

Chapter 15. Hydrocarbon

alkanes: saturated hydrocarbons with the general formula C_nH_{2n+2}

saturated hydrocarbon: compound of hydrogen and carbon only in which the carbon-carbon bonds are all single covalent bonds, resulting in the maximum number of hydrogen atoms in the molecule.

Homologous series.

CH_4 methane

C_2H_6 ethane

C_3H_8 propane

C_4H_{10} butane

C_5H_{12} pentane

C_6H_{14} hexane

~ $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_3$: butane

$\text{CH}_3\text{CH}(\text{CH}_3)\text{CH}_3$: 2-methyl propane

$-\text{CH}_3$: methyl

~ C_5H_{12}

$\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_3$: pentane

$\text{CH}_3\text{CH}(\text{CH}_3)\text{CH}_2\text{CH}_3$: 2-methyl butane

2,2-dimethyl propane : $\text{CH}_3\text{C}(\text{CH}_3)_3$



~ C_6H_{14}

$\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_3$: hexane

2-methyl pentane : $\text{CH}_3\text{CH}(\text{CH}_3)\text{CH}_2\text{CH}_2\text{CH}_3$



3-methyl pentane



2,2-dimethyl butane

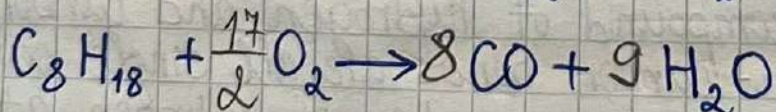
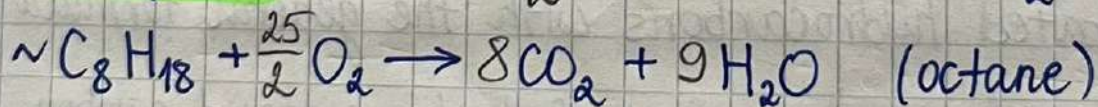
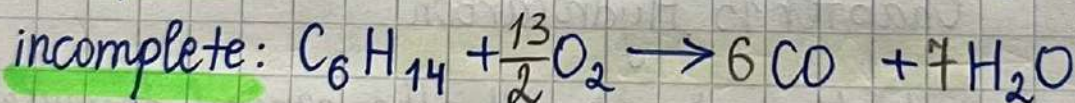
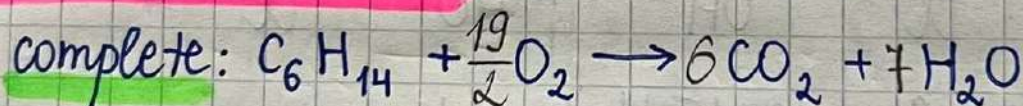


