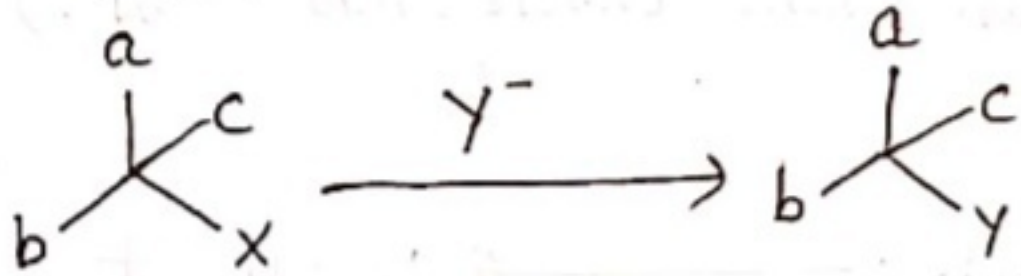
HALOALKANES & HALOARENES

04-07-2020 (Lecture-11) By-Dr.Rinky

CHEMISTRY, CLASS-XII, UNIT-10

Retention :- Retention of configuration is the preservation of integrity of the spatial arrangement of bonds to an asymmetric centre during a chemical reaction or transformation.

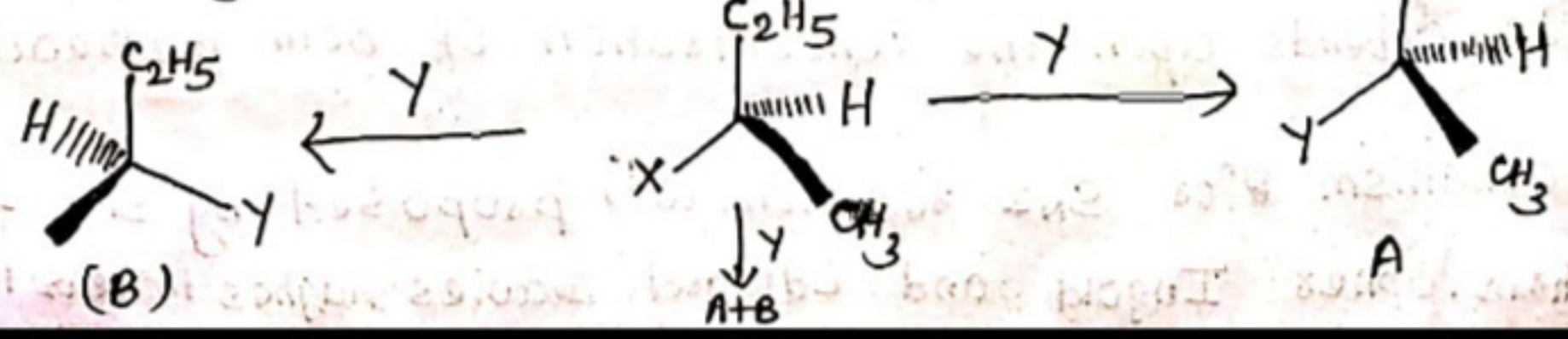
eg 

In general, if during a reaction, no bond to the stereo-centre is broken, the product will have the same general configuration of groups around the stereocentre as that of reactant.

INVERSION, RETENTION & RACEMISATION

For a reaction at an asymmetric carbon atom, there are three outcomes possible.

Consider the replacement of a group 'X' by 'Y' in the following reaction.



