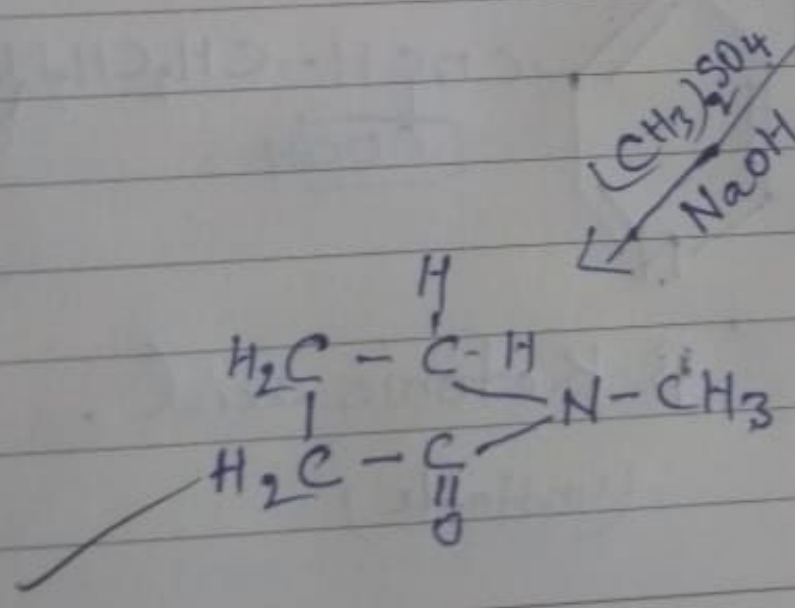
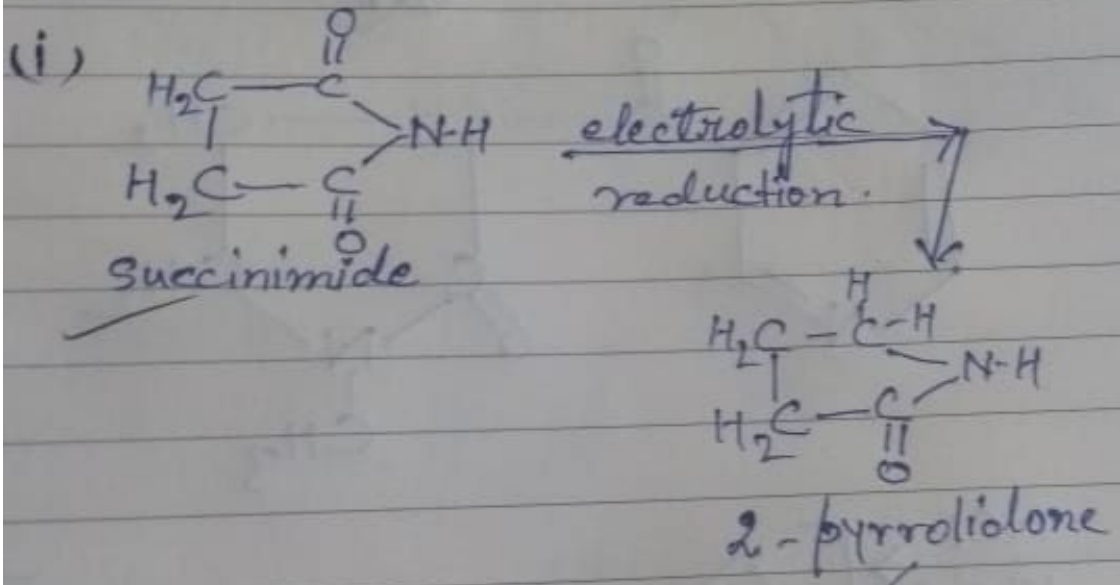
Nicotine hydriodide forms nicotine isomethiodide when warmed with methyl iodide and this, on oxidation with potassium ferricyanide, is converted into nicotone, which, on oxidation with chromium trioxide, gives L(-) hygrinic acid.



