Class XII Academic Program -2020

2nd paper

Organic

Chemistry

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Translated by : Burha nus Sameer

Organic Compounds and vital force Theory:

1815 → Scientist Barzelias developed his vital force theory

1828 → *German Scientist* Friedrich Wohler has proved it wrong

mistery → living organisms

$$Pb(CNO)_2(aq) + 2NH_4Cl(aq) = PbCl_2 + 2NH_4CNO(aq)$$

Isomerism

$$NH_4CNO \xrightarrow{\Delta} H_2N - CO - NH_2$$

Inorganic → Organic (urine)

Definition of Organic c

The compounds which are formed by the addition of carbon and other single or multiple elements(H, X, O, N, S, P)are known as organic compounds.

C, H

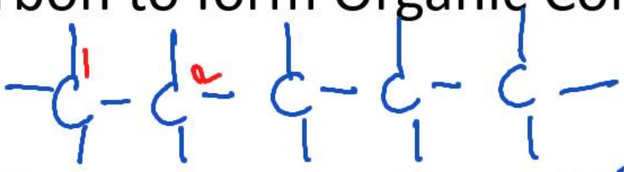
- Organic Compounds are made of catinated carbon chain , bonded with covalent bond with each other, sublimated substances , insoluble in water and burnable compounds.
- In other word , The compounds which are formed by carbon and hydrogen are called Hydrocarbon and Hydrocarbon as well as its derivatives are known as Organic Compounds.

mother compound

Specialty of Carbon to form Organic Compounds

80 Lakh

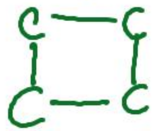
- Catenation

(4) 

$>C=C<$ $-C\equiv C-$ C_{30}

→ Catena chain

Bond energy (C−C) : 347 kJ/mol E.A ↑ e⁻ share



N−N : 163 kJ/mol

E.N → 2.5 ← (1+4)/2

Li Be B C N O F Ne

- Isomerism

→ Structural formula diff.

→ Molecular formula same → C_4H_8 → Alkene (C_nH_{2n})

