

ORGANIC CHEMISTRY-I

UNIT 3 NOTES

ALKYL HALIDES

- SN1 & SN2 REACTIONS
- STRUCTURE & USES OF :
 - CHLOROFORM
 - TRICHLOROETHANE
 - DICHLOROMETHANE
 - IODOFORM

ALCOHOLS

- QUALITATIVE TESTS
- ETHYL ALCOHOL, METHYL ALCOHOL
- BENZYL ALCOHOL



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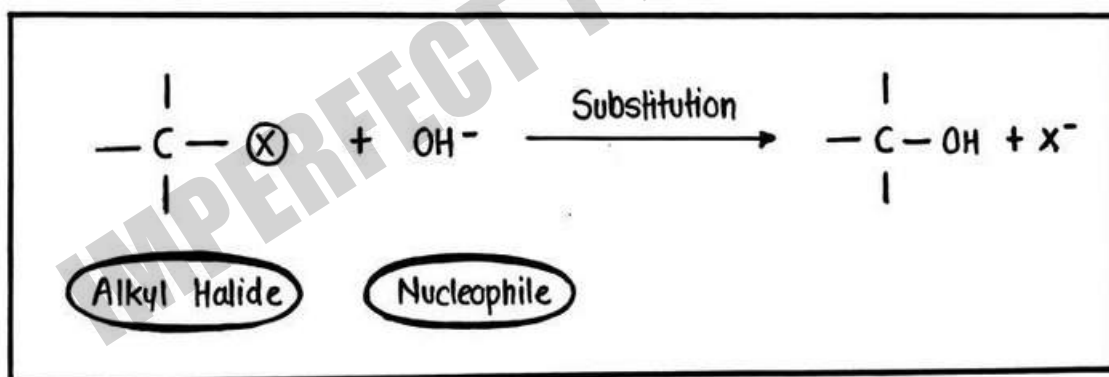
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SN₁ & SN₂ REACTIONS

- SN₁ & SN₂ reactions are nothing but simply a type of Nucleophilic Substitution Reaction.
- A Nucleophilic substitution reaction is a type of organic reaction in which an atom or group of an atom is replaced from substrate by a nucleophile.
- The substitution can be occur either in one or two step.
- The two step mechanism is known as SN₁ Reactions while the one step mechanism is known as SN₂ Reactions.
- Nucleophilic substitution reactions mainly occurs in Alkyl Halides and Alcohols.



TYPES OF NUCLEOPHILIC SUBSTITUTION REACTION

They are of mainly two types

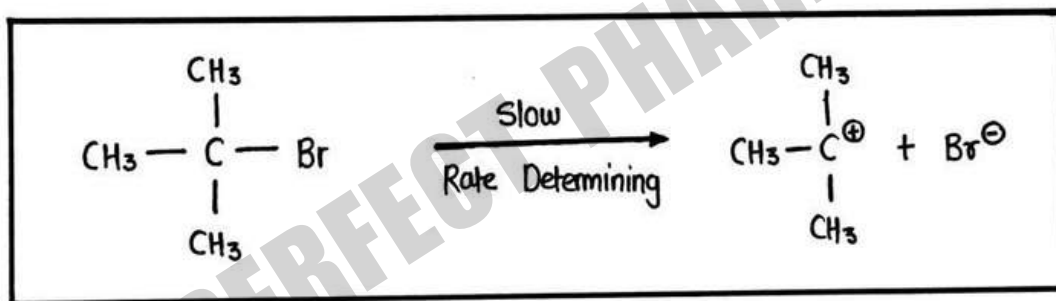
- ① SN₁ Reaction
- ② SN₂ Reaction

SN¹ REACTION

- SN¹ stands for Unimolecular Nucleophilic Substitution Reaction.
- It is a two step process.
- The reaction follows First order kinetics.
- The reaction takes place in the presence of weak base or weak nucleophile.
- Order of reactivity $\rightarrow 3^\circ > 2^\circ > 1^\circ$

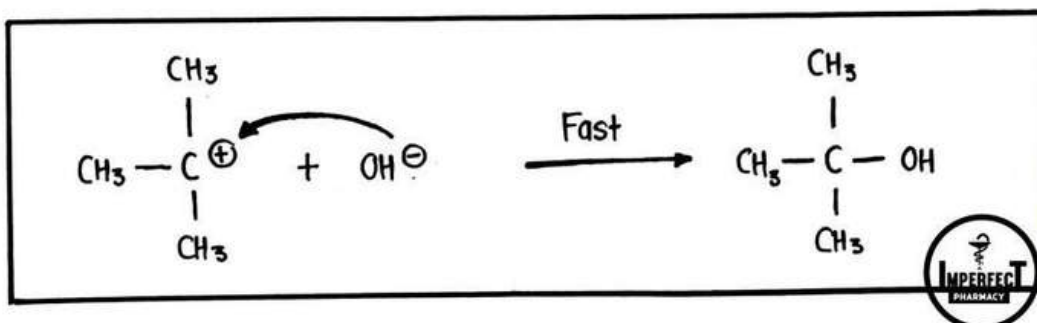
STEP - I

It is slow & rate determining step in which carbocation is formed.



