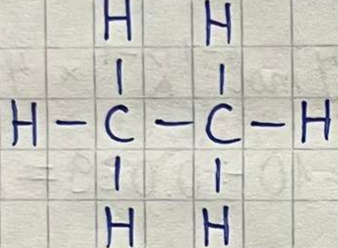
Chapter 14. Introduction to organic chemistry

14.1. Representing organic molecules.

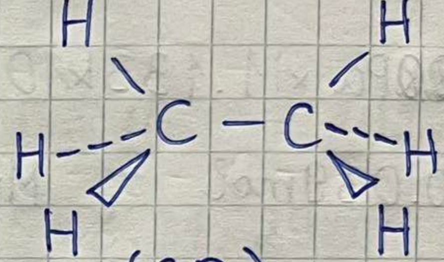
- ↳ Structural formula ✓
- ↳ Skeletal formula ✓
- ↳ Displayed formula (All the bonds within molecule are shown
- ↳ 3D formula ✗



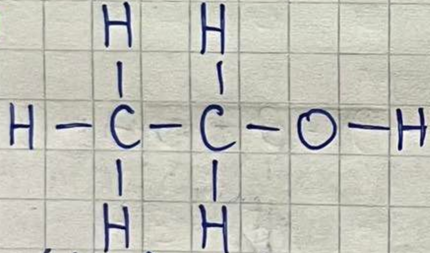
(displayed)

CH_3CH_3
(structural)

(skeletal)



(3D)

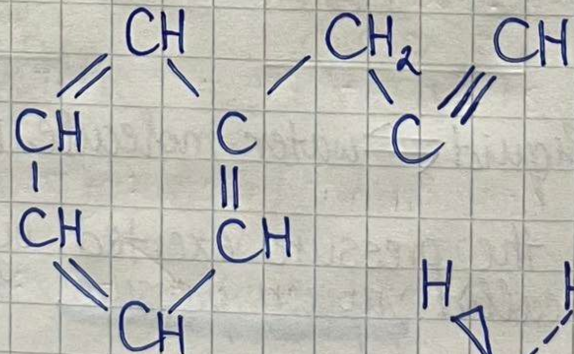


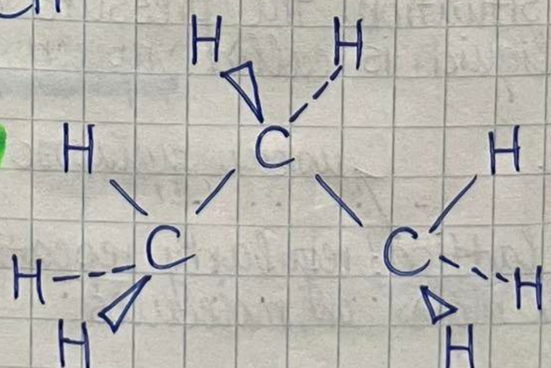
(displayed)

CH_3CH_2OH
(structural)

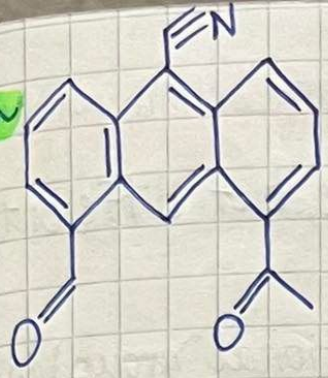
(skeletal)