- Polymerisation

Poly + mer (molecule) polyethene

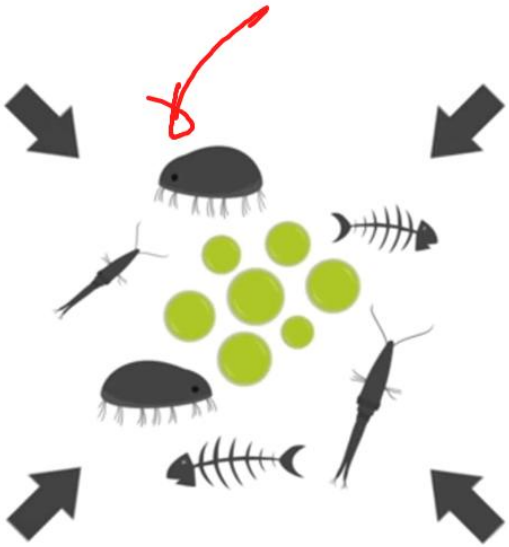
n

mono + mer

$CH_2 = CH_2$

→ $-(CH_2-CH_2)-_n$

Source of Organic Compounds



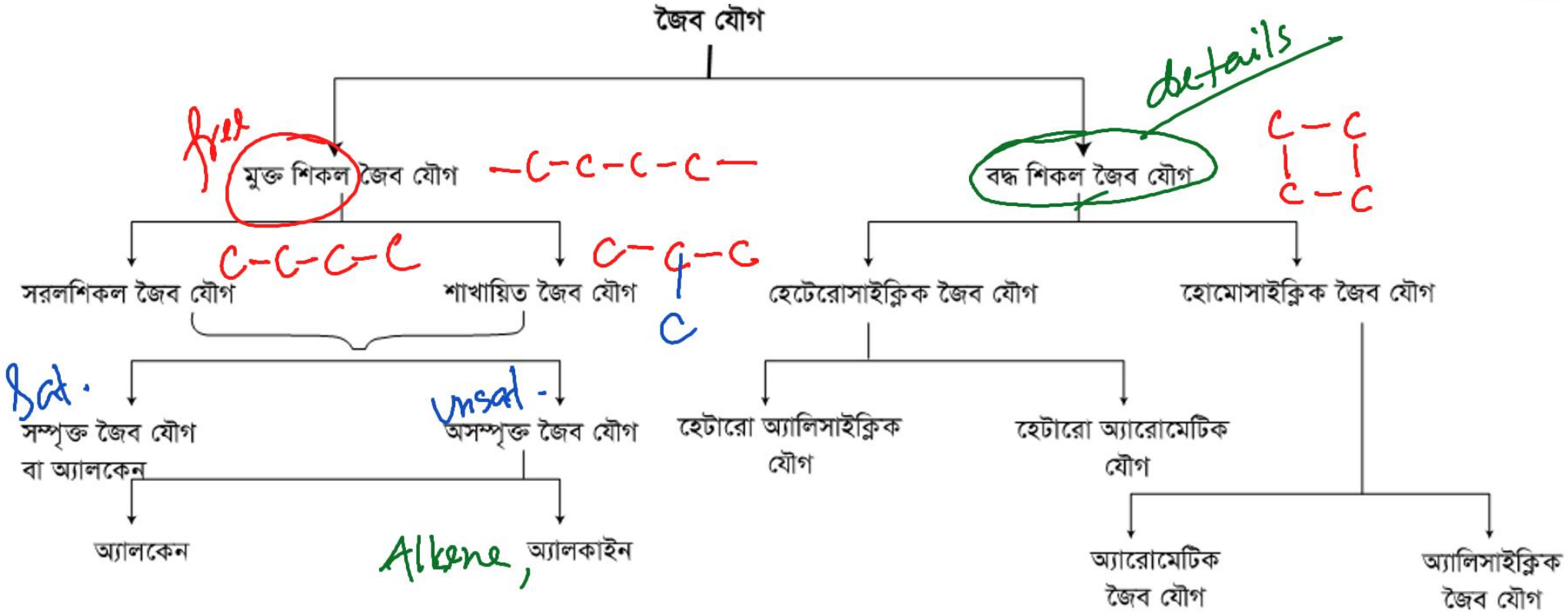
Fossil Fuel

COAL ✓

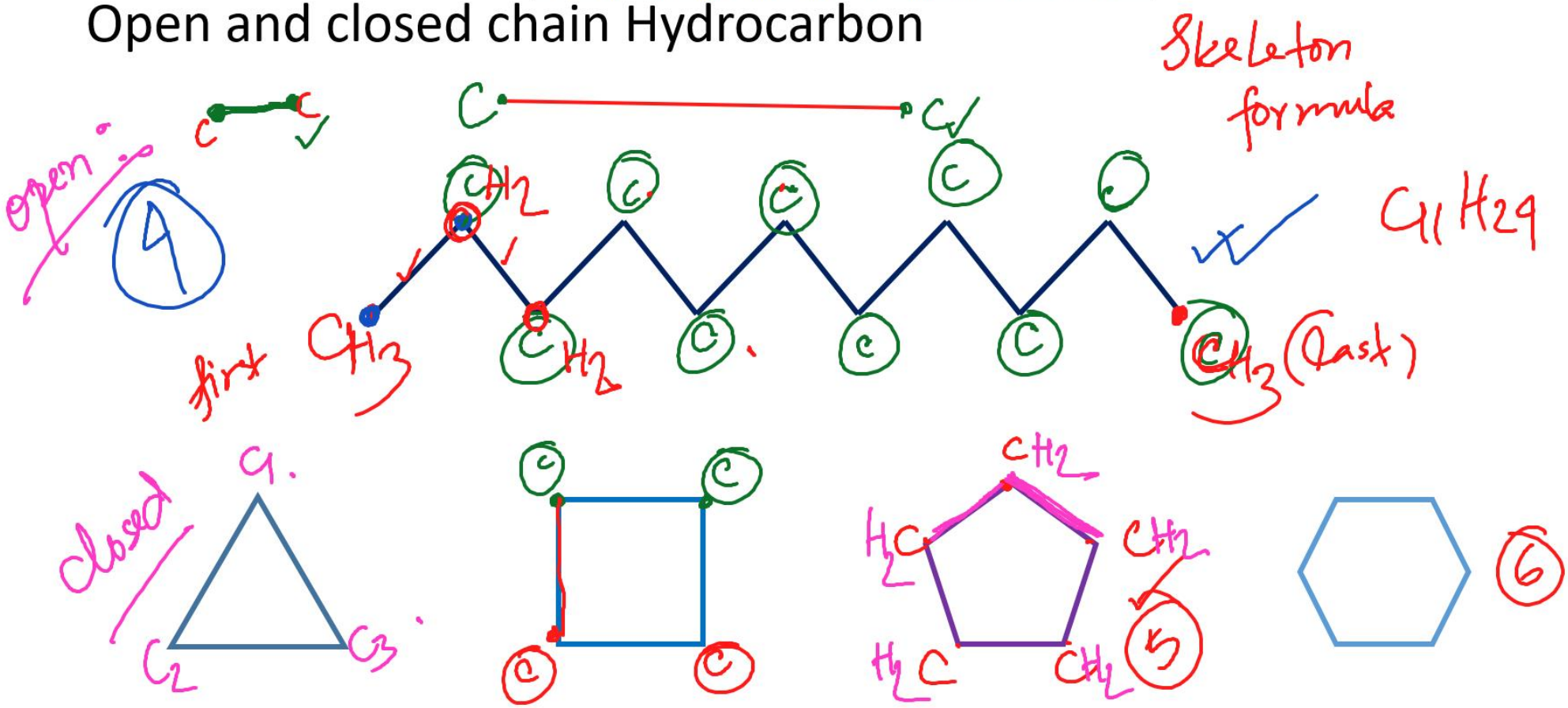
HC.