2,3-dimethyl butane

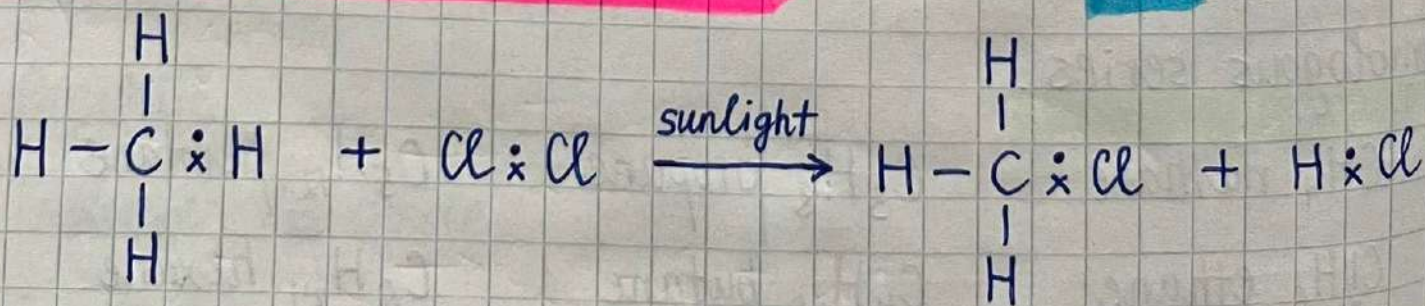
15.2. Reactions of alkanes

crude oil

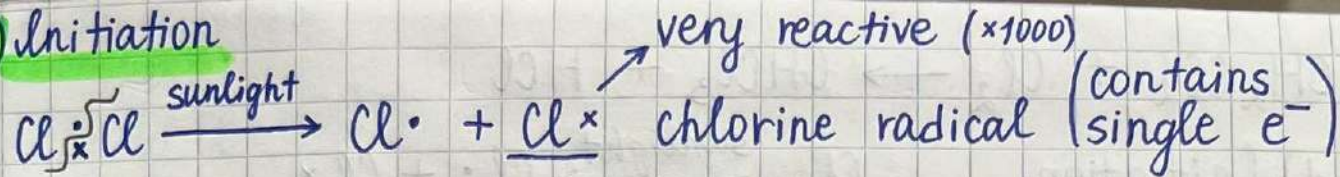
Combustion of alkanes



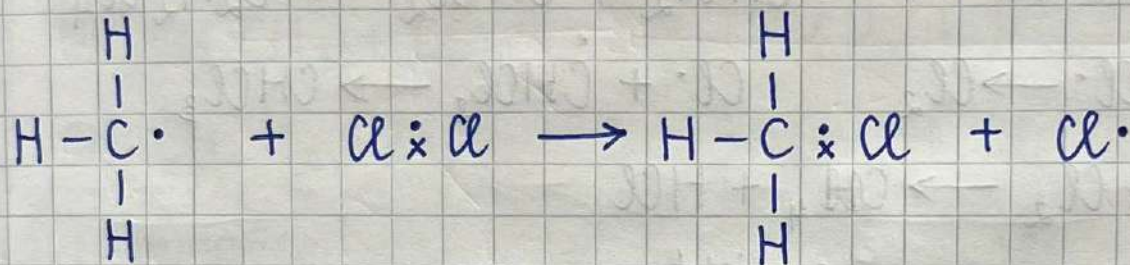
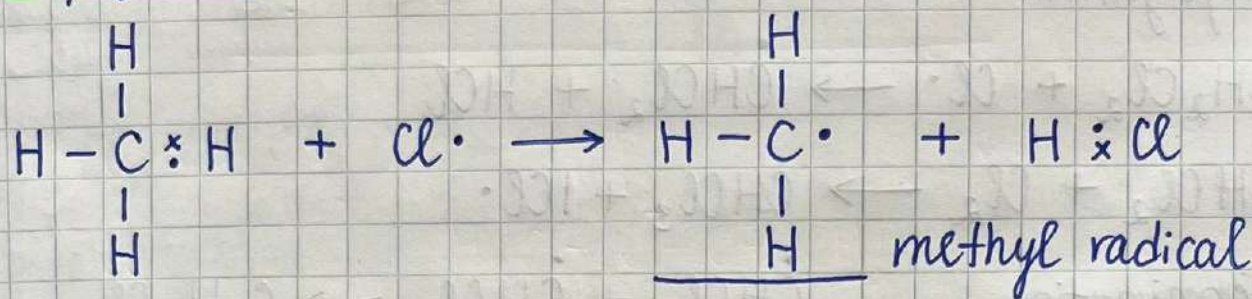
Substitution reactions of alkanes (radicalic): S_R



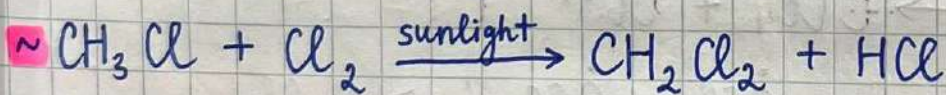
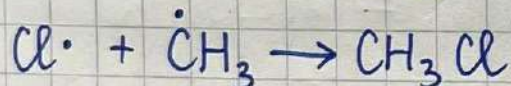
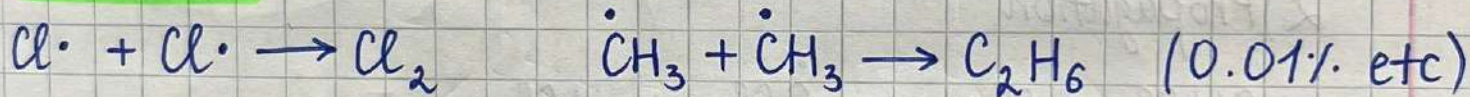
1) Initiation



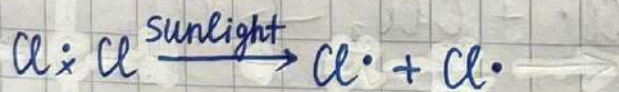
2) Propagation (chain reaction)



3) Termination



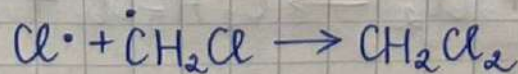
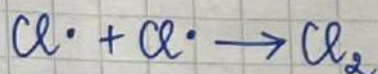
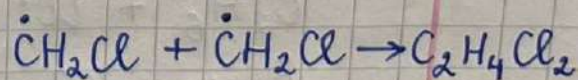
1) Initiation



2) Propagation

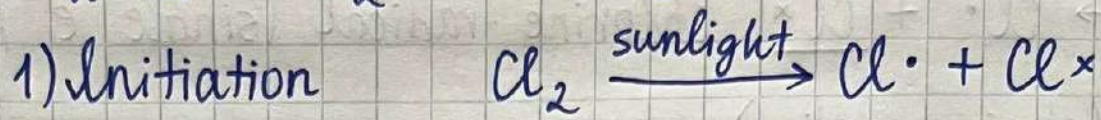


3) Termination





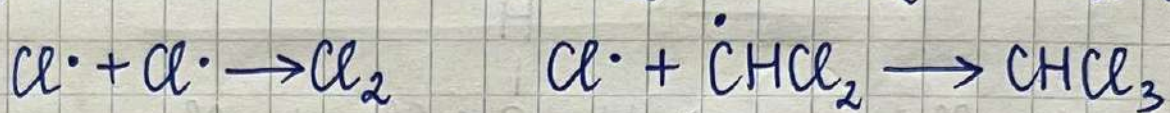
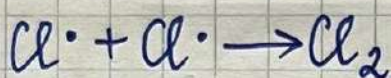
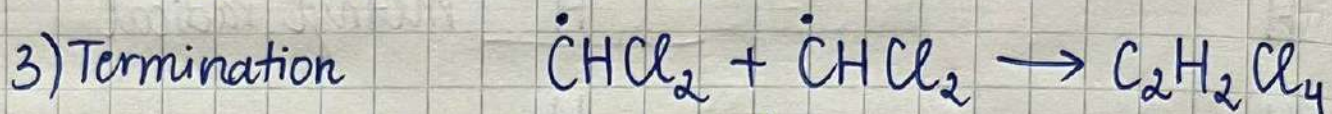
1) Initiation