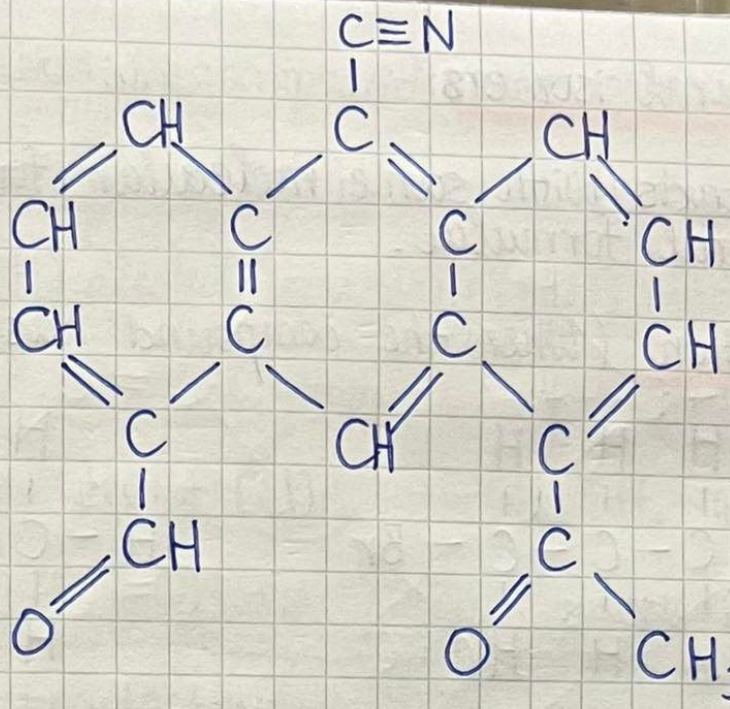
C_9H_8

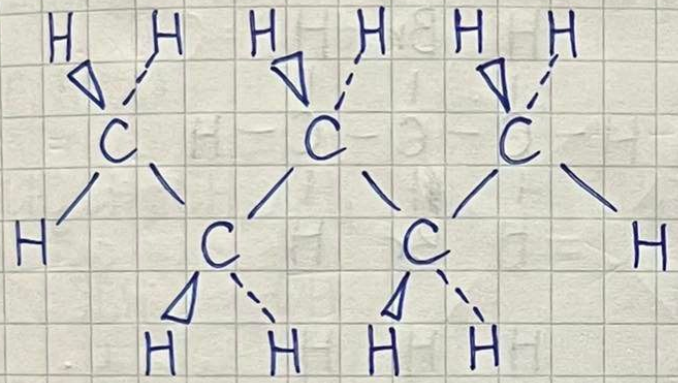


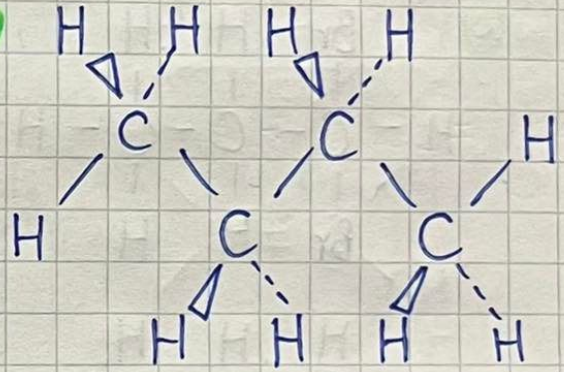


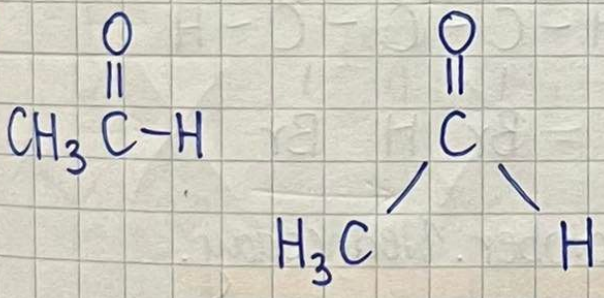
CH_4 дээр байхгүй (skeletal)









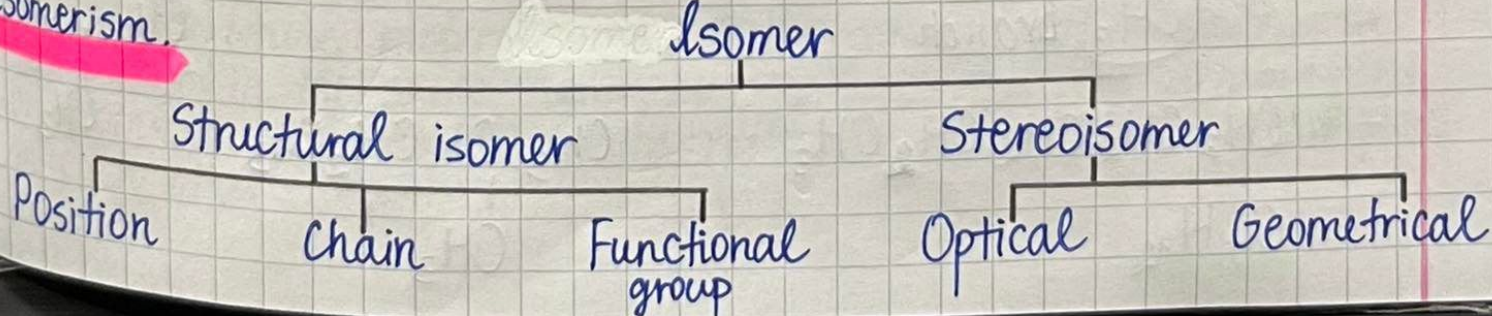


- all single bond : tetrahedral
  sp^3 hybridisation
- C=C , C=O : trigonal planar
  sp^2 hybridisation
- C≡C , C≡N : linear
  sp hybridisation

Functional group.