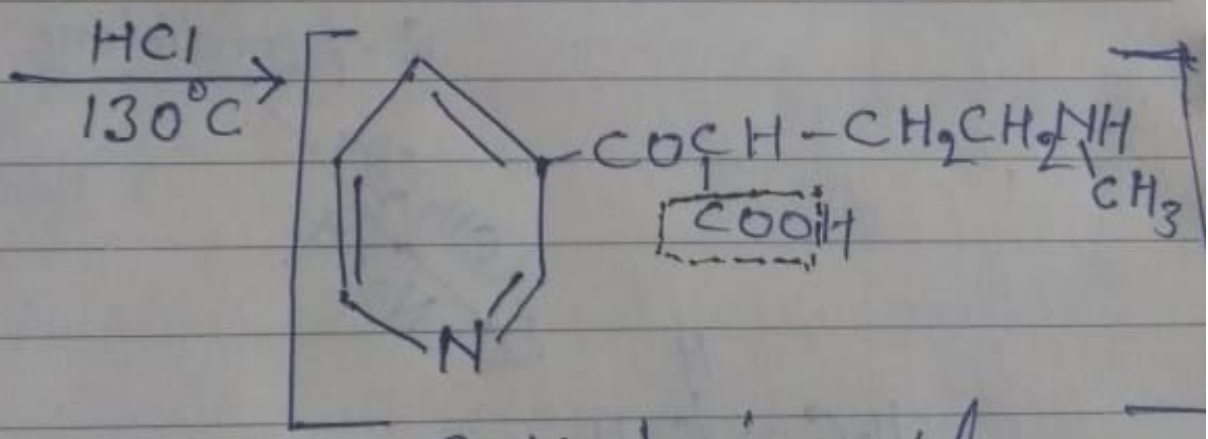
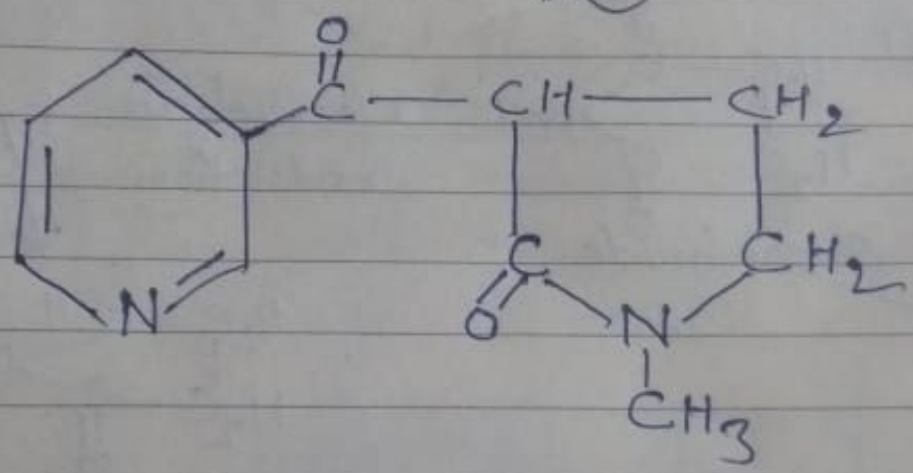
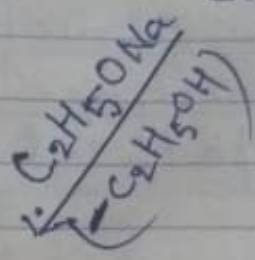
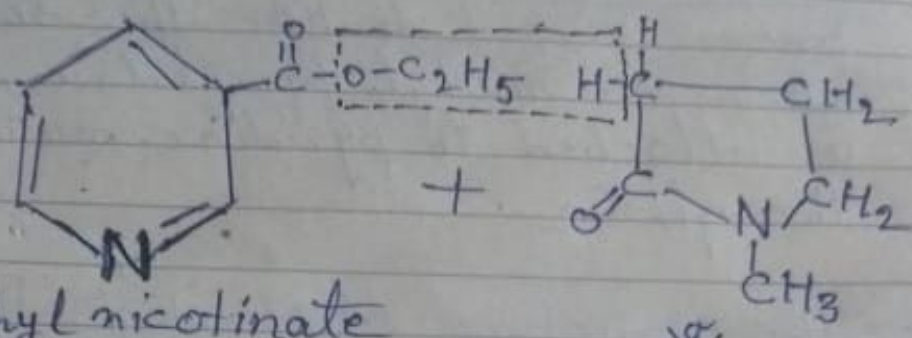
L(-) hygrinic acid

