

# REACTION MECHANISMS: INTRO TO ORGANIC CHEM

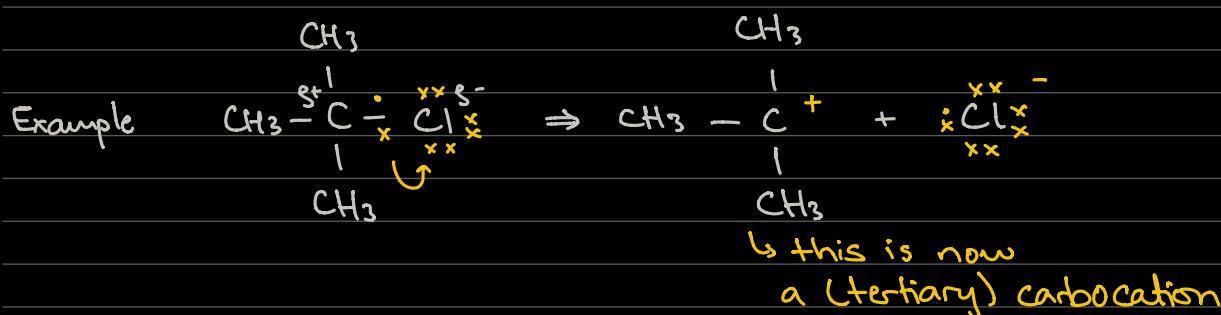
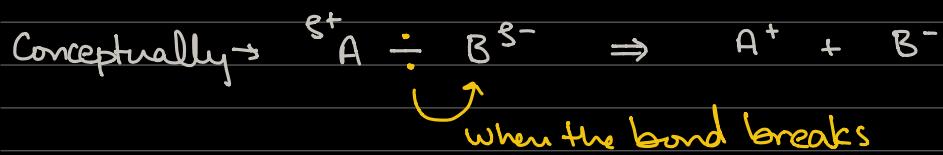
## TERMINOLOGY:

- A mechanism describes how bonds are broken, the intermediates that are formed, the movement of electrons, how bonds are made, what is the reacting species, etc.



## HETEROlytic Fission (heterolysis)

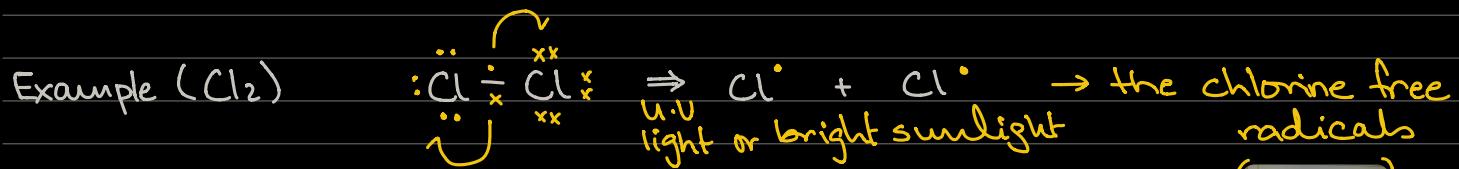
- Breaking of a covalent bond in which both of the shared electrons are transferred to one of the bonded atoms
- Heterolytic fission occurs in polar covalent bonds
- When the bond breaks, both the electrons move to the more electronegative atom
- This results in the formation of cations and anions



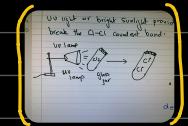
## HOMOLYTIC FISSION (Homolyisis)

- Breakage of a covalent bond in an equal manner
- The bonded electrons are equally distributed
- Occurs in non-polar covalent bonds
- Products are called "free radicals"

$\curvearrowright$  = shows movement of 1 electron  
 $\curvearrowleft$  = shows movement of 2 electrons



Free Radical: A species with a single, unpaired electron



U.V or bright sunlight provides the activation energy required to break the Cl-Cl covalent bond.

→ Free radicals are high in energy and highly unstable  
↳ they are "short-lived", that is, they rapidly combine back into their elemental form.

### Heterolytic Fission

1. In polar covalent bonds
2. Occurs readily during collisions
3. Shared electrons are unequally distributed



4. Results in the formation of ions

### Homolytic fission

1. In non-polar covalent bonds
2. Needs energy in the form of UV light
3. Shared electrons are equally distributed



4. Results in the formation of free radicals

Reacting species or attacking species (reagents)

Nucleophile

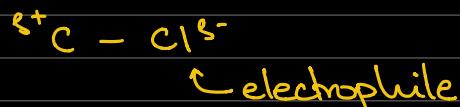
Electrophile  $\dashrightarrow$  Two classes of reagents

Nucleophile: "Nucleus lover"  
 (+) charge lover OR  
a partially positive charge of a polar bond

- A nucleophile is attracted to the centre of a (+) charge
- And so nucleophiles themselves are negatively charged ions, i.e.  $\text{OH}^-$   
→ Definition
- AND [molecules that have at least one lone pair of electrons, i.e.  $\text{H}_2\text{O}$  and  $\text{NH}_3$ ] + [electron pair donors]

Electrophiles: [Are electron pair acceptors] → Definition  
 (-) charge lover

- Electrophiles are attracted to centers of negative charge, i.e. the partially negatively charged atom of a polar covalent bond



- Electrophiles are also attracted to regions of high electron density  
 i.e. in  $-\underset{\text{||}}{\text{C}}=\text{C}-$  ( $\sigma + \pi$ )
- So an electrophile itself has either a full (+) charge or a partial positive charge