Functional group determines the characteristic chemical properties of the compounds that contain that specific functional group.

Isomerism.

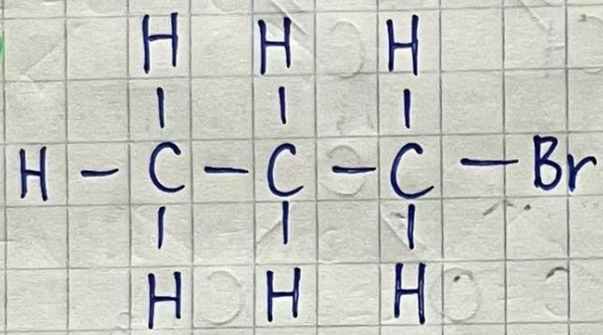


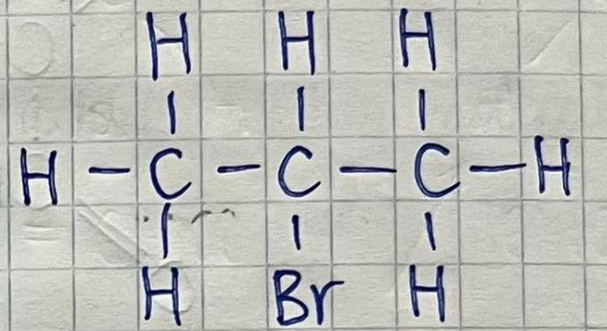
4) Structural isomer

Compounds with same molecular formulae, but different structural formulae.

a) Position (When the compound has functional group and it changes its position)

~





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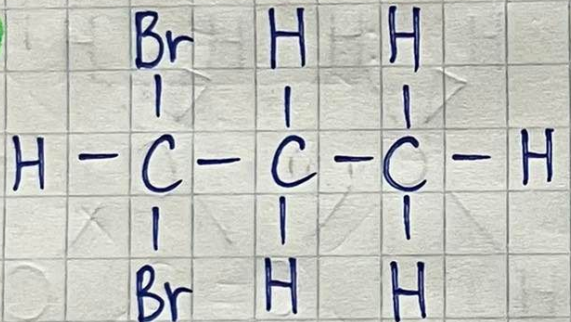
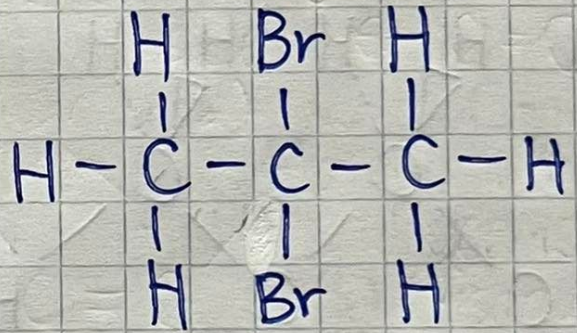
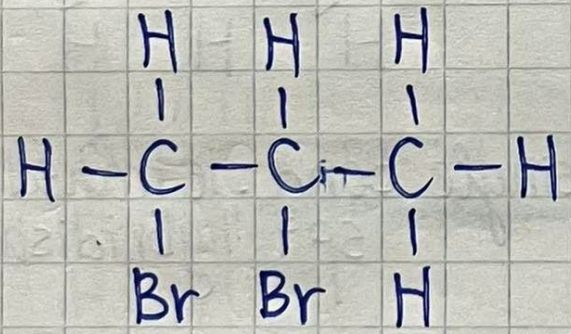
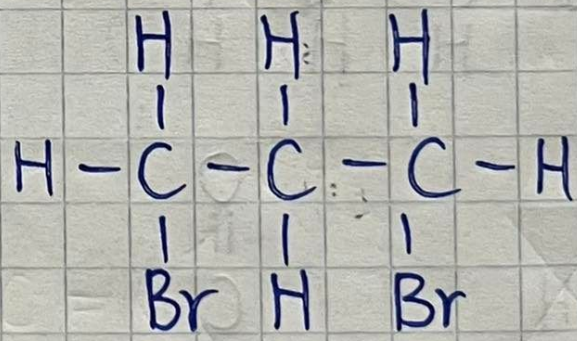