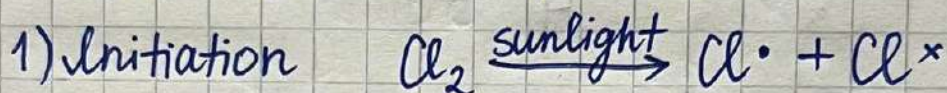
2) Propagation



3) Termination



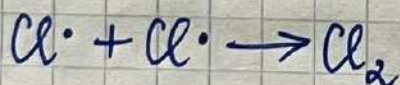
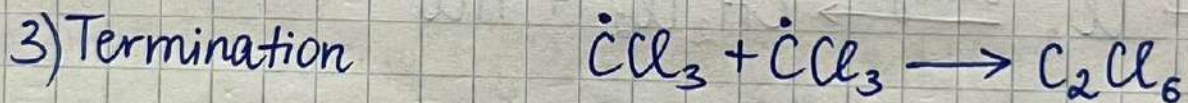
1) Initiation



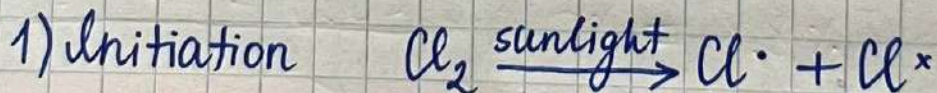
2) Propagation



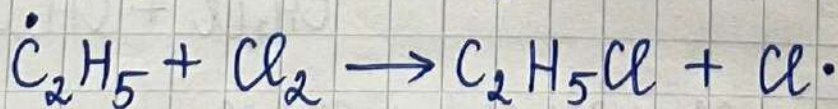
3) Termination



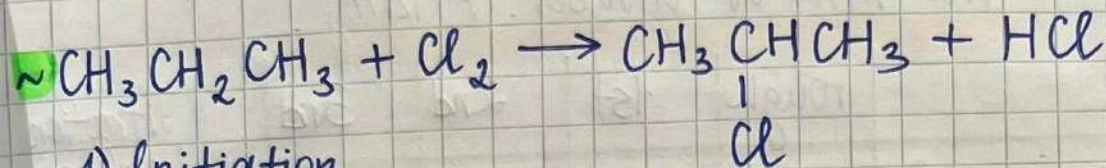
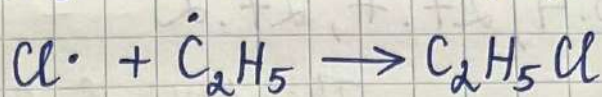
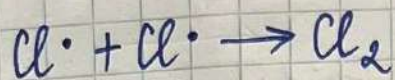
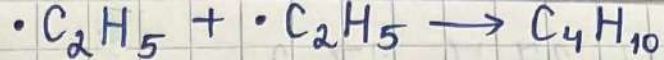
1) Initiation



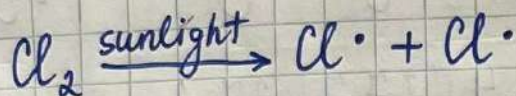
2) Propagation



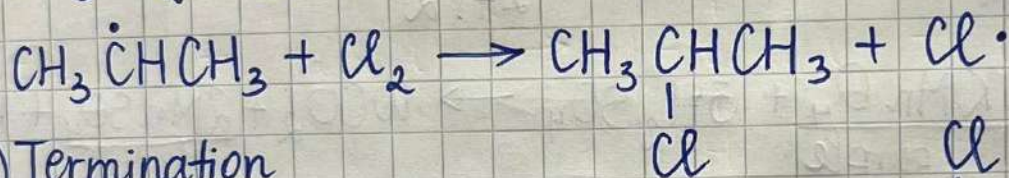
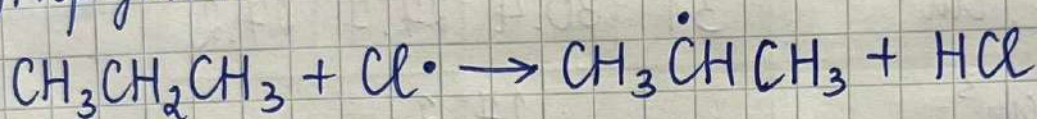
3) Termination



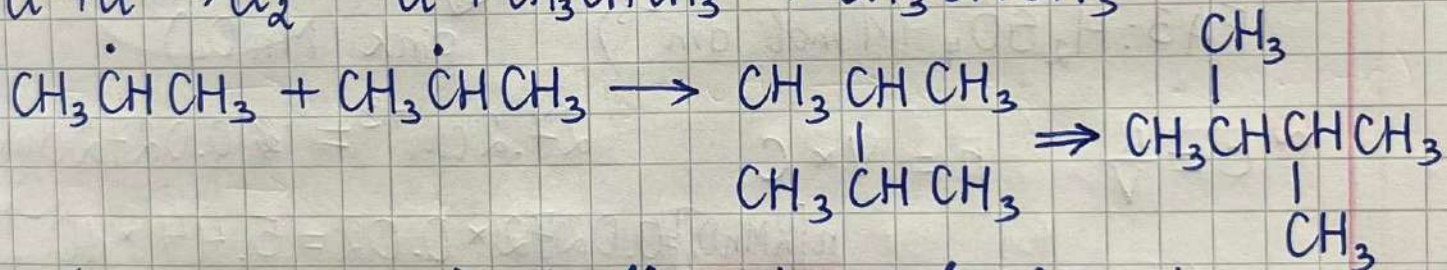
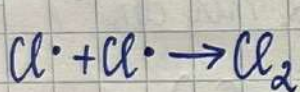
1) Initiation



2) Propagation



3) Termination



enantiomers: a pair of optically active molecules whose mirror images cannot be superimposed

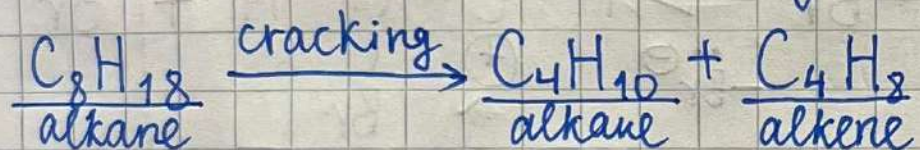
homolytic fission: both the atoms at each end of the bond leave with one electron from the pair that formed the covalent bond (Initiation)

The species produced when a bond breaks homolytically are called free radicals.

