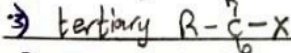
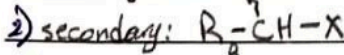
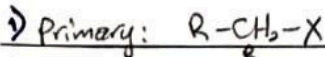


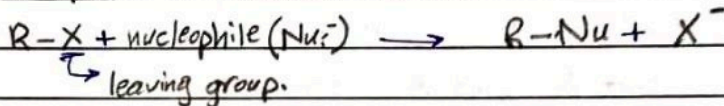
\* The general formula:  $R-X$   
 where X is halogen and R is alkyl halide

لا يوجد أفضلية لتسمية الهالوجينات على مجموعات التكليف المركب الأخرى



Reactions of alkyl halides:-

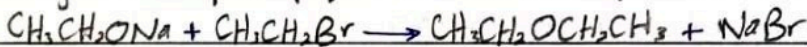
[1] nucleophilic substitution reaction



Types of nucleophiles:-

[1] Oxygen nucleophiles [2] nitrogen nucleophiles [3] sulfur nucleophiles

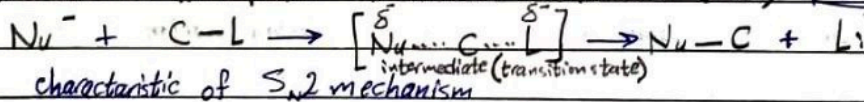
[4] halogen nucleophile ( $I^-$ ) [5] carbon nucleophiles



Mechanism

i) Bimolecular nucleophilic substitution mechanism. ( $S_N2$ )

$S_N2$  is one step mechanism



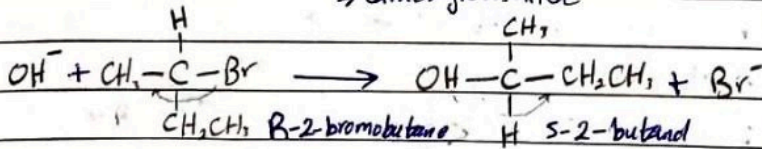
characteristic of  $S_N2$  mechanism

1- rate of reaction = constant [alkyl halide] [nucleophile].

2- inversion in stereochemistry of the product compared to the reactant.

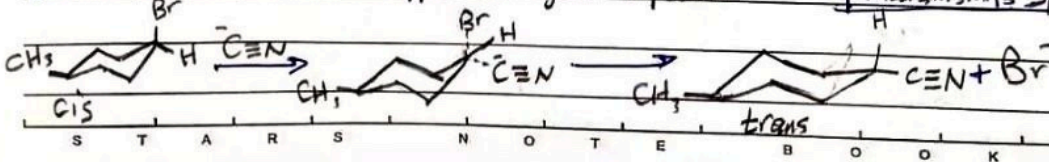
3- rate of reaction with primary halide > secondary > tertiary.

\* It needs aprotic solvent:-  
 1) acetone 2) dimethyl sulfoxide 3) tetrahydrofuran



If we notice an inversion orientation of the chiral center, we know that the mechanism is  $S_N2$

\* The same mechanism is applied on cyclic compounds.



Subject: Alkyl halides

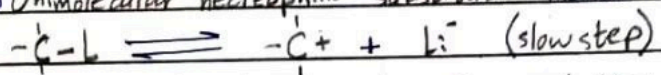
Arrange the following compounds in order of decreasing  $S_N2$  reactivity toward sodium ethoxide: secondary  $CH_3$  primary  $CH_3$  primary

$$CH_3CH_2CHBr < CH_3CH(CH_3)CH_2Br < CH_3CH_2CH_2CH_2Br$$

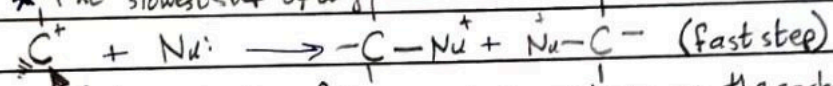
ترتيب المركب الزود، لاننا نقوي على مجموعة متفرقة متفرقة

2) Unimolecular nucleophilic substitution mechanism ( $S_N1$ )

$S_N1$  is one step mechanism



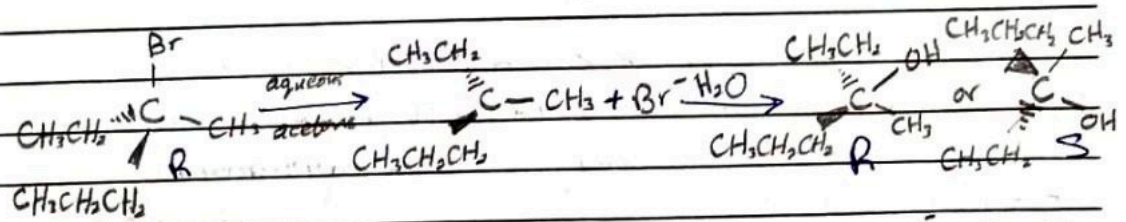
- \* The bond between carbon atom and the halogen is broken heterolitically.
- \* The slowest step of any reaction determines the overall rate of the reaction.