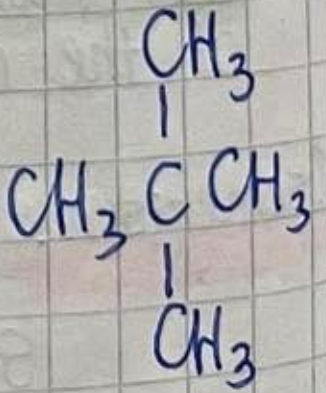


b) chain (When the number of carbons in main chain changes)

~ $CH_3CH_2CH_2CH_3$: main chain

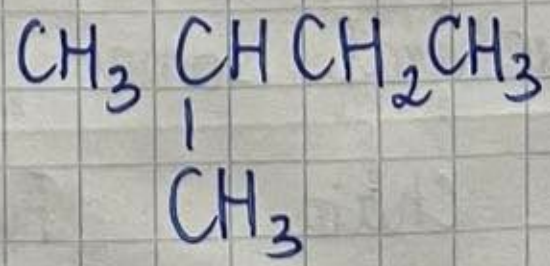
$CH_3CH(CH_3)CH_3$: main → chain isomer

(CH_3 branch)



~ $CH_3CH_2CH_2CH_2CH_3$

C_5H_{12}

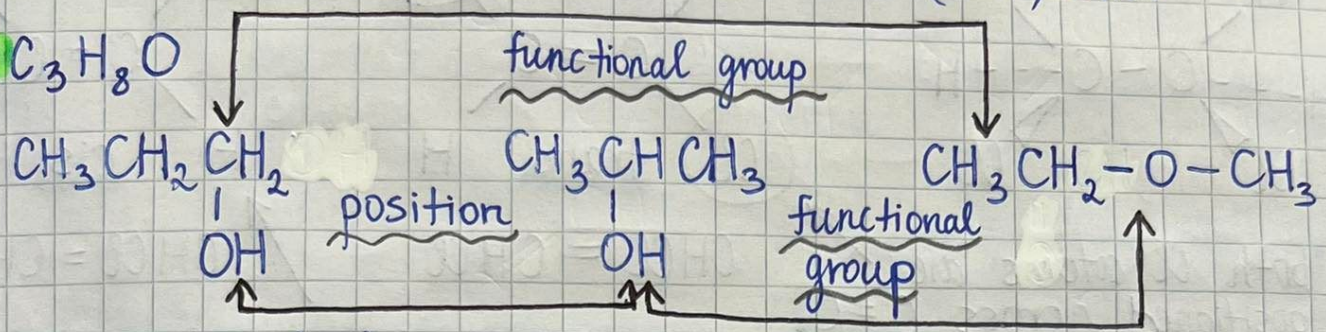


c) **Functional group** (When the compounds have same structural formula, but have different functional group)

~ $CH_3CH_2OH \Rightarrow \underset{C_2H_6O}{CH_3CH_2-O-H}$; $\underset{C_2H_6O}{CH_3-O-CH_3}$