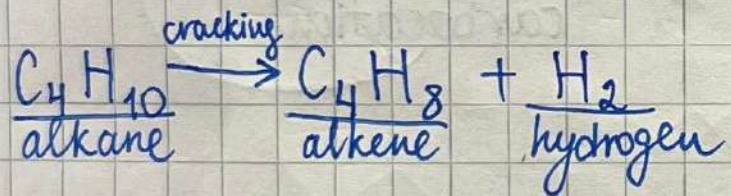
reaction mechanism: the series of steps that take place in the course of the overall reaction.

Alkene: $C_n H_{2n}$ ($-C=C-$) 15.3. Alkenes
→ described as unsaturated hydrocarbon)

Alkene formed from cracking of alkane.



functional group: double bond



Homologous series

↓ C_6H_{12} : hexene

C_2H_4 : ethene

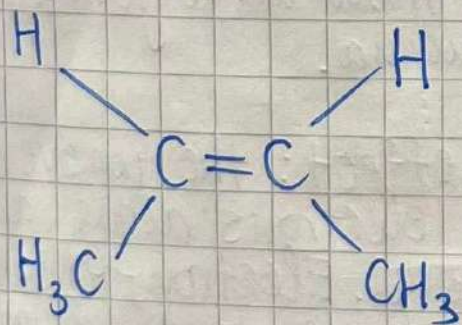
C_3H_6 : propene

C_4H_8 : butene

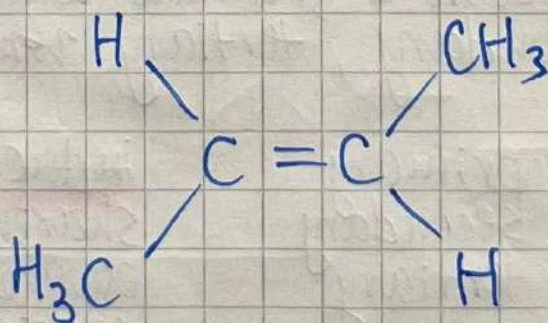
C_5H_{10} : pentene

~ $H_2C=CHCH_2CH_3$: but-1-ene

$CH_3CH=CHCH_3$: but-2-ene



(cis) but-2-ene



(trans) but-2-ene

~ C_5H_{10}

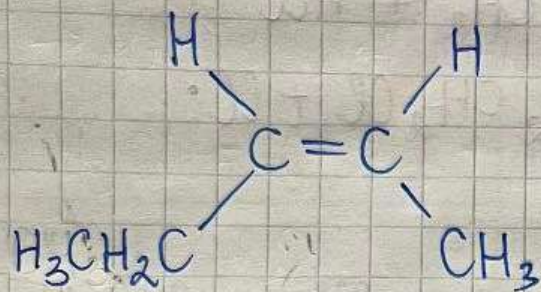
: pent-1-ene

: pent-2-ene

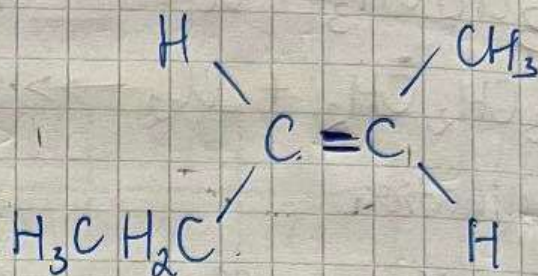
: 3-methylbut-1-ene

: 2-methylbut-1-ene

: 2-methylbut-2-ene

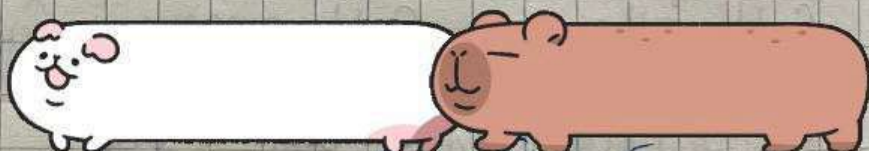
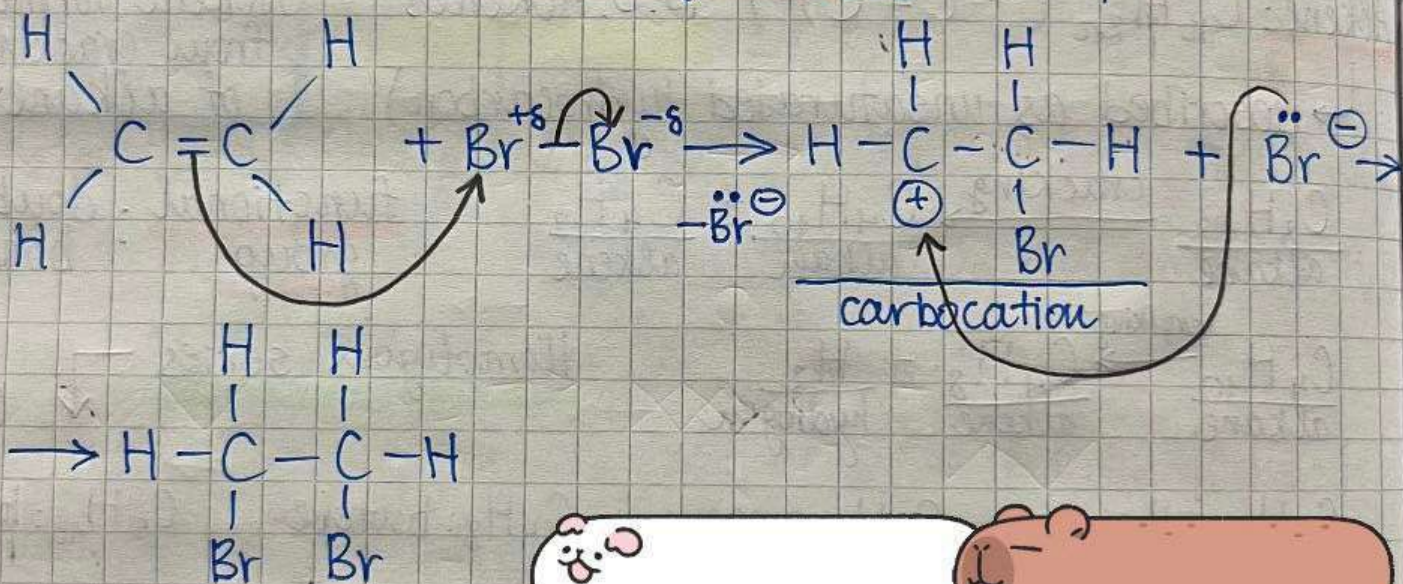


(cis) pent-2-ene



(trans) pent-2-ene

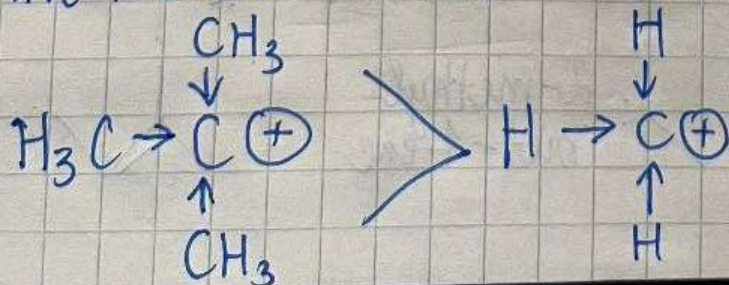
1) Addition reaction with halogen: A_E (electrophilic)



Carbocation ууссах C уаамаа хэгэн C-мол хайрхгосоор нь primary, secondary, tertiary болно.