OIL ✓

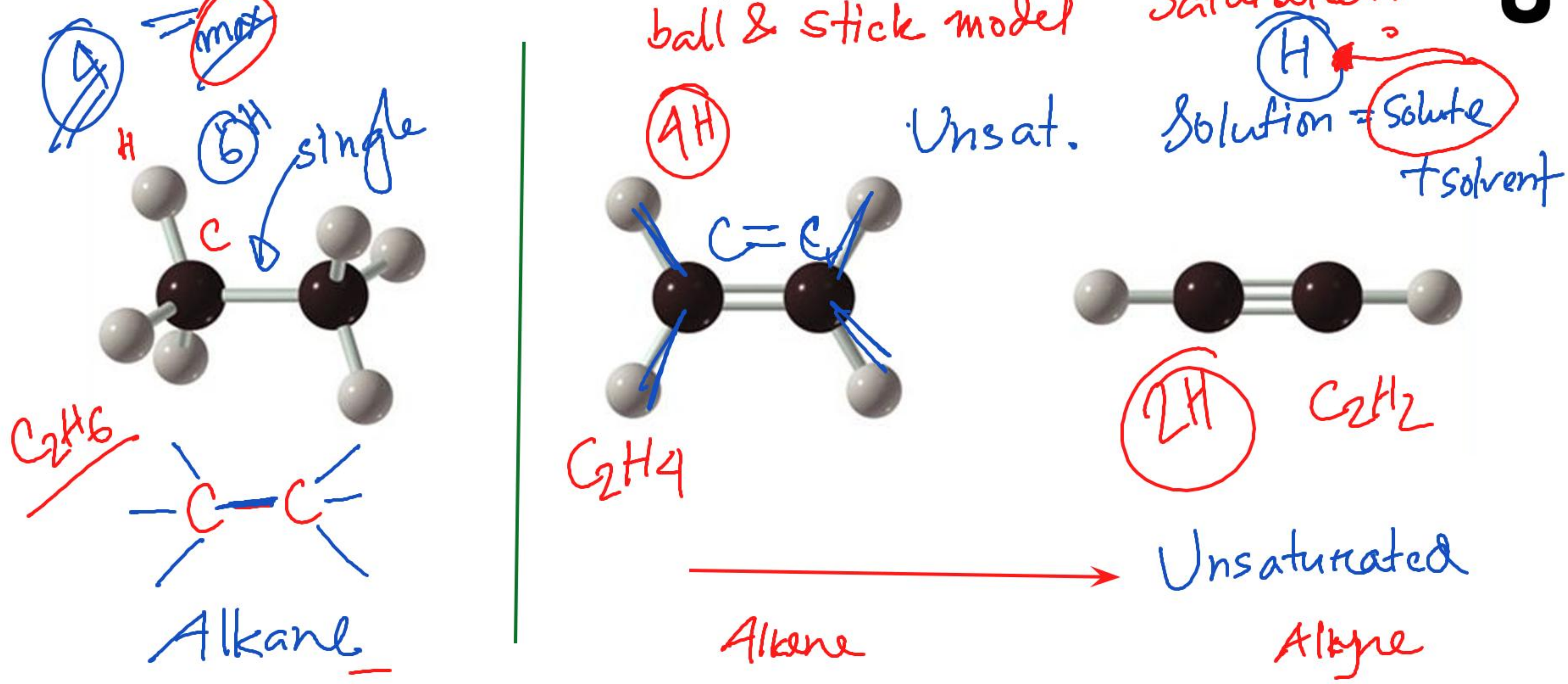
NATURAL GAS ✓



Open and closed chain Hydrocarbon



Saturated and Unsaturated Hydrocarbon

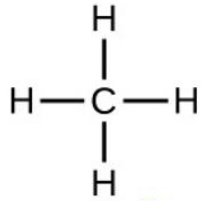


Saturated and Unsaturated Hydrocarbon

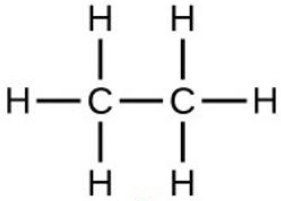
Single

Alkane

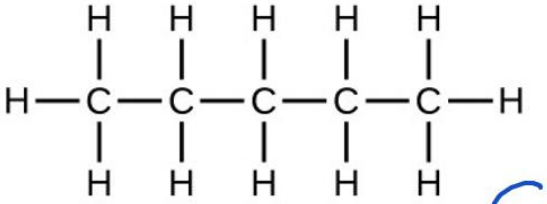
2D →



CH_4

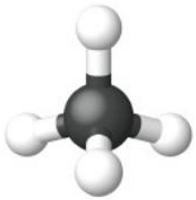


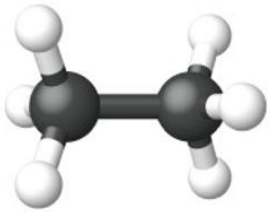
C_2H_6

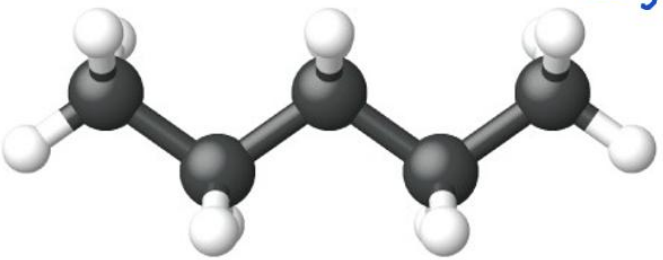


C_5H_{12}

3D:







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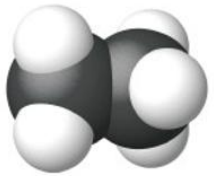
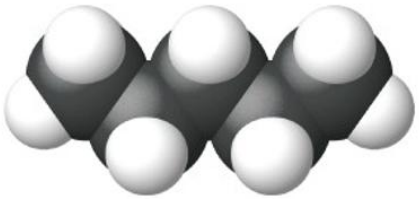


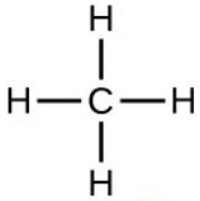


Saturated and Unsaturated Hydrocarbon

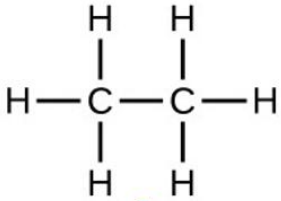
Single

Alkane

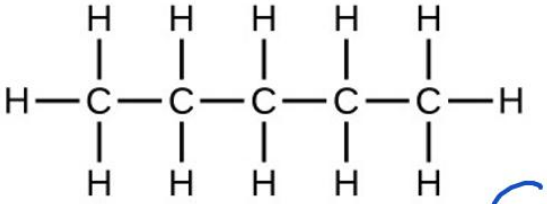
2D →



CH_4

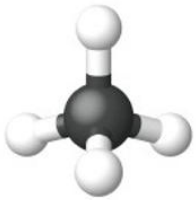


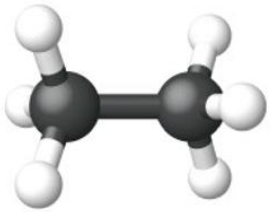
C_2H_6

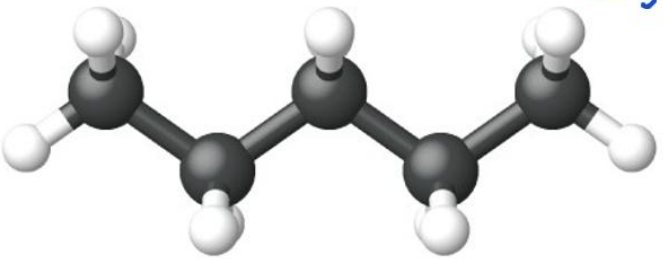


C_5H_{12}

3D:







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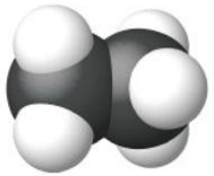
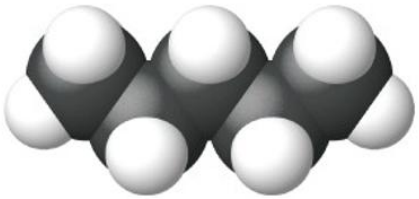
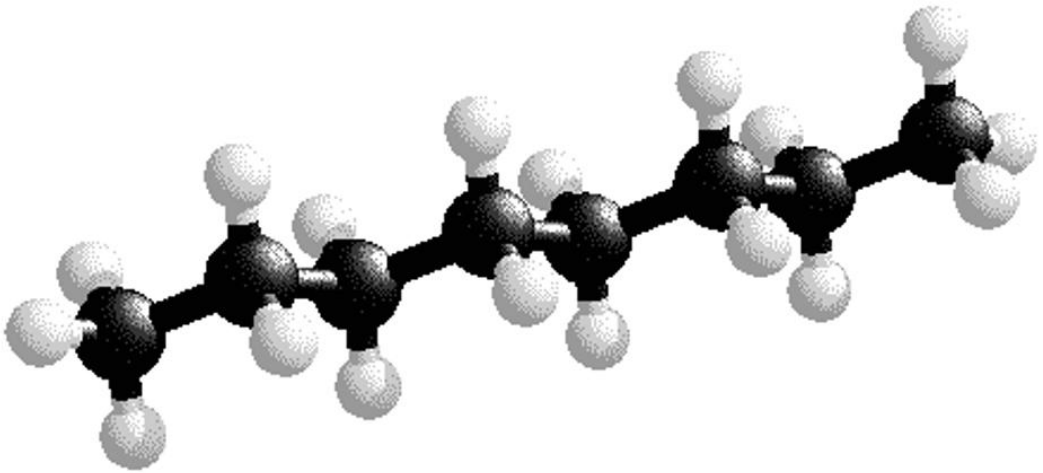




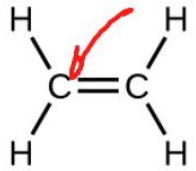
Saturated and Unsaturated Hydrocarbon

C_8H_{18} → Octane.

