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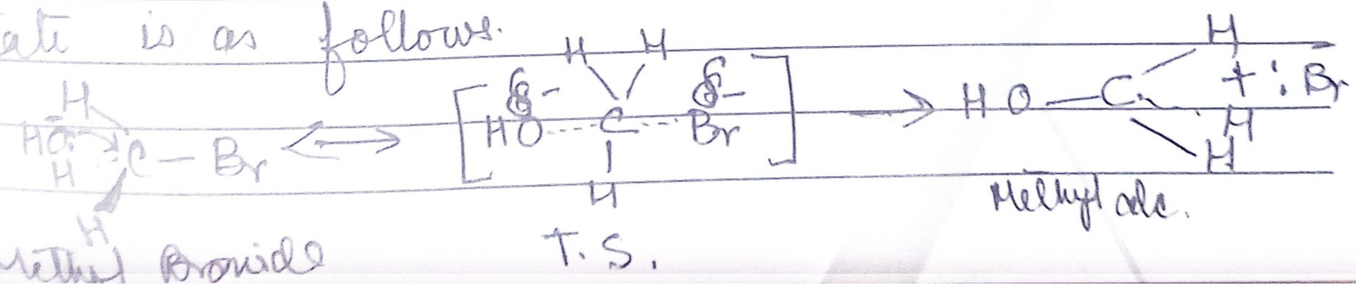
SN^2 Reaction - Bimolecular Nucleophilic Substitution Reaction.

When the rate of a nucleophilic substitution reaction depends on the concentration of both the substrate and nucleophile the reaction is second order and represented by SN^2.

$$\text{Rate} \propto [\text{Substrate}][\text{Nucleophile}]$$

i.e. The rate detoning step involve the participation of both substrate and the nucleophile.

The hydrolysis of methyl bromide by aq NaOH, the reaction and transision state is as follows.



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The OH ion approaches the Substrate carbon from the opposite side from the Br atom (Back side attack) Because both the hydroxide ion and bromine atoms are electron rich. It is natural that they stay as far as possible (Like charges Repels) In T.S. both Br and OH are partially bonded to Substrate carbon. The C-Br bond is not completly cleaved and C-OH bond is not completly formed. Hydroxide ion has diminished -ve charge because it started to share its $\bar{e}$ to Substra carbon. Bromine atom also carries -ve

DATE: charge because it started removing its share pair of election from the carbon atom. In T.S. the three C-H bond lies in one plane the C-OH and C-Br bonds are perpendicular to the plane of C-H bonds. The average energy needed for the cleavage of C-Br bond is partially provided by the energy liberated by the C-OH bond formation.

In the course of reaction the configuration of the carbon is inverted like an umbrella blown inside out. The change in configuration is called "<u>Walden Inversion</u>".