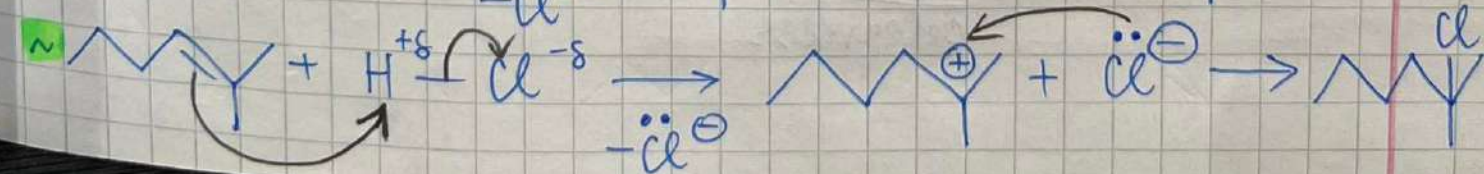
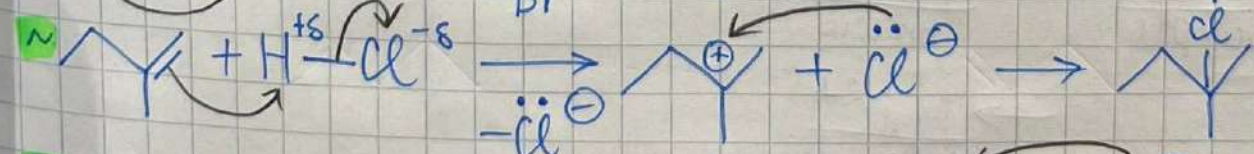
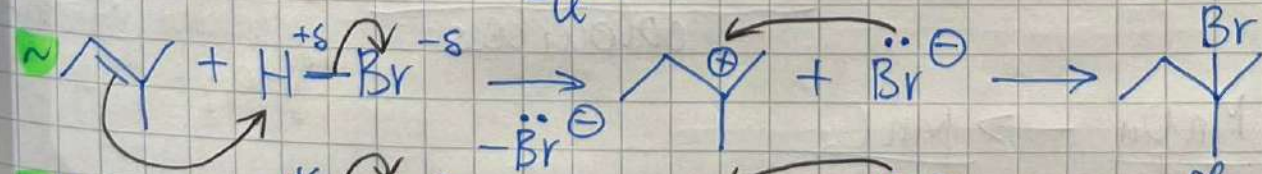
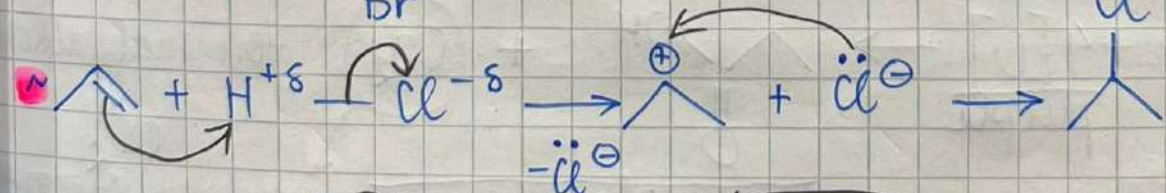