STEP - II

Attack of Nucleophile on carbocation to give product.

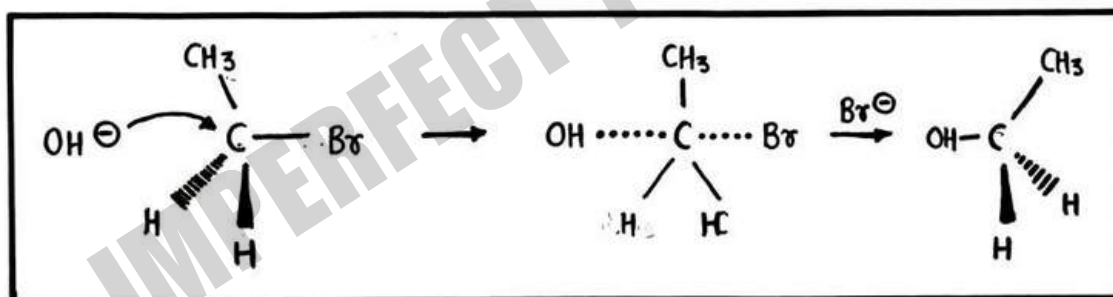


SN² REACTION

- SN² stands for Bimolecular Nucleophilic substitution Reaction.
- It is a one step process
- The reaction follows Second Order kinetics.
- Formation of Transition state takes place.
- Reactivity order $1^\circ > 2^\circ > 3^\circ$

MECHANISM OF SN² REACTION

In SN² reaction the nucleophile attacks on carbon atom of Alkyl halide from backside which results in the formation of transition state & ultimately give product of opposite / inverted configuration to that of initial Alkyl halide.



SN ₁ REACTION	SN ₂ REACTION
• It is a unimolecular Reaction • It follows 1st order kinetics • It is a two step process • Reactivity order : $3^\circ > 2^\circ > 1^\circ$	• It is a bimolecular Reaction • It follows second order kinetics • It is a one step process • Reactivity order : $1^\circ > 2^\circ > 3^\circ$



FACTORS AFFECTING S_N1 & S_N2

There are following various factors that affect S_N1 & S_N2 reactions :

- Nature Of Alkyl Halide** :
- Reactivity order of Alkyl Halides for S_N1 : $3^\circ > 2^\circ > 1^\circ$
 - Reactivity order of Alkyl Halides for S_N2 : $1^\circ > 2^\circ > 3^\circ$

- Nature of Leaving Group** :
- More easily the leaving group removed from carbon atom faster will be substitution reaction.



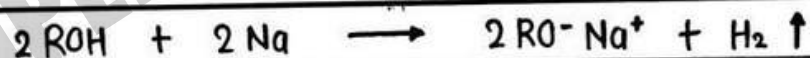
- Nature of Solvent** :
- Generally Polar Protic Solvents are used for S_N1 reactions.
 - Polar Aprotic solvents are used for S_N2 reactions.

QUALITATIVE TEST FOR ALCOHOLS

- Qualitative Test for alcohols are some chemical test that are used to identify the presence of alcohol in a particular solution.
 - Some of them (Mainly Lucas & Victor Mayer) are also used to differentiate between Primary (1°), Secondary (2°) and Tertiary Alcohols (3°).
 - These are 4 most common qualitative test for Alcohols.
- ① Sodium Metal Test
 - ② Ceric Ammonium Nitrate Test
 - ③ Lucas Test
 - ④ Victor Mayer Method.

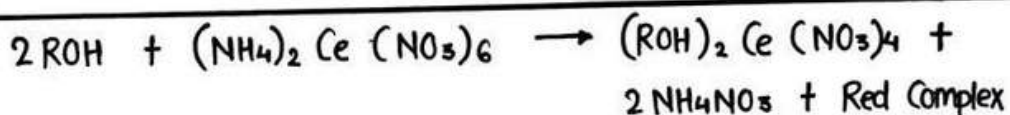
SODIUM METAL TEST

Alcohols with a small dry piece of sodium metal give effervescence due to liberation of hydrogen gas.