(-OH) alcohol (-O) ether

~ C_3H_8O



$CH_3CH_2\underset{OH}{CH_2}$ $CH_3\underset{OH}{CH}CH_3$ $CH_3CH_2-O-CH_3$

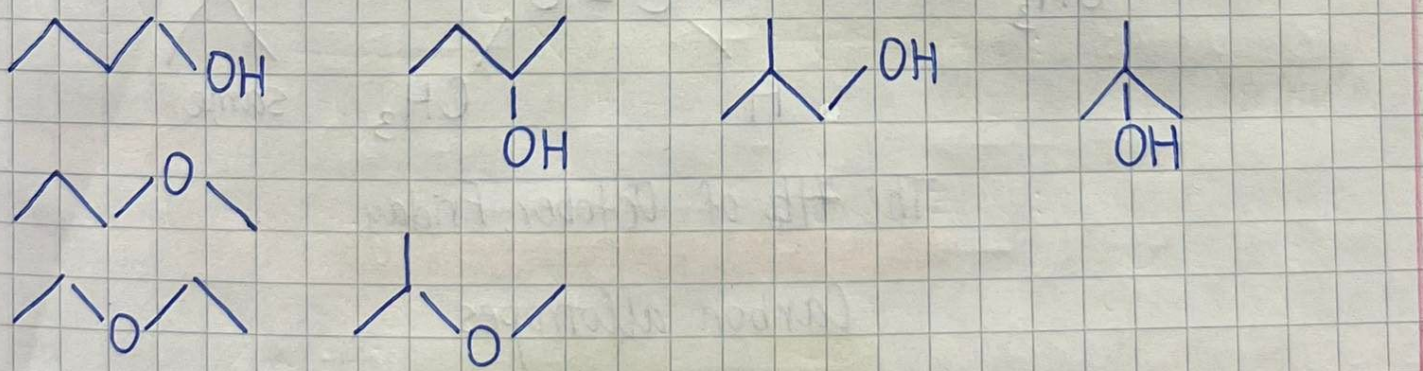
contact.p ux (97°) > contact.p dara (85.6°) > permanent dipole (10.4°C)

~ $C_4H_{10}O$

① $CH_3CH_2CH_2\underset{OH}{CH_2}$ (2,3) $CH_3CH_2\underset{OH}{CH}CH_3$ (2,3) $CH_3\underset{OH}{CH}CH_2$ (with CH_3 branch)

④ $CH_3\underset{OH}{C}(CH_3)_2$ (5,6) $CH_3CH_2CH_2-O-CH_3$ (5,6) $CH_3CH_2-O-CH_2CH_3$

⑦ $CH_3\underset{OH}{CH}-O-CH_3$

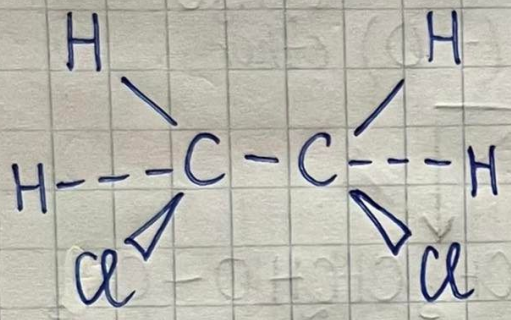


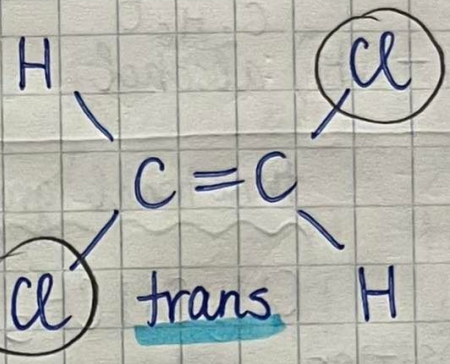
2) **Stereoisomer**

Compounds whose molecules have the same atoms bonded to each other in the same way, but with a different arrangement of atoms in space so that the molecules cannot be superimposed on each other.

a) Geometrical (When the compound has C=C)

↳ there is no rotation about a C=C bond.