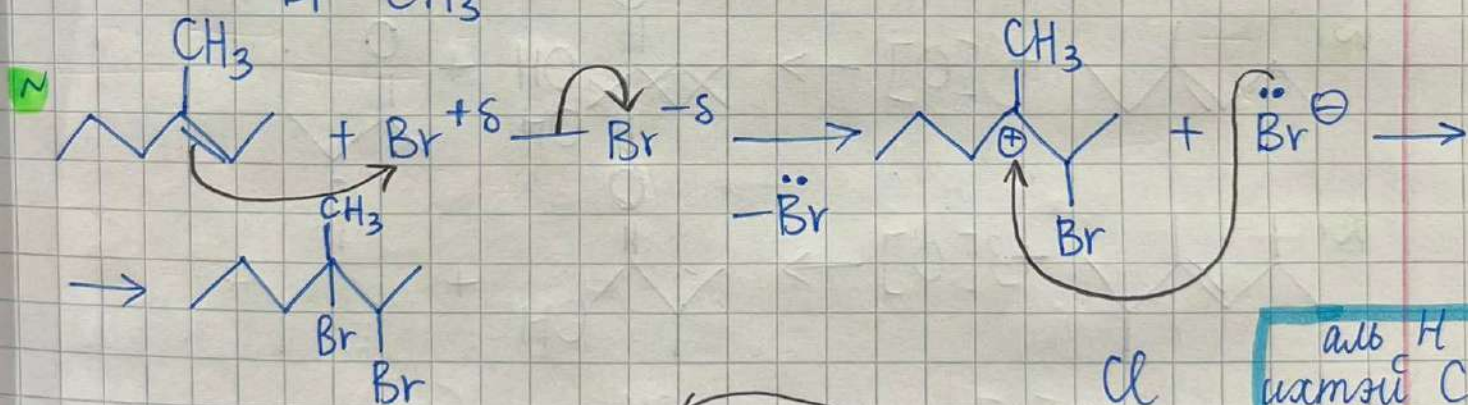
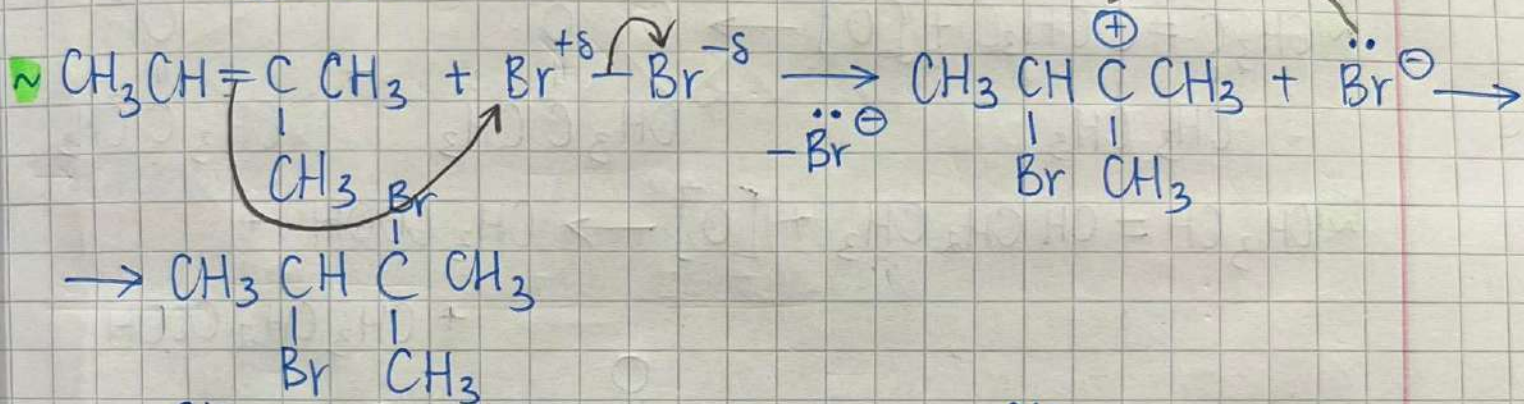
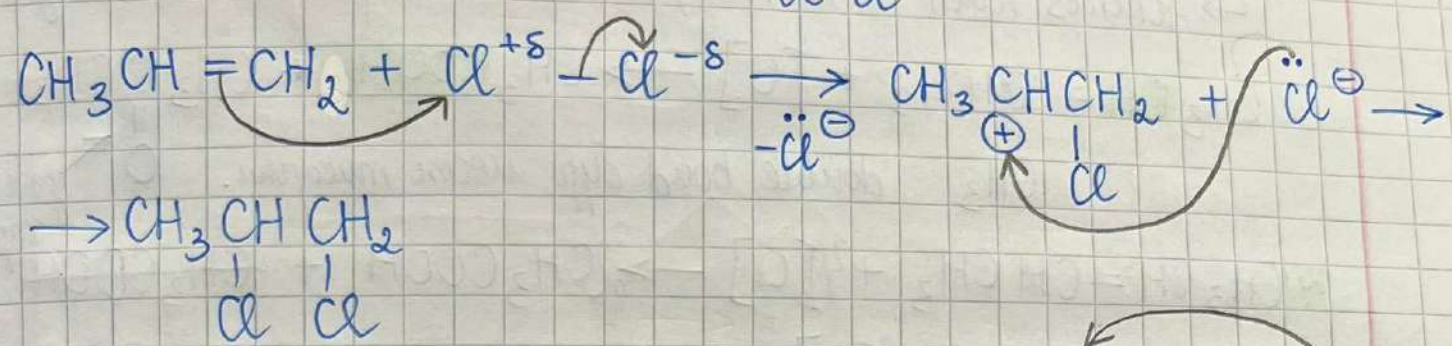
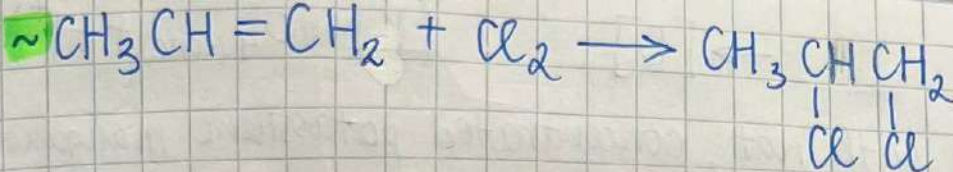
stability ↓ primary
secondary
tertiary