If product is only A = Retention

" " " " B = Inversion

- - - - - - - - A+B = Racemisation

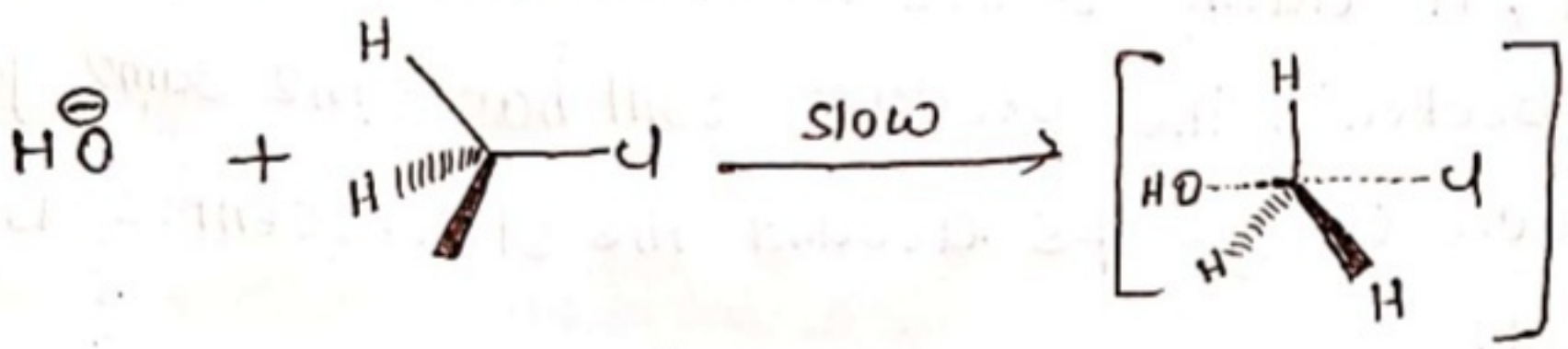
2.

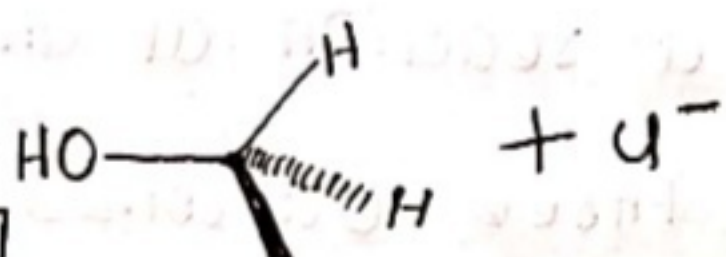
Mechanism of Nucleophilic Substitution

This reaction has been found to proceed by two different mechanisms:-~

a) substitution Nucleophilic Bimolecular (S_N2)

example; $CH_3Cl + OH^- \longrightarrow CH_3OH + Cl^-$





Rate Of reaction $r = K[HO^-][H_3C-Cl]$

This is 2nd Order reaction.

* Rate depends upon the concentration Of both the reactants

* Mechanism for S_N2 reaction was proposed by Sir Christopher Ingold and Edward Davies Hughes in year 1937

In this mechanism no intermediate is formed.

* Reaction occurs in one step only.
* In this reaction the configuration of carbon atom under attack inverts in much the same way as an umbrella is turned inside out when caught in a strong wind.

This process is called as inversion of configuration.

Since this reaction requires the approach of the nucleophile to the carbon bearing the leaving group, the presence of bulky substituents on or near the carbon atom have inhibiting effect.

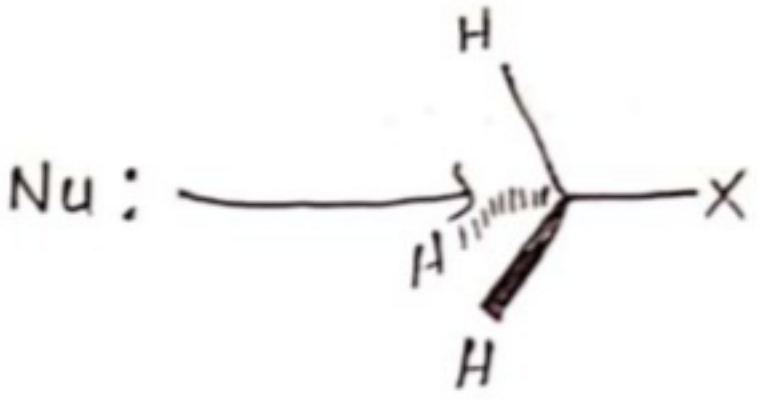
Therefore, methyl halide (CH_3X) react most rapidly in S_N2 reactions because these are only three small hydrogen atoms.

* Back side attack of nucleophile is basic criteria of S_N2 reaction.

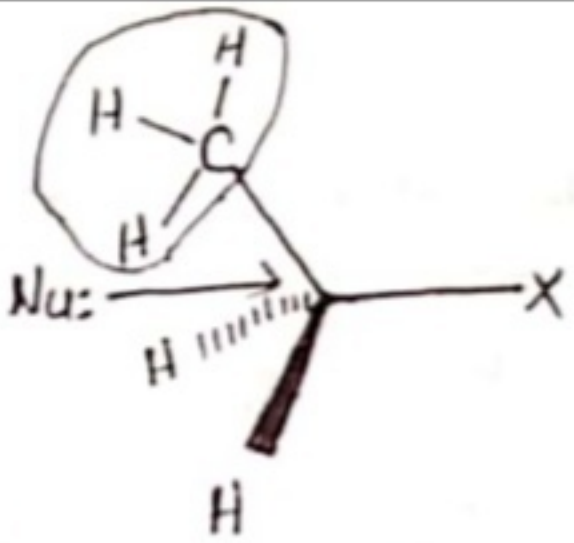
* 3° halides are the least reactive because there are bulky groups which hinder the approaching nucleophiles.