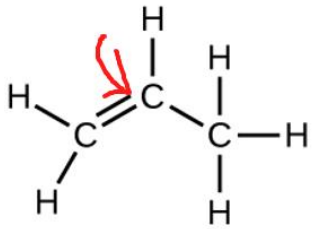


Saturated and Unsaturated Hydrocarbon

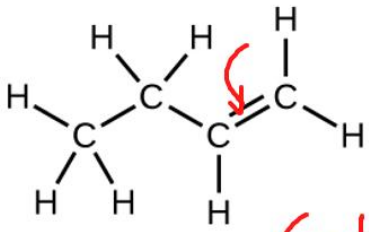
Alkene



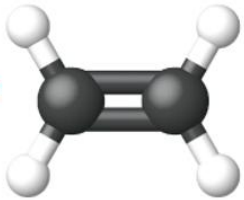
C_2H_4

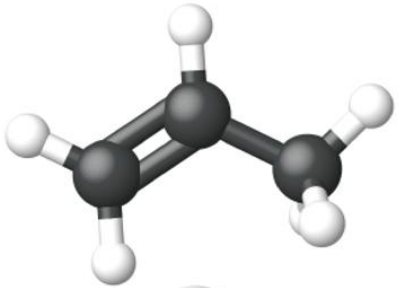


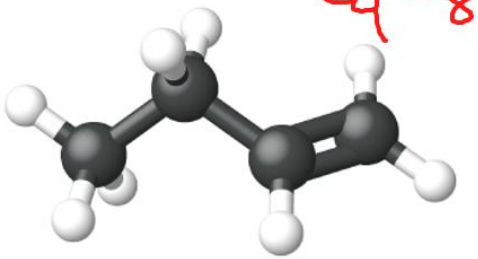
C_3H_6

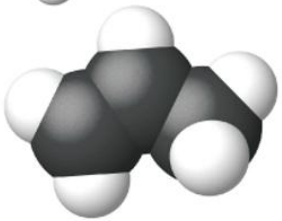


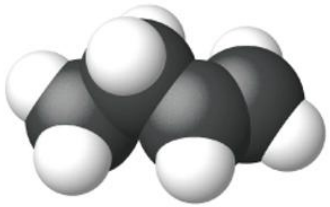
C_4H_8

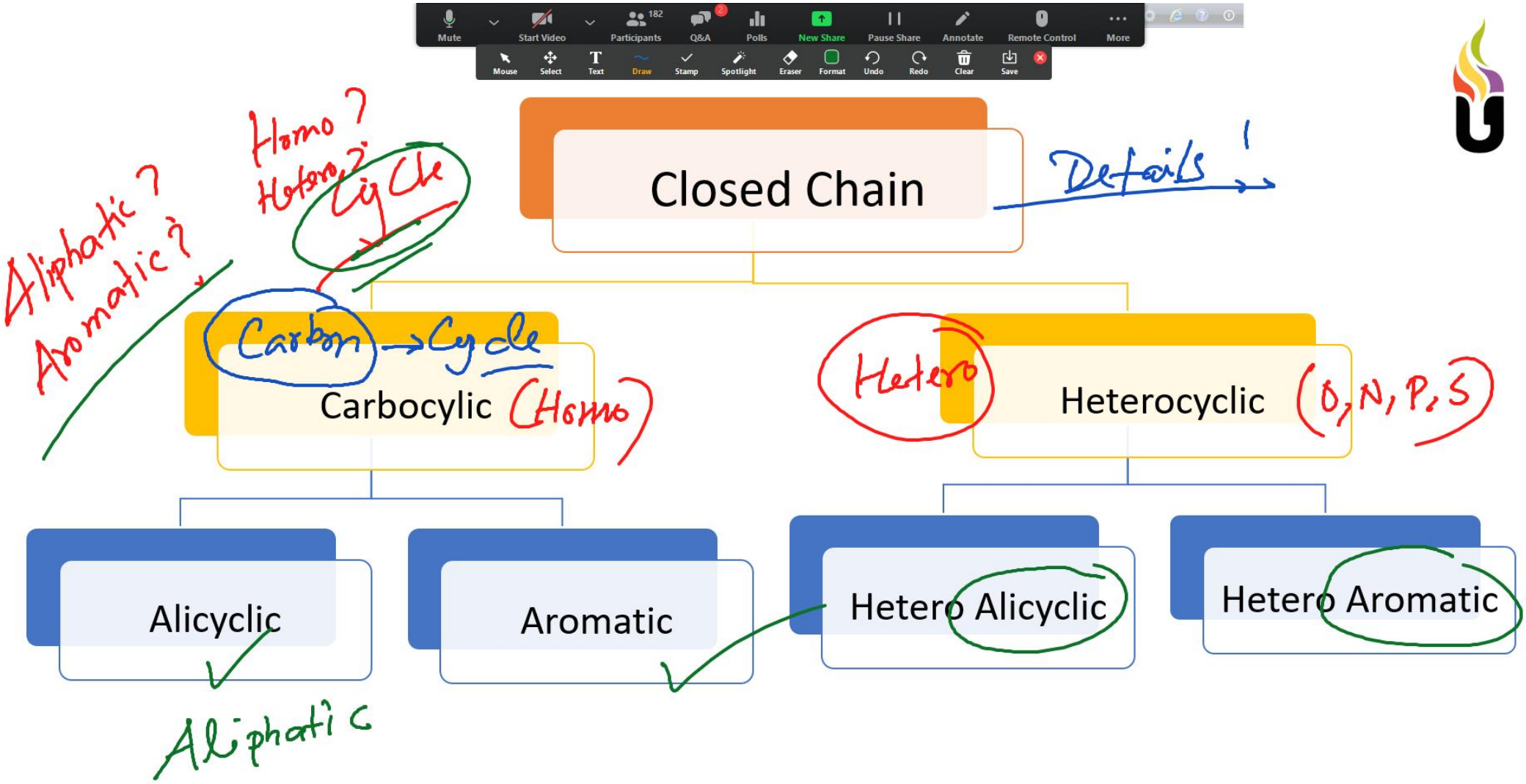


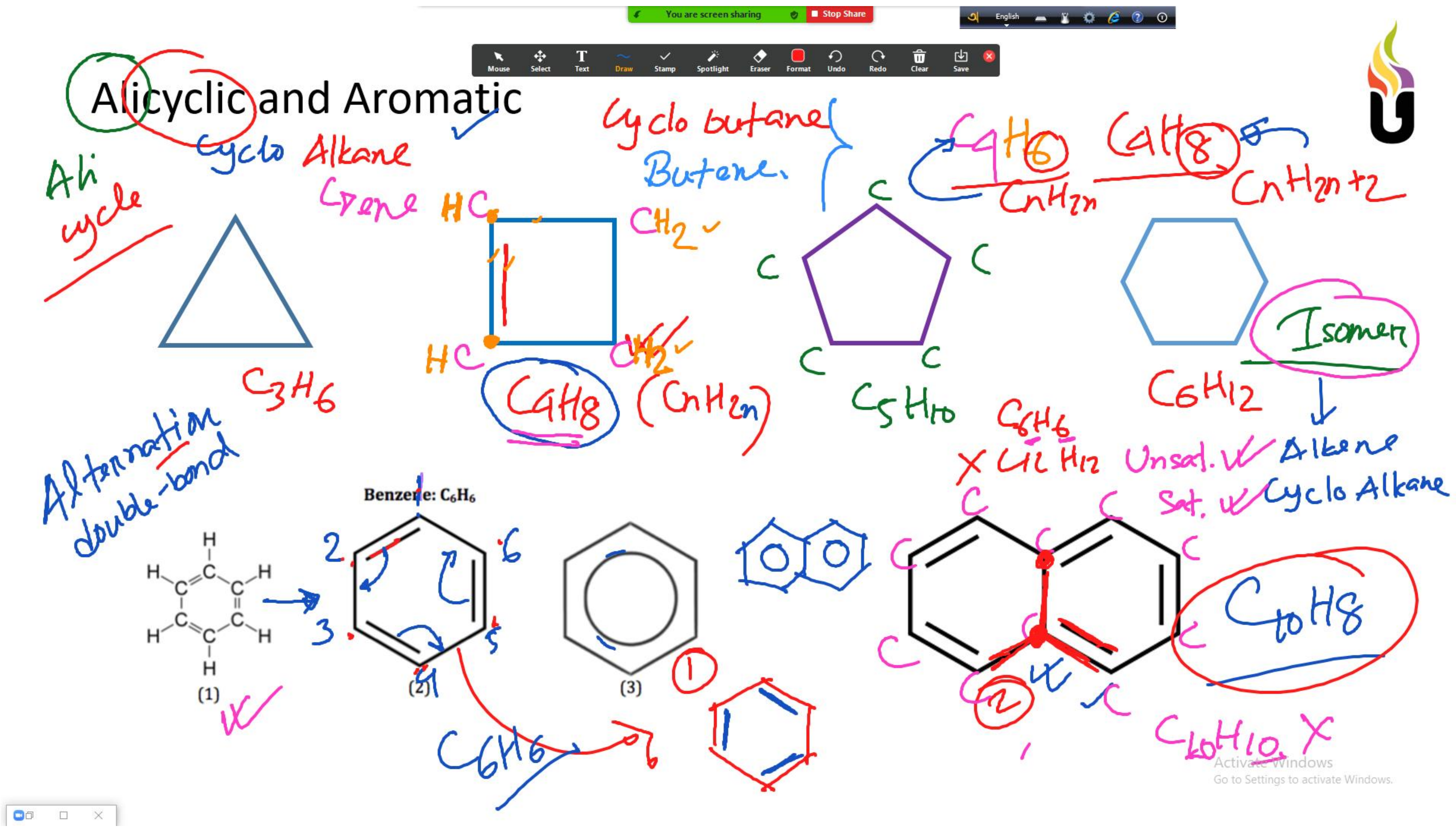






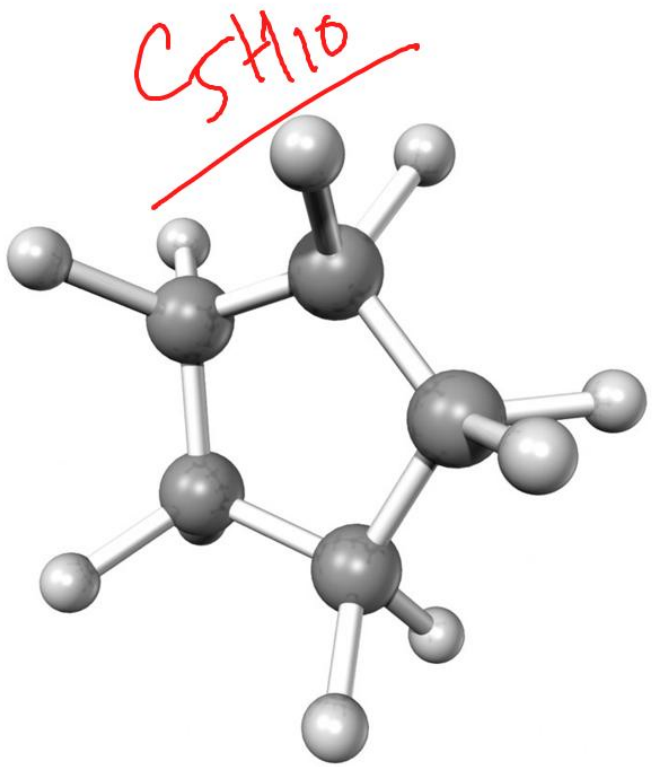


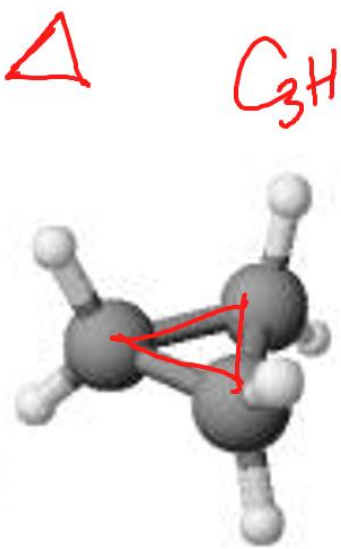


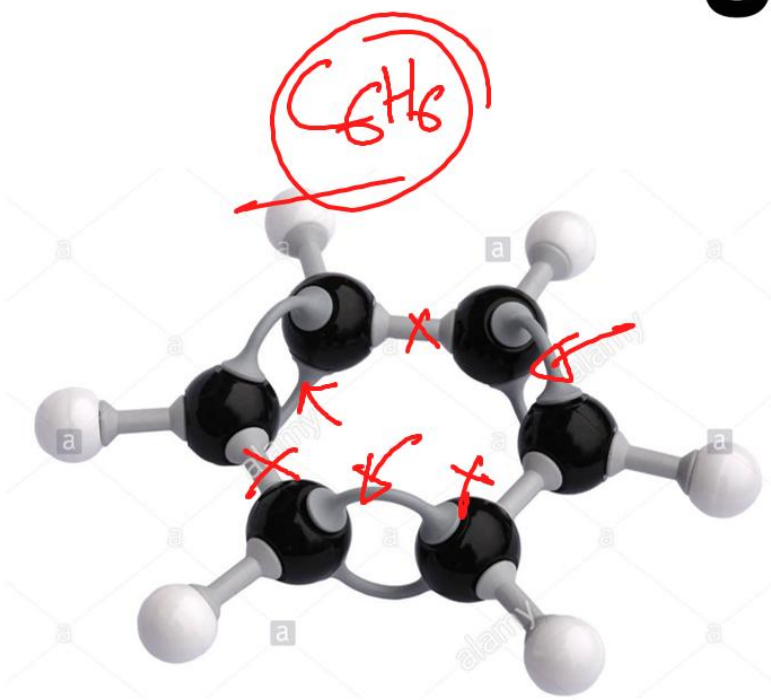


You are screen sharing
Stop Share
Alicyclic and Aromatic
Ali cycle
Cyclo Alkane
Cyclo butane