are said to have a positive inductive effect whereas electron-withdrawing species, such as an oxygen atom, have a negative inductive effect.



carbon ууш ух электроной hydrogen-ооц ургаас carbocation-ий

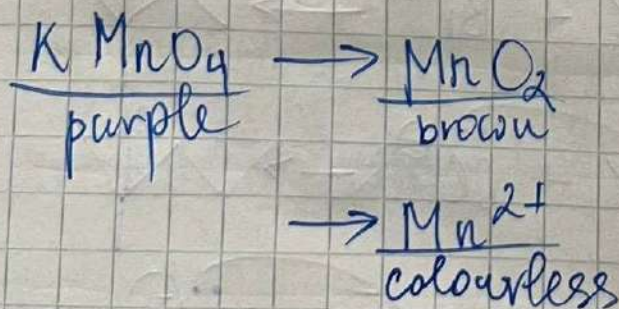
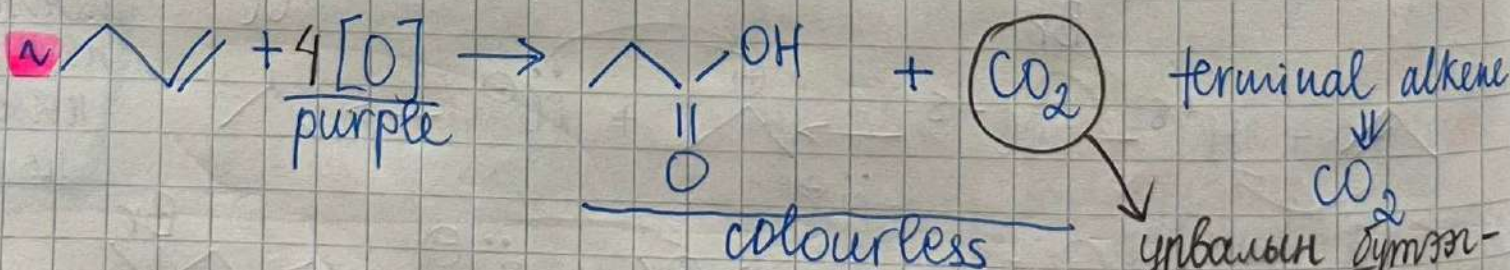
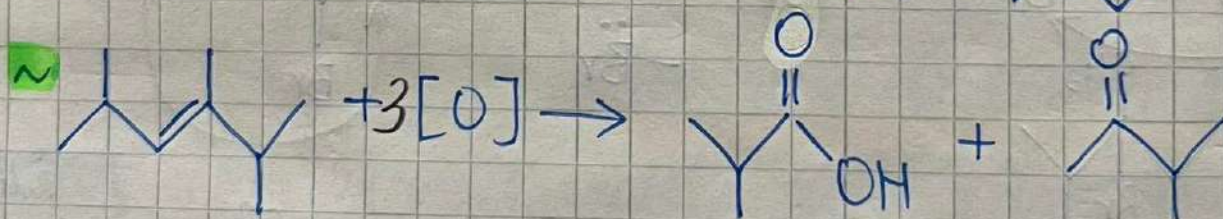
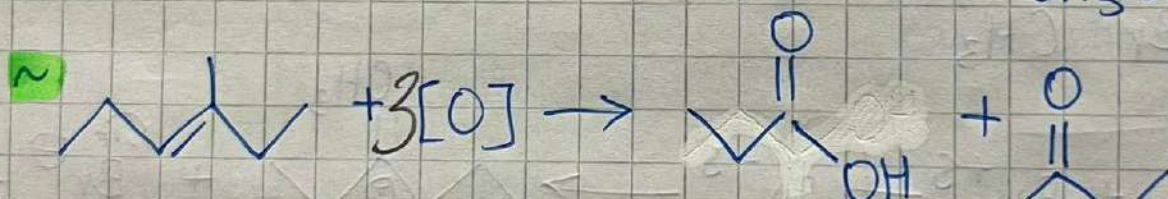
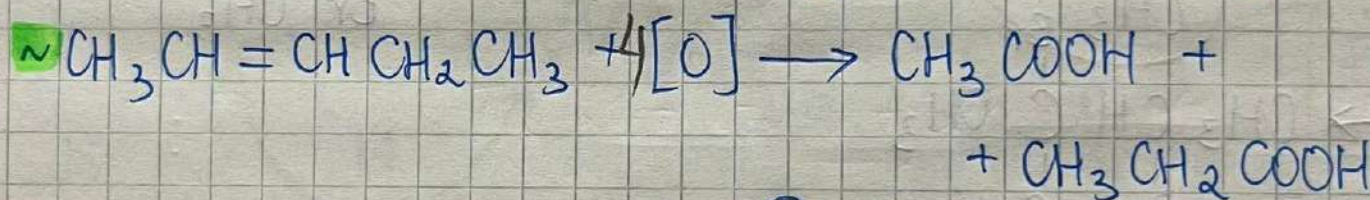
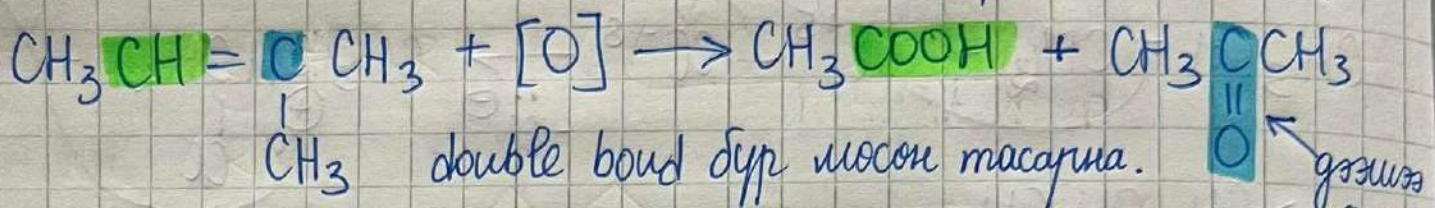
электроной ууш сайн таарна түүн ууш тогтвортой байна.

