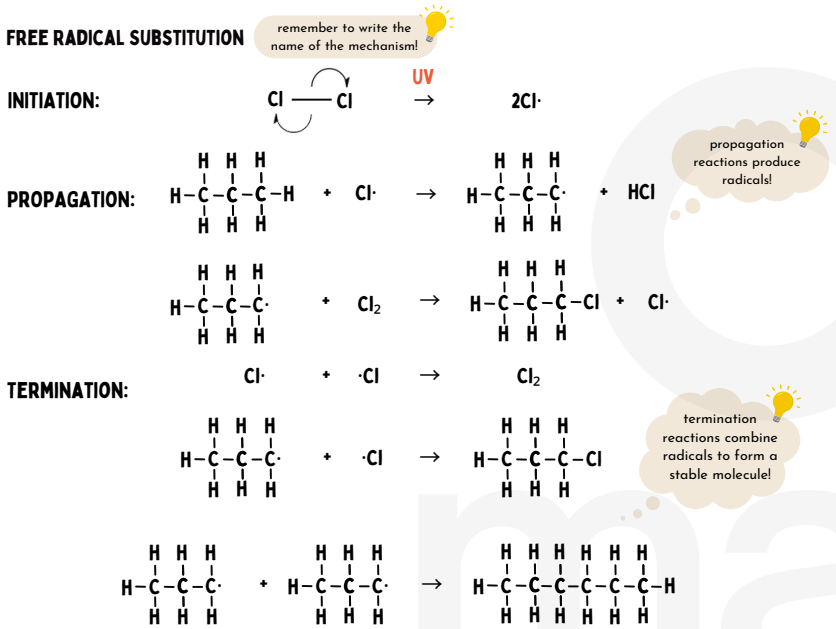
macro H2 CHEMISTRY

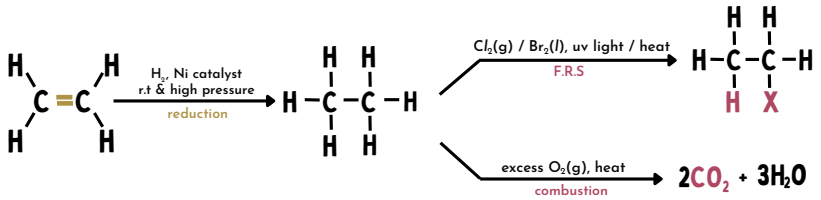
Alkanes

FREE RADICAL SUBSTITUTION

Question: Describe the mechanism involved when propane is reacted with chlorine in the presence of UV light to form 1-chloropropane.



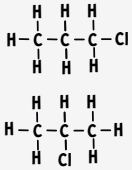
REACTION MINDMAP



PREDICTING THE RATIO OF DIFFERENT MONO-SUBSTITUTED PRODUCTS

Question: State and predict the ratio of the different mono-chlorinated products formed when propane reacts with chlorine under uv.

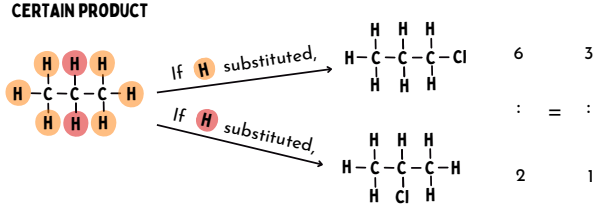
STEP 1: LIST THE POSSIBLE MONO-BROMINATED PRODUCTS FORMED



1-chloropropane

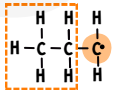
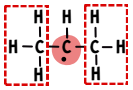
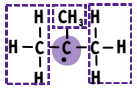
2-chloropropane

STEP 2: LABEL AND GROUP THE HYDROGEN ATOMS THAT WILL GIVE RISE TO A CERTAIN PRODUCT



STABILITY OF ALKYL RADICAL

Question: While the statistical ratio between 1- and 2-chloropropane is 3:1, the observed ratio was found to be 1:2.
Use the concept of stability of radicals to explain this discrepancy.

Radical	Stability
 Primary radical	Least stable
 Secondary radical	More stable
 Tertiary radical	Most stable

Key Concept

Alkyl groups are **electron-donating** groups. The more electron-donating alkyl groups attached to the carbon radical, the **more electron density donated**, the **more stable** the radical and the **easier it is to be formed**.