* The order of reactivity for S_N2 reaction is

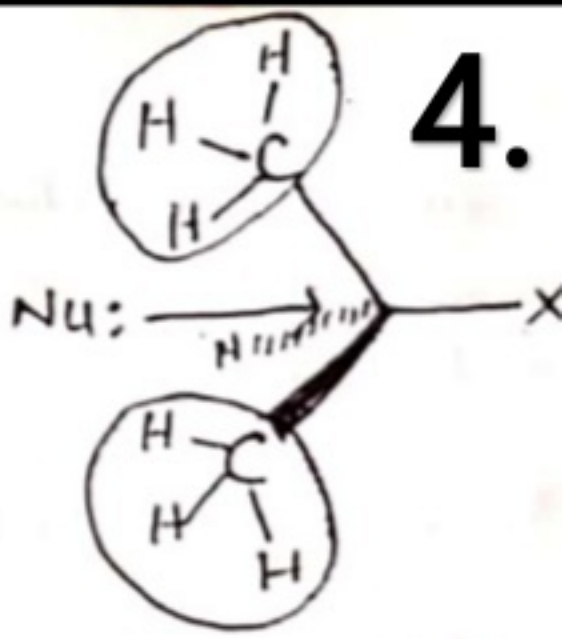
CH_3X > Primary halide (1°) > 2° > 3°



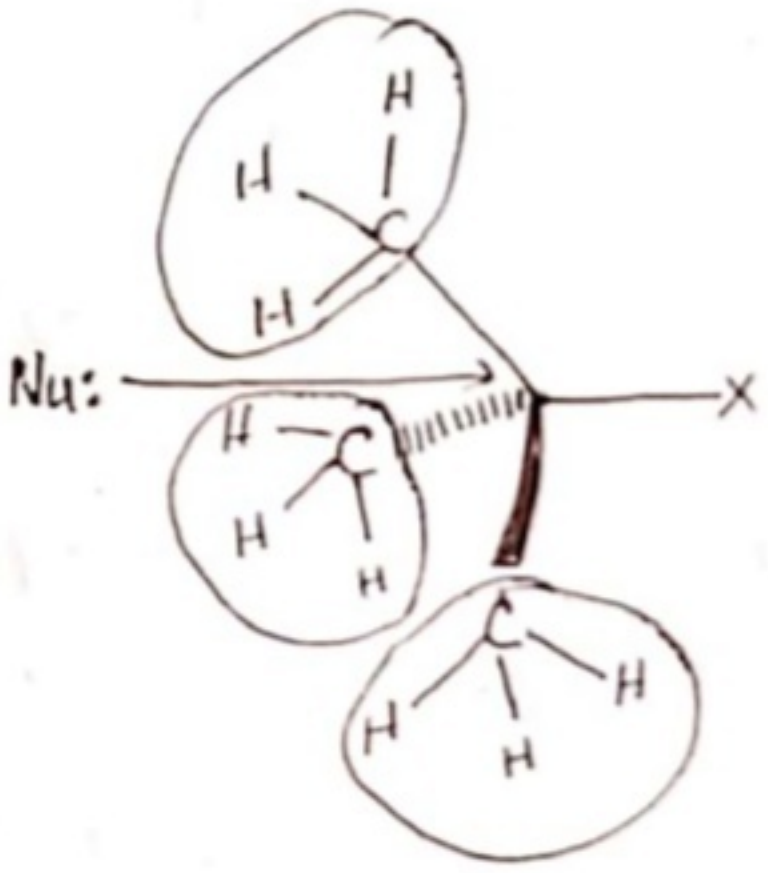
(Methyl halide)



Ethyl (1°)



Isopropyl (2°)



tert. butyl (3°)

NCERT

Example 10.6

, Because it is primary halide.

, Because Iodine is better leaving group.

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To be continued in next lecture...