Butene.
C4H6
C4H8
CnH2n
CnH2n+2
C3H6
HC
CH2
C4H8
(CnH2n)
C5H10
C6H12
Isomer
Alkene
C6H6
Unsat.
Sat.
Cyclo Alkane
Alternation double-bond
Benzene: C6H6
(1)
(2)
(3)
C6H6
C10H8
C10H10
Activate Windows
Go to Settings to activate Windows.

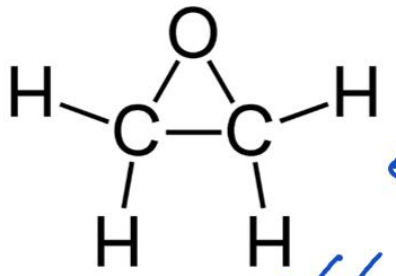
Alicyclic and Aromatic

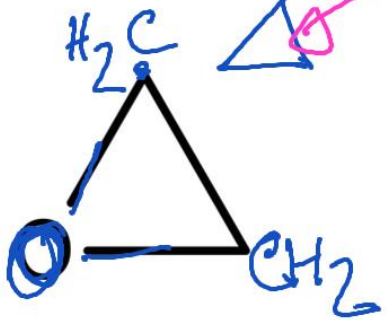


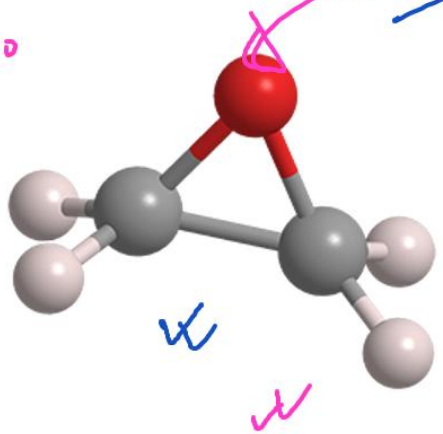




Hetero Alicyclic and Hetero Aromatic

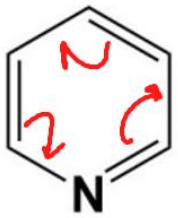






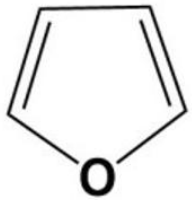
Homo Hetero

Pyridine



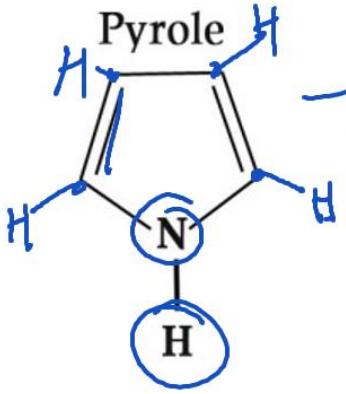
C_5N_5H

Furan



Thiophene

Pyrole



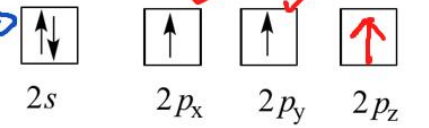
Practice:

C_4NH_5

Covalent Bond in Organic Compound

Why? 4 Share 2

Carbon



2 Valence shell odd e

H

$2s^1$ $2p_x^1$ $2p_y^1$ $2p_z^1$

Theory:

Lewis e- Theory (particle)

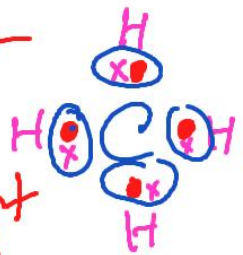
Orbital over lapping (wave)

1 pair of e- → 1 covalent bond

1) E.N ↔ E.N : Covalent

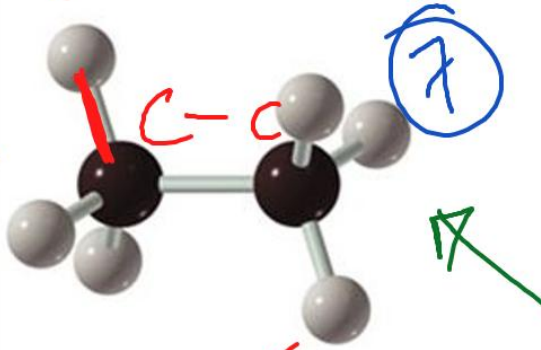
E.P ↔ E.N : Ionic

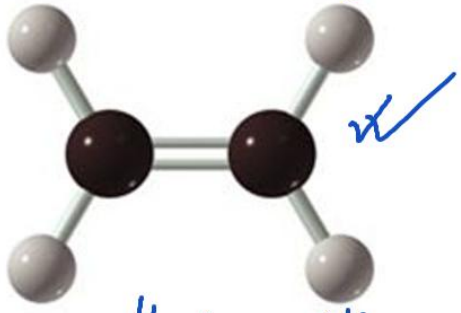
E.P ↔ E.P : ? Metallic

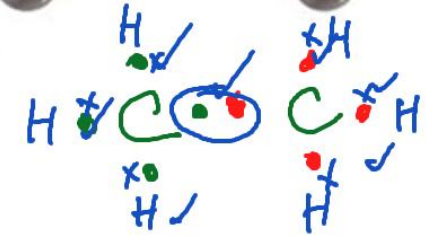