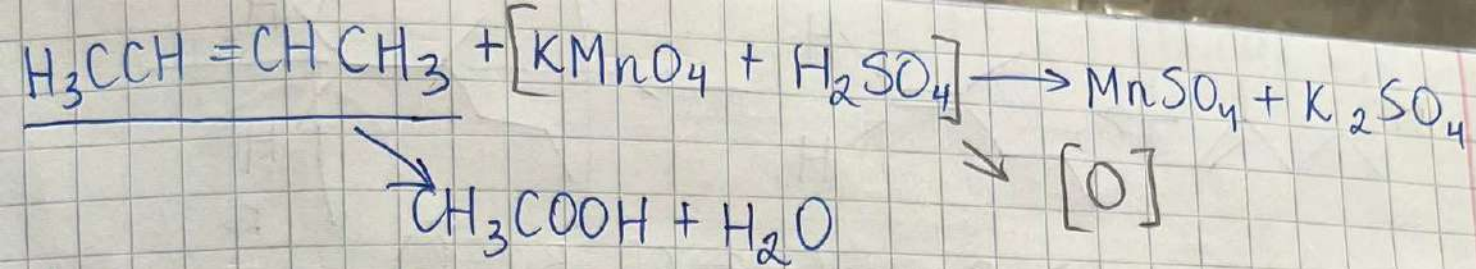


алы H
иатын Cгээр
нь H оргол.
нооо гээр
нь halogen.

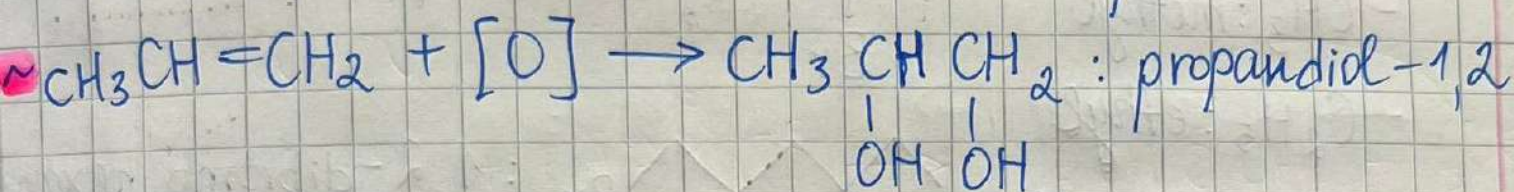
2) Oxidation $\rightarrow [O]$ $(KMnO_4 (conc) + H^+)$

Alkenes react with hot, concentrated potassium manganate



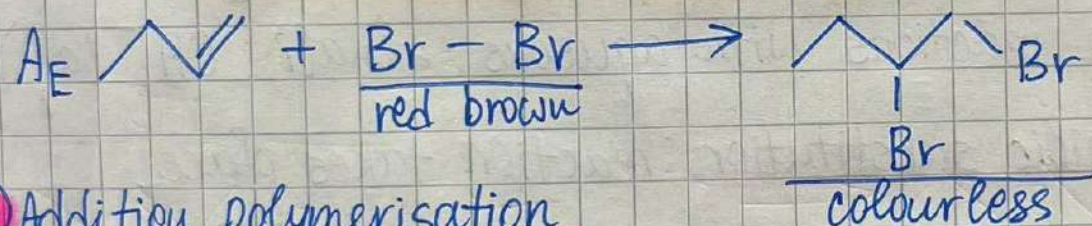


↳ Oxidation with cold, dilute, potassium manganate
 ↳ decreased oxidation power



3) Alkene test

↳ with bromine water



4) Addition polymerisation