Answering Technique

1-chloropropane is formed from a **primary radical** while 2-chloropropane is formed from a **secondary radical**. With **more electron-donating alkyl groups** attached to the carbon radical, the secondary radical is **stabilized to a greater extent**. Hence, 2-chloropropane is formed at higher proportions.

macro H2 CHEMISTRY

Alkenes

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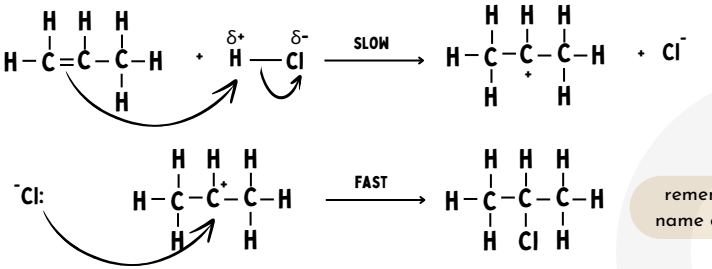
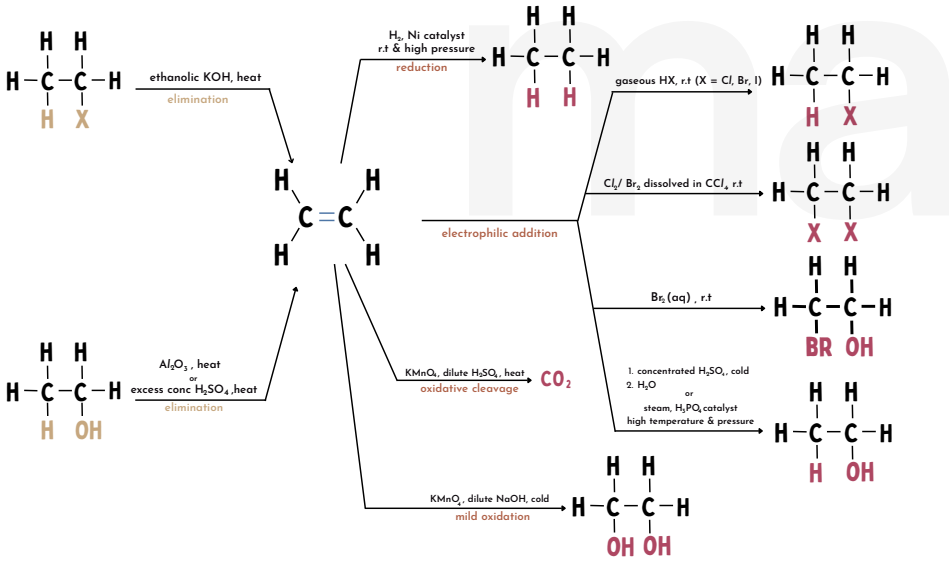
ELECTROPHILIC ADDITION

Question: Describe the mechanism involved when propene is reacted with HCl at room temperature to form 2-chloropropane.



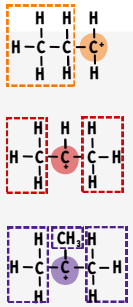
remember to write the name of the mechanism!

REACTION MINDMAP



MAJOR AND MINOR PRODUCT OF E.A

Question: When propene is reacted with HCl at room temperature, two possible products are formed: 1-chloropropance and 2-chloropropane. Explain why 2-chloropropane is the major product.



Carbocation	Stability
Primary carbocation	Least stable
Secondary carbocation	More stable
Tertiary carbocation	Most stable

Key Concept

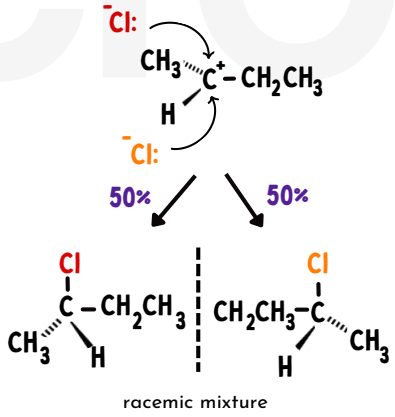
Alkyl groups are **electron-donating** groups. The more electron-donating alkyl groups attached to the carbocation, the **more electron density donated**, the **more stable** the carbocation and the **easier it is to be formed**.

Answering Technique

1-chloropropane is formed from a **primary carbocation** while 2-chloropropane is formed from a **secondary carbocation**. With **more electron-donating alkyl groups** attached to the secondary carbocation, its positive charge will be **dispersed greater** and the carbocation will be **stabilized to a greater extent**.

RACEMIC MIXTURE

Question: When but-2-ene and HCl react, the product mixture is optically inactive under plane-polarized light. Explain.



racemic mixture

Answering Technique

First step of electrophilic addition results in the formation of a **trigonal planar carbocation intermediate**. The nucleophile is thus able to attack from the top or bottom face of the carbocation with **equal probability**. **Equal proportion of enantiomers /racemic mixture** is formed, which cancels each other out when rotated through plane-polarized light.

OXIDATIVE CLEAVAGE