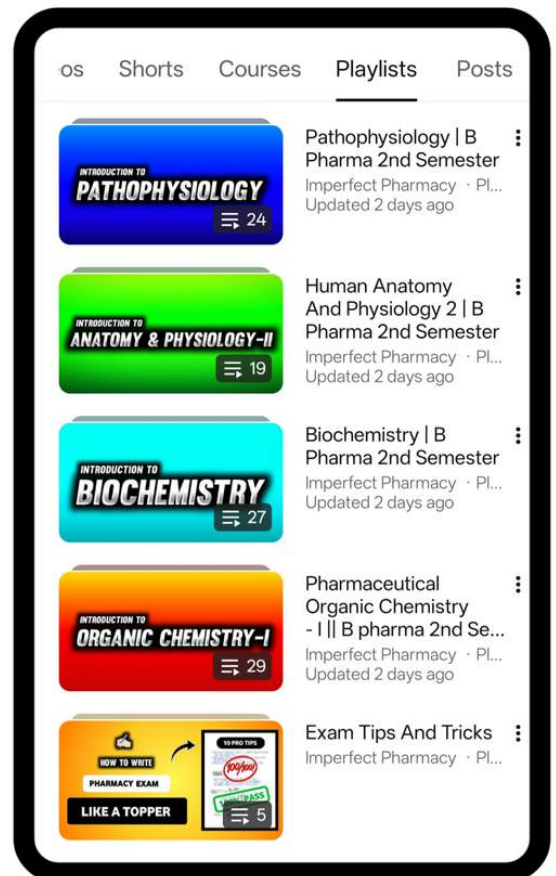
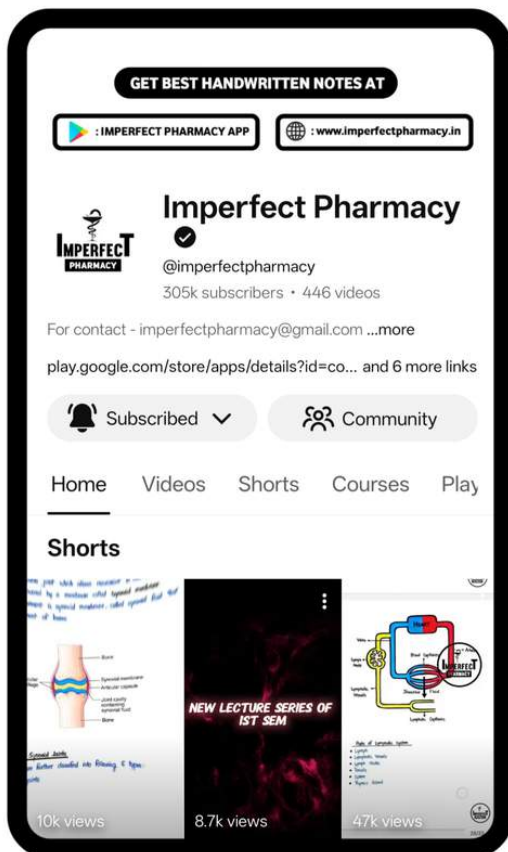


CERIC AMMONIUM NITRATE TEST

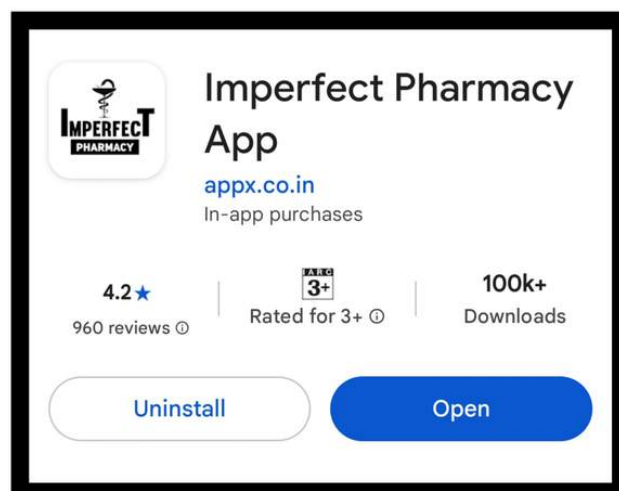
Alcohols with few drops of ceric ammonium nitrate reagent give red colour.