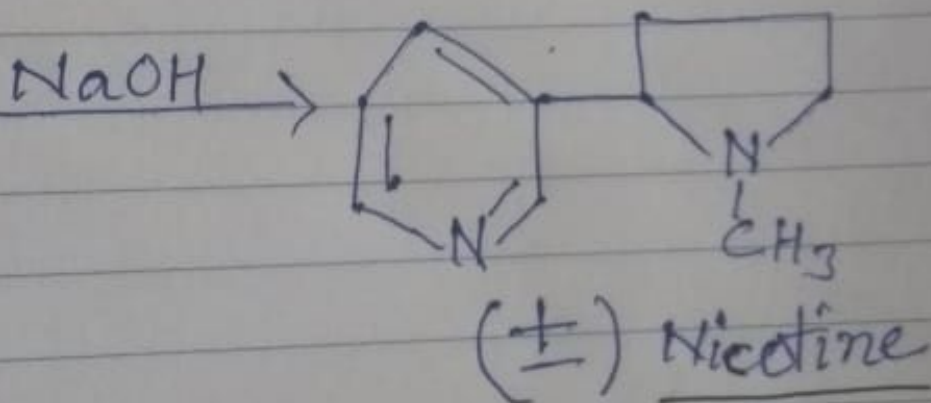
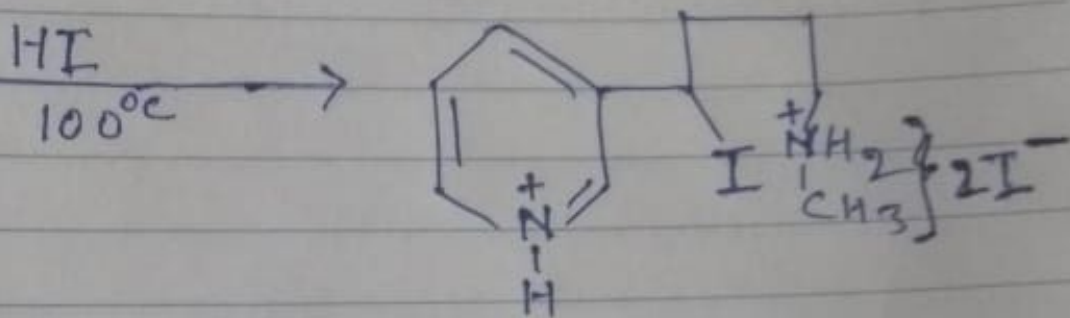
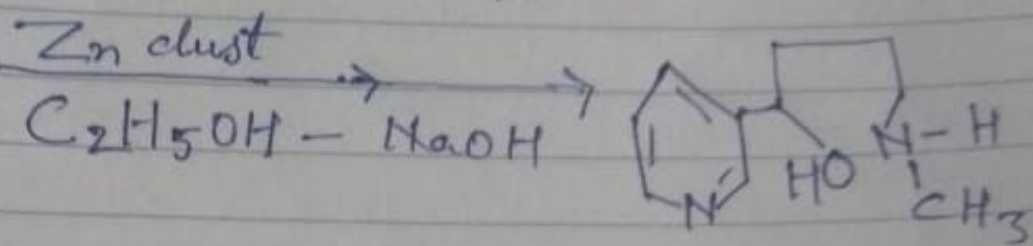
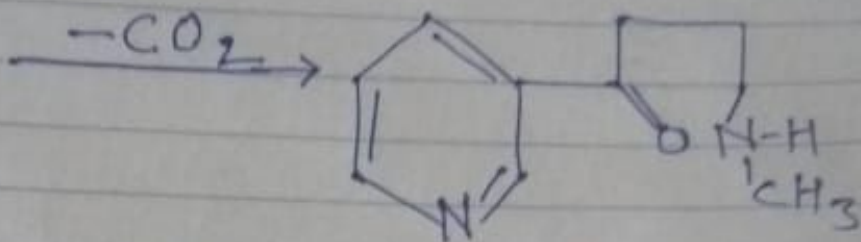
The formation of hygrinic acid proves beyond doubt the side-chain N-methyl pyrrolidine, is attached to pyridine nucleus through C₂.

* The structure of Nicotine, has been confirmed by synthesis, e.g., spath et al synthesis (1928).



(ii)





This was resolved by means of (+)-tartaric acid; the synthetic (-)-Nicotine is identical with the natural compound

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