



# Organic Chemistry Revision Sheets

## Alkanes | Free Radical Substitution

### Reaction

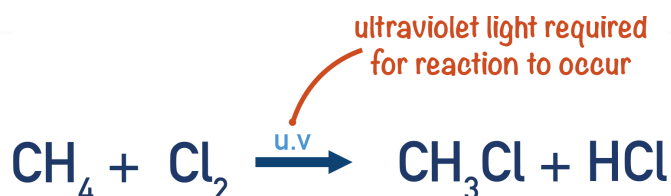
**REACTANTS:** Alkane and Halogen

**CONDITIONS:** U.V (ultraviolet) light

**PRODUCT(S):** Halogenoalkane and Hydrogen Halide

**REACTION TYPE:** Free Radical Substitution

**REACTION:**  
(example of  
methane and  
chlorine)

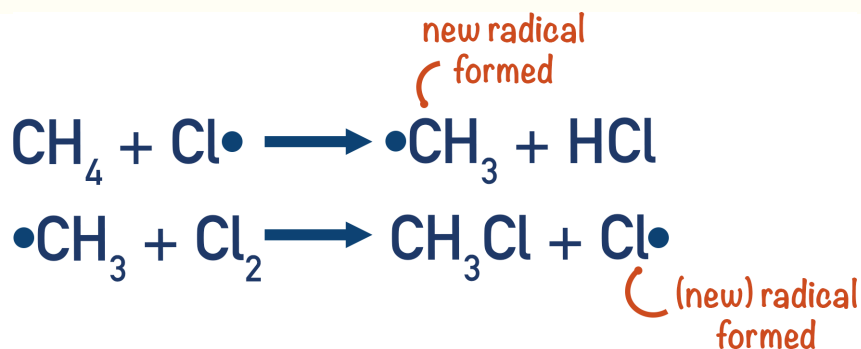


### Mechanism

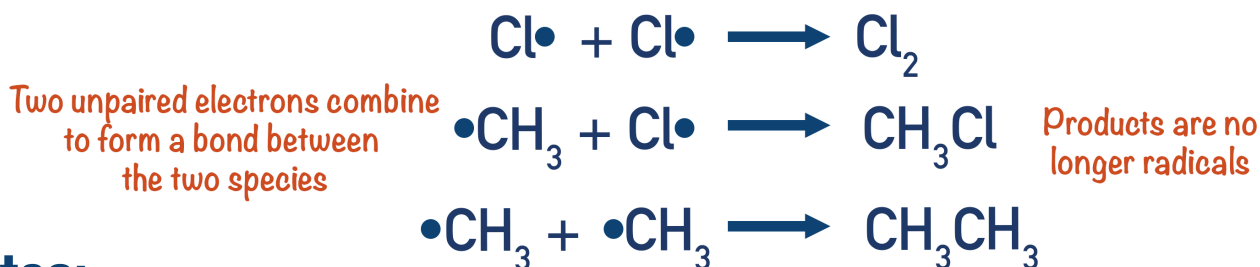
**INITIATION STEP:** Halogen molecule undergoes heterolytic fission to form radical species:



**PROPAGATION STEP:** Radical species reacts with alkane to form alkyl radical and HCl. Alkyl radical then reacts with halogen molecule, reforming another halogen radical, creating a **chain reaction**:



**TERMINATION STEP:** Radical species combine to end chain reaction:



### Notes:

- Heterolytic fission is the even breaking of a covalent bond (each bonded atom gets an electron and becomes a radical species).
- UV light provides the energy required for heterolytic fission.
- Further substitution reactions can occur, eventually forming tetrachloromethane:  
*chloromethane to dichloromethane to trichloromethane to tetrachloromethane*