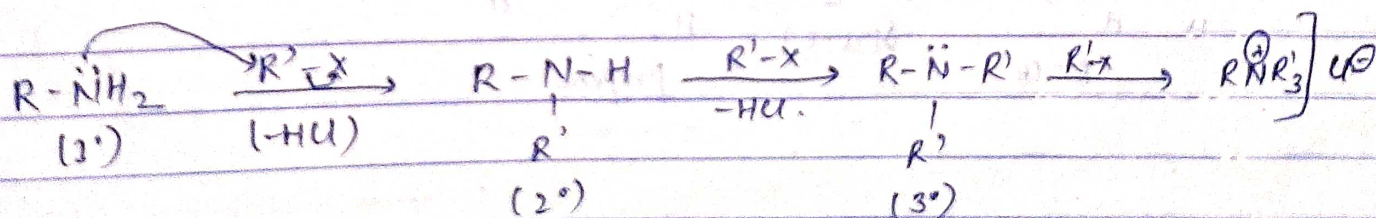


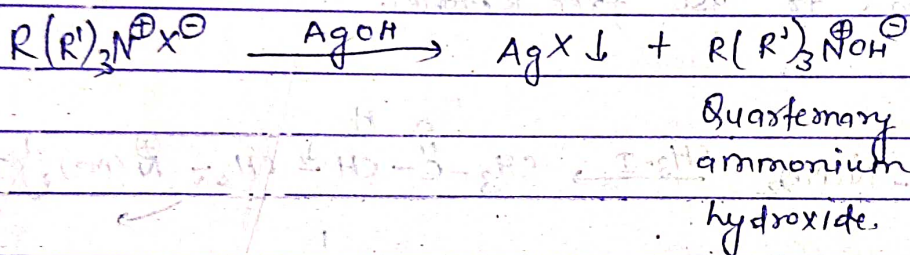
Hofmann's exhaustive methylation & elimination  $\rightarrow$  The conversion of primary, secondary & tertiary ammine into quaternary ammonium salt by the treatment of excess methyl iodide (chloride, bromide etc.) is called exhaustive methylation of amines as shown below:



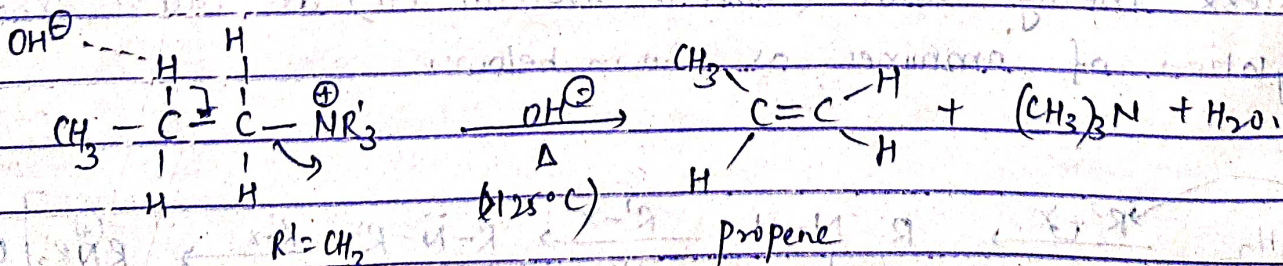
Where  $\text{R}^1 = \text{CH}_3$ ; Amine =  $1^\circ$  or  $2^\circ$  or  $3^\circ$  (aliphatic / Aromatic)

In this reaction, primary amine will take up 3 methyl group, secondary amine will take up 2 methyl groups tertiary amine will take up only one methyl group

⇒ Degradation & elimination : when a solution of quaternary ammonium halide is treated with moist silver oxide ( $\text{Ag}_2\text{O}$ ) silver halide precipitates & solid quaternary ammonium hydroxide forms.



when this quaternary ammonium hydroxide is heated strongly (to  $125^{\circ}\text{C}$  or more), it decomposes to form water, a tertiary amine & alkene provided that R contains two or more hydrogen atom. The Nature of alkene depends on the structure of R'. This is a typical  $\beta$ -elimination reaction known as Hoffmann's elimination as shown below:

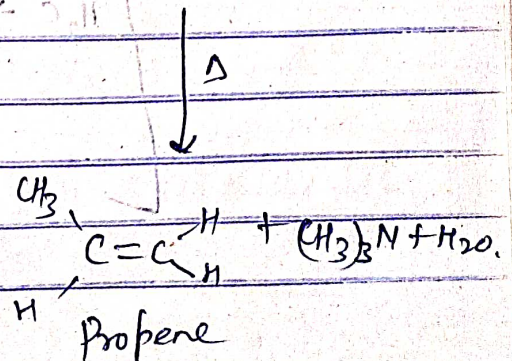
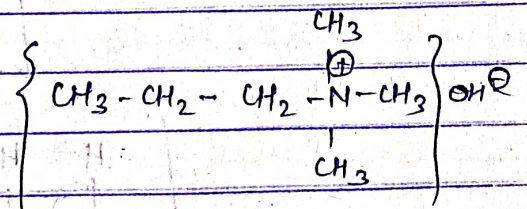
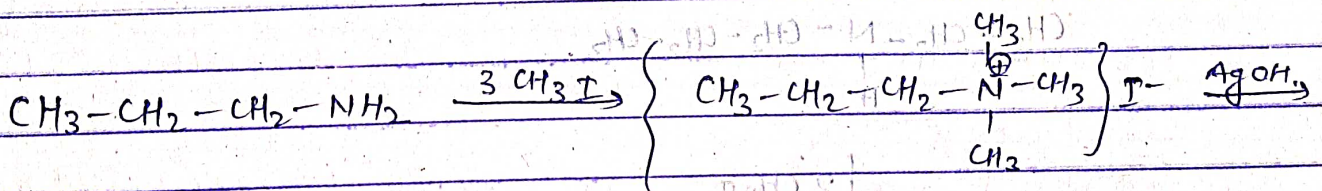