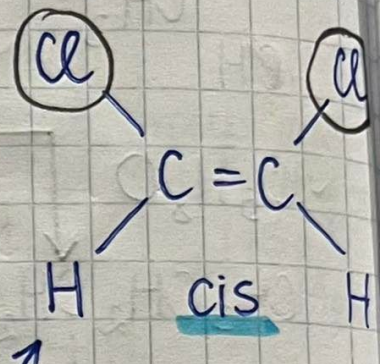




trans

$CHCl=CHCl$

both Cl atoms are positioned across C=C

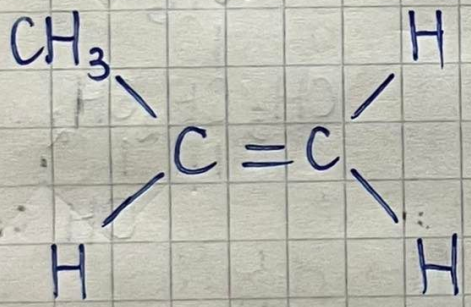


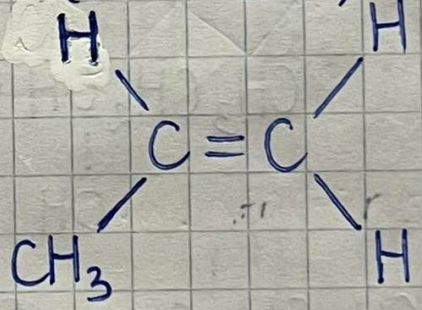
cis

$CHCl=CHCl$

both Cl atoms are fixed on the same side of C=C

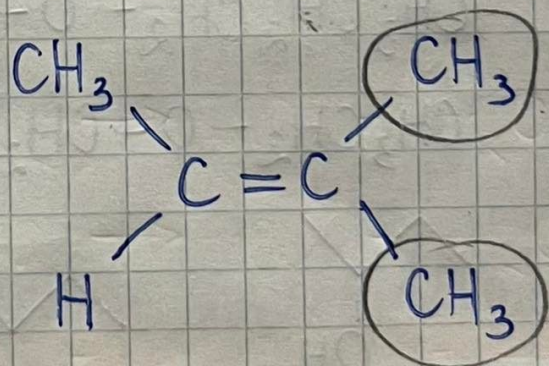
~ $CH_3CH=CH_2$: terminal alkene (double bond)





There is no geometrical isomer on terminal alkene.

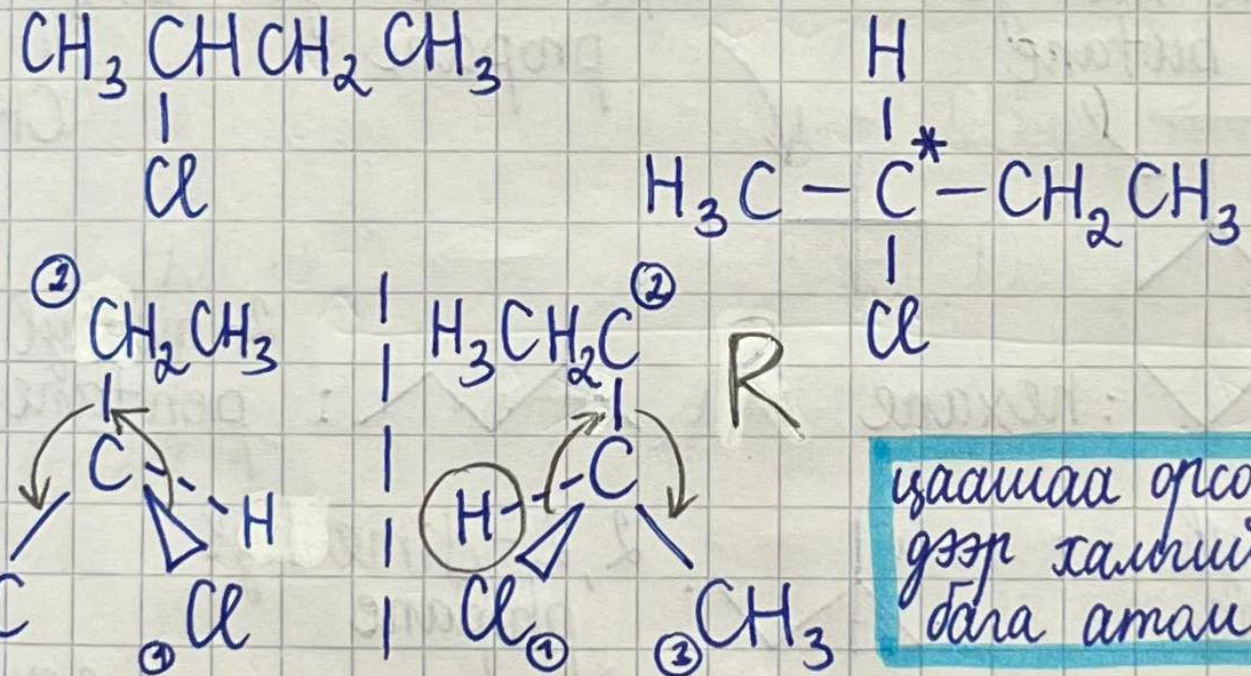
~ $CH_3CH=C(CH_3)CH_3$



same

b) Optical (have chiral centre and mirror image of each one)

chiral centre: a carbon atom with the four different atoms or groups of atoms attached



Шууд холбогдсон атомын атом масс буурах дарааллаар

цаашаа орсон дээр халтийн бага атом

Цагийн зүүний дагуу R isomer, эсрэг S isomer