- \*  $S_N1$  mechanism form a racemic mixture, as the carbon atom is  $sp^2$  hybridized.
- \* Aprotic

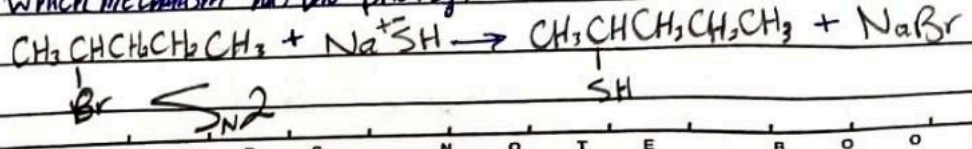
characteristic of  $S_N1$  mechanism

- 1- rate of reaction = constant [alkyl halide]
- 2- Inversion and retention is stereochemistry of the product compared to the reactant. Forming racemic mixture.
- 3- rate of tertiary halide > secondary > primary halide

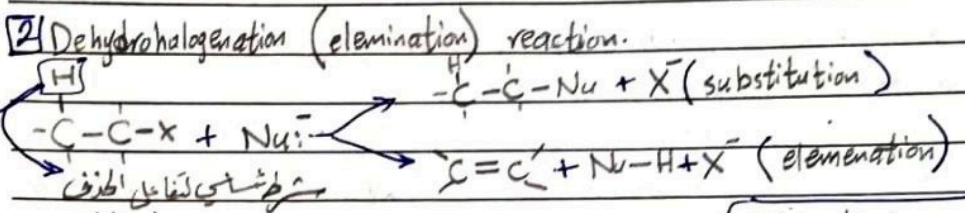


- \* Negative ions are more nucleophilic than neutral molecules:  $OH^- > H-OH$
- \* Elements in lower periods/rows are more nucleophilic:  $HS^- > OH^-$
- \* Elements in greater column are less nucleophilic:  $>C^- > >N^- > R-O^- > F^-$

Which mechanism has the priority?

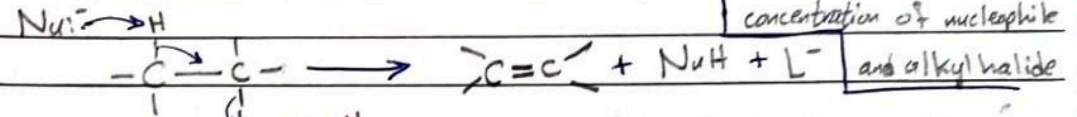


S T A R S N O T E B O O K

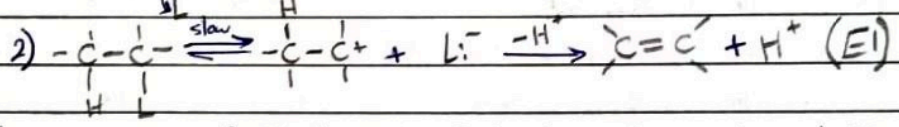


Mechanisms

1) Bimolecular elimination mechanism (E2)

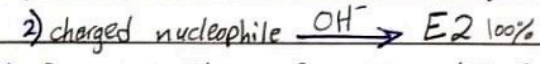
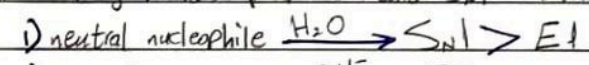


The rate of reaction in E2 depends on the concentration of nucleophile

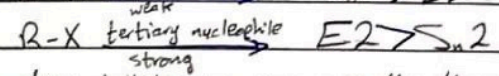
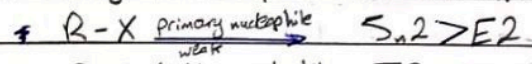


\* The mechanism of E1 share the first step with S<sub>N</sub>1, so both products are possible

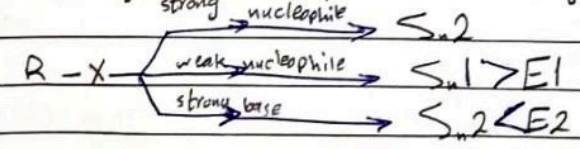
\* Tertiary halides prefer E1 and S<sub>N</sub>1 more than E2 and S<sub>N</sub>2. However,



\* Primary halides prefer E2 and S<sub>N</sub>2 more than E1 and S<sub>N</sub>1



\* Secondary halides can pass a reaction through all mechanisms.



note- In alkenes, when the double bond is located between more alkyl groups, eventually the compound is more stable