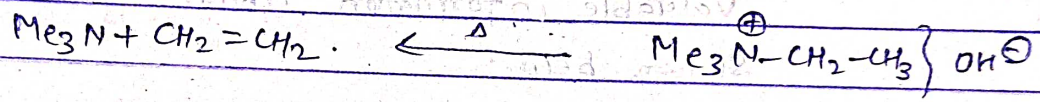
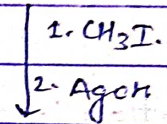
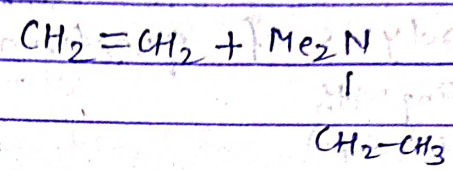
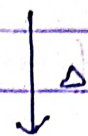
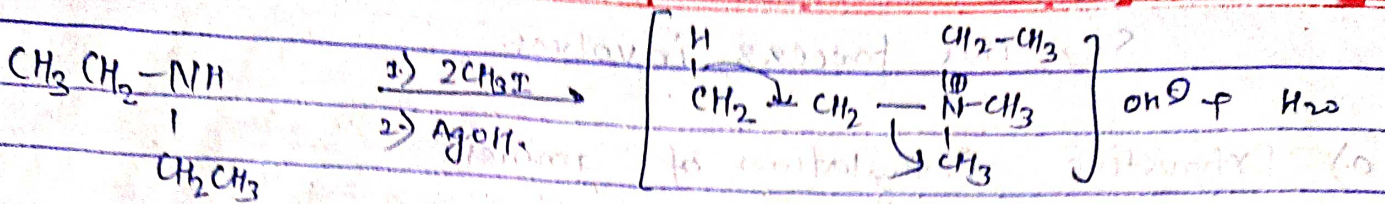
So, This process involves.

- Exhaustive methylation of amines.
- treatment of quaternary ammonium halide with  $\text{AgOH}$  &
- Pyrolysis of quaternary ammonium hydroxide.  
(heating with high temp.)

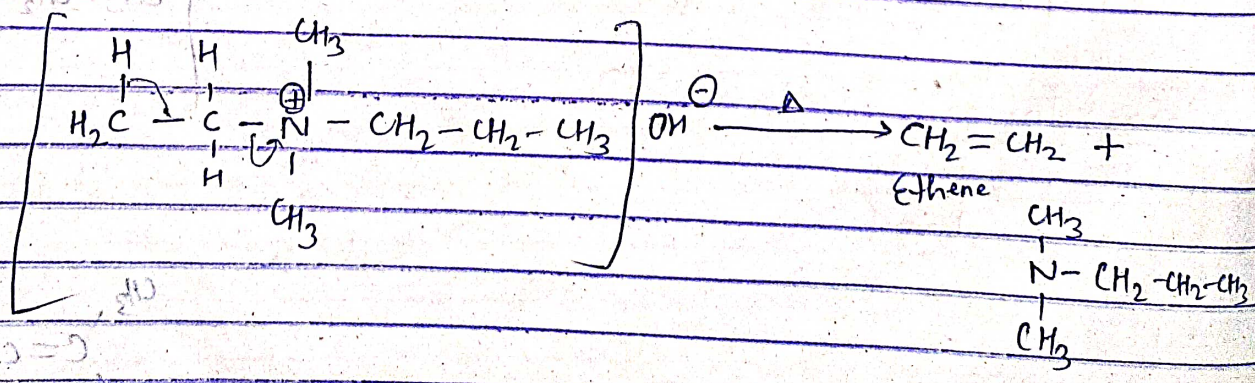
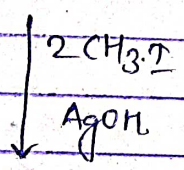
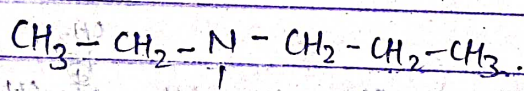
⇒ Application: Identification of alkene produced by this process gives valuable information about the structure of amines as shown below.

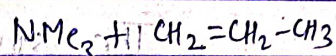
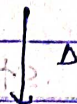
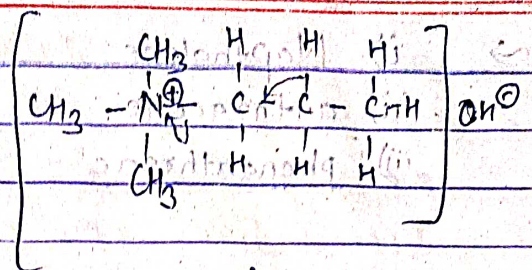
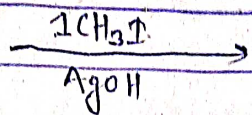
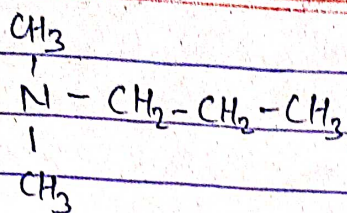
As for eg: In above example, it is clear that parent amine will be  $(\text{CH}_3-\text{CH}_2-\text{CH}_2-\text{NH}_2)$  → normal propylamine.





\* Mixed 2° or 3°





Propene

### Application in cyclic compound