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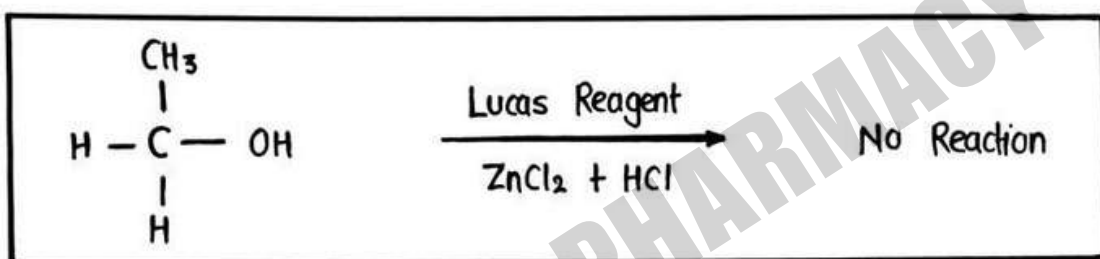
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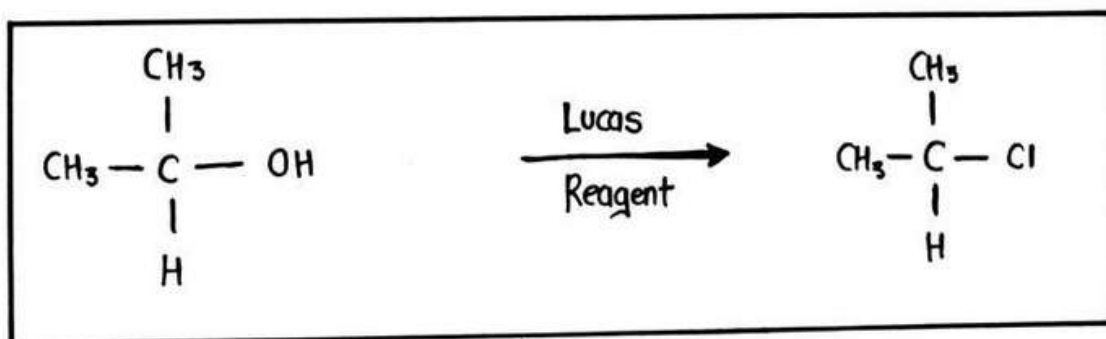
LUCAS TEST

- Lucas test is mainly used to differentiate between Primary Secondary and Tertiary alcohols.
- In this test alcohols are treated with a solution of HCl and Zinc Chloride to form Alkyl halides

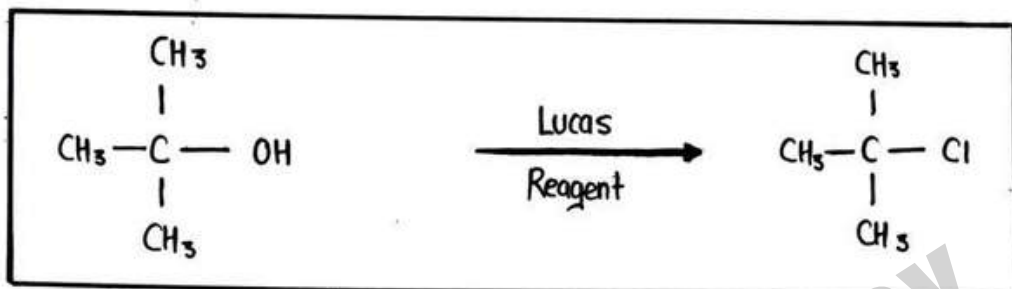
① **Primary Alcohols** : Primary Alcohols gives no reaction with Lucas reagent at room temperature



② **Secondary Alcohols** : Secondary Alcohols reacts with Lucas Reagent and gives reaction approximately in 5 minutes & a cloudiness appears.



- ③ **Tertiary Alcohol** : Tertiary Alcohols reacts with Lucas reagent & gives instant reaction & an immediate cloudiness appears.



VICTOR MAYER METHOD

- Victor Mayer's test is one of the most commonly used method to differentiate between 1°, 2° & 3° Alcohol.
- The following series of reactions carried out in Victor Mayer's Test.
 - (i) The alcohol is first treated with iodine in the presence of red phosphorus to obtain Alkyl Iodide.
 - (ii) The Alkyl iodide is then treated with silver nitrate to form nitroalkane.
 - (iii) The nitroalkane is finally treated with nitrous acid & the resulting solution is made alkaline by adding caustic soda.

Primary Alcohol : Gives Red colour

Secondary Alcohol : Gives Blue colour

Tertiary Alcohol : No Colour



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