

Quadrant II – Transcript and Related Materials

Programme: T. Y. B. Sc.

Subject: Chemistry

Paper Code: CHC 107

Paper Title: Organic Chemistry

Unit: 2- Alkaloids

Module Name: Zeisel's Method and Herzig-Meyer's Method

Module No: 10

Name of the Presenter: Dr. Sonia Bharat Parsekar

Methods Used in Structure Determination

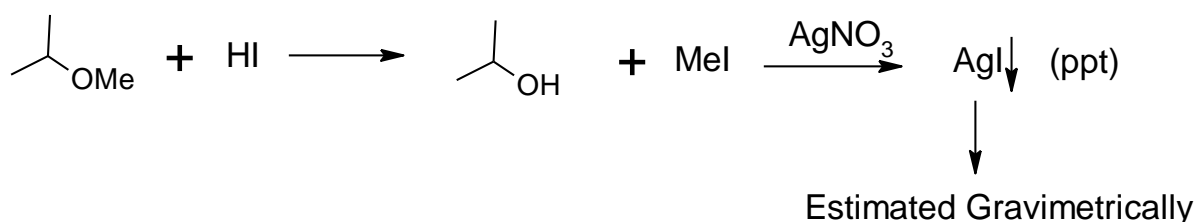
Zeisel's Method – Method of Estimation of Methoxy group $-\text{OCH}_3$

Herzig-Meyer's Method – Method of Estimation of $-\text{NCH}_3$ group

Important in the field of alkaloid chemistry where such compounds are often encountered

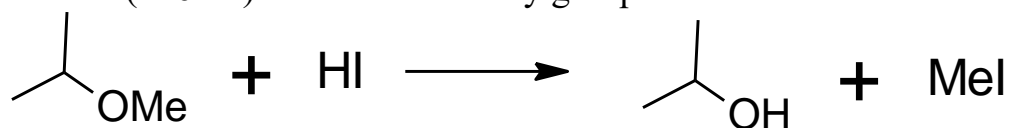
Zeisel's Method

This method is used to - 1) Detect the presence of methoxy group
2) Determine the number of methoxy group



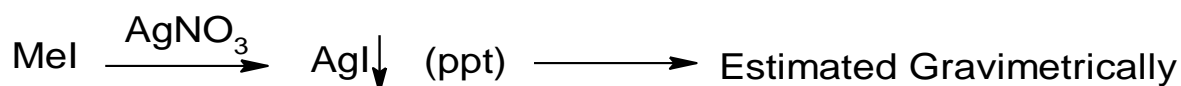
In this method,

1) A known weight of alkaloid is heated with hydroiodic acid at its boiling point (126°C) – cleaves methoxy group with the formation of methyl iodide



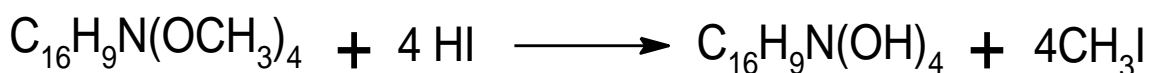
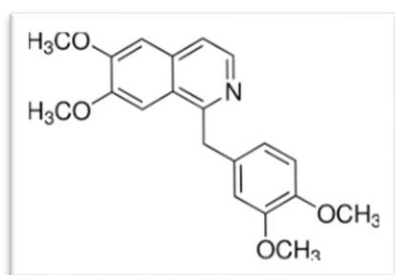
2) Methyl iodide is absorbed by ethanolic silver nitrate – To obtain the

precipitate of silver iodide

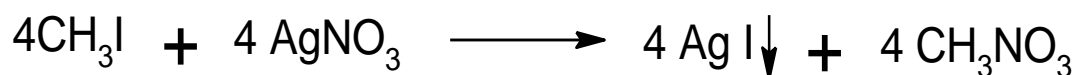


- 3) Precipitated Silver iodide is filtered, dried and weighed
- 4) From the weight of silver iodide, the number of methoxy groups may be calculated - The no. of moles of silver iodide indicate the no. of methoxy groups present in an alkaloid

Papaverine ($\text{C}_{20}\text{H}_{21}\text{O}_4\text{N}$)

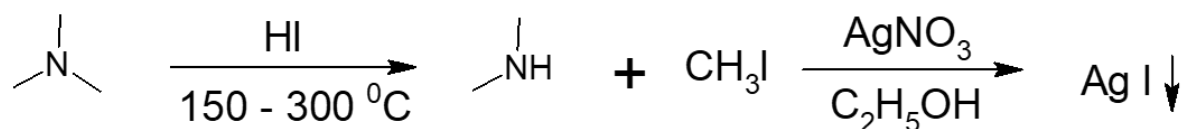


Papaverine



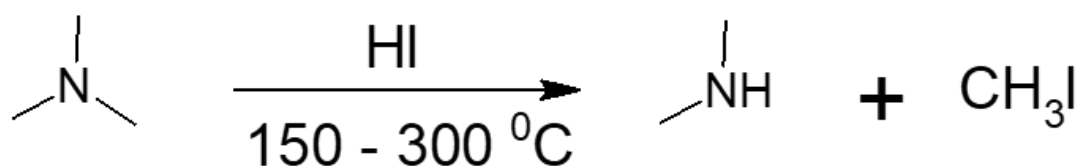
Herzig-Meyer's Method

- This method is used to
- 1) Detect the presence of methyl groups attached to nitrogen atom
 - 2) Determine the number of methyl groups attached to nitrogen atom

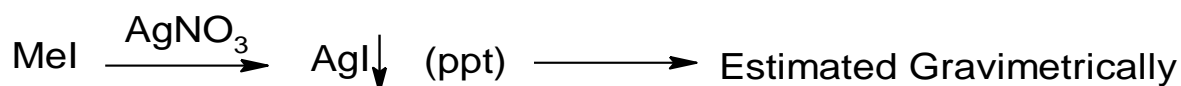


In this method,

- 1) A known weight of alkaloid is heated with hydroiodic acid at about 150 - 300 $^\circ\text{C}$ – cleaves N-Methyl group with the formation of methyl iodide



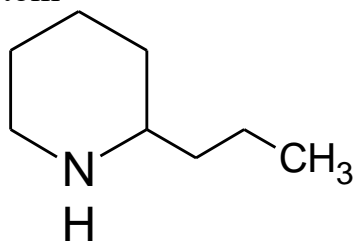
- 2) The vapours of CH_3I formed is passed into alcoholic AgNO_3 solution –
Precipitate of silver iodide is obtained



- 3) Precipitated silver iodide is filtered, dried and weighed
4) From the weight of silver iodide, the number of N-Methyl groups may be calculated - The no. of moles of silver iodide indicate the no. of N-Methyl groups present in the alkaloid

If the alkaloid reacts with one mole of methyl iodide to form an N-methyl derivative, it means that a secondary nitrogen atom is present

For example, Coniine, $\text{C}_8\text{H}_{17}\text{N}$ reacts with one mole of methyl iodide to form an N-methyl derivative, indicating that coniine must contain secondary nitrogen atom



Coniine

By careful control of temperature both the groups can be estimated separately when present simultaneously in a compound

The methods can also be applied for the determination of $-\text{OEt}$ and $-\text{NEt}$ groups - But with higher alkyl groups, the method is not effective because of the insufficient volatility of the corresponding alkyl iodide formed