dot cross structure

7







H:C: :C:H

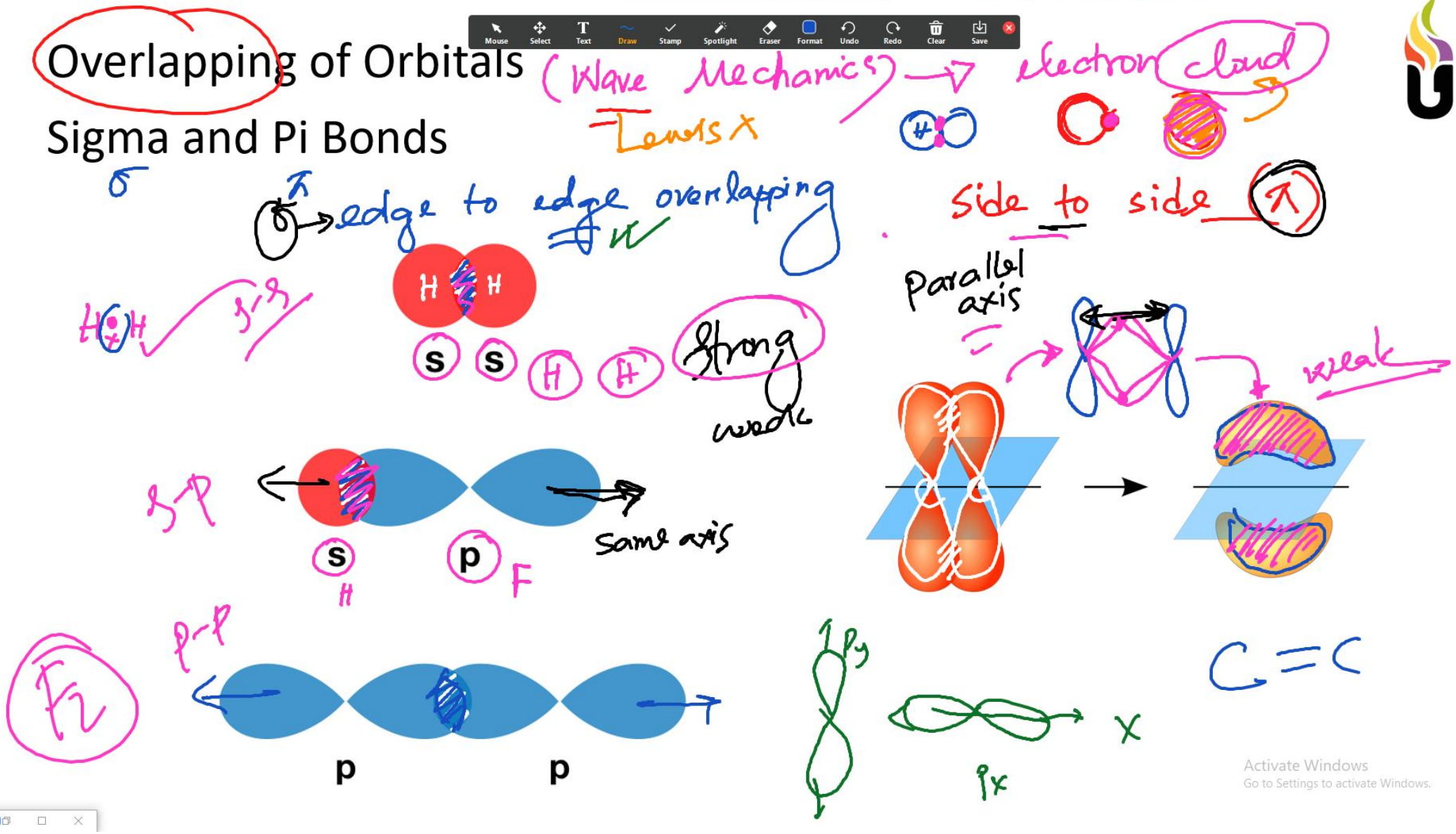
C-C

C-H

C-H → X, N, S

Overlapping of Orbitals

Sigma and Pi Bonds



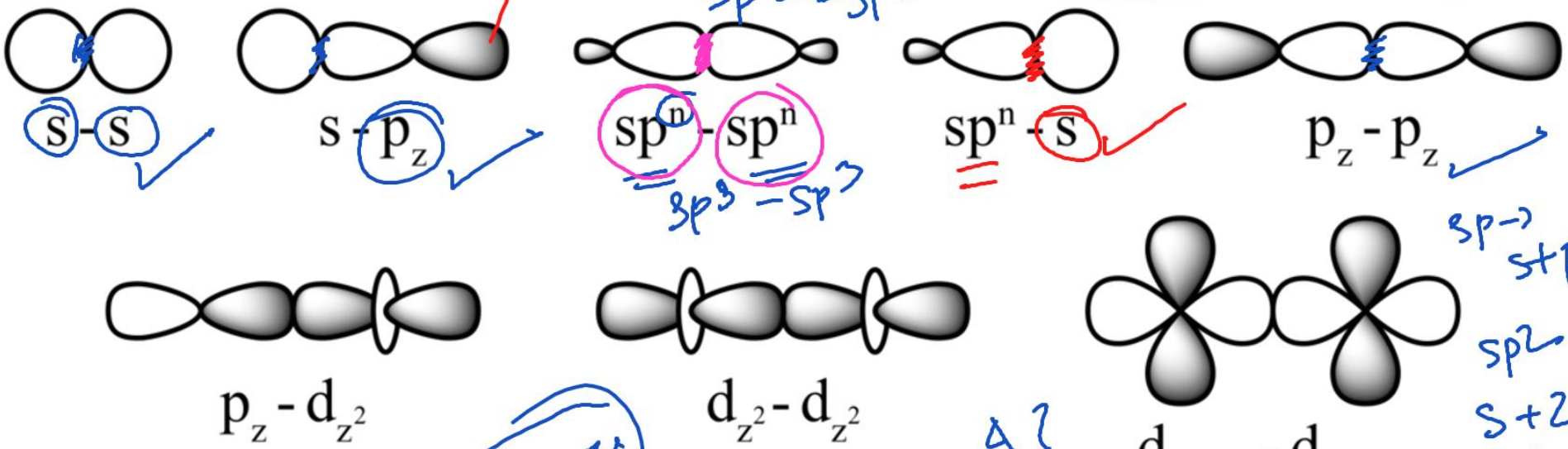
pure - pure σ
pure - hybrid σ
hybrid - hybrid σ

hybrid

sp^n n = ? 1, 2, 3

sp
sp2
sp3

σ bonds



↑ bond → pure + pure

sp^4 ? ×

sp → s+p
sp2 → s+2p
sp3 → s+3p

pure - pure σ
pure - hybrid σ
hybrid - hybrid σ

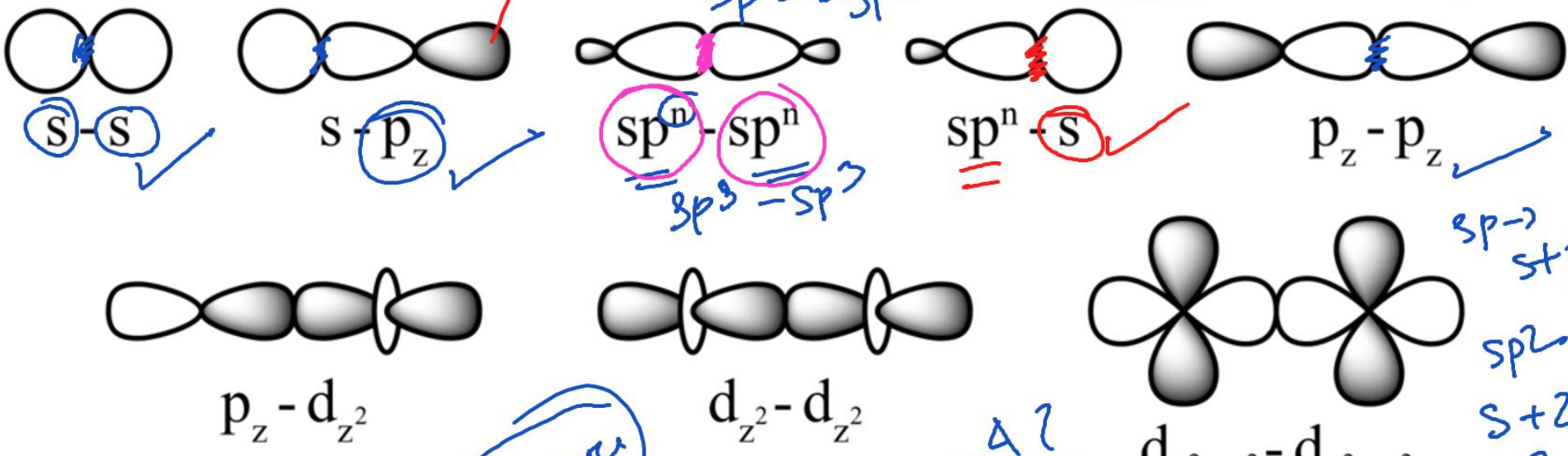
hybrid

sp^n n = ?

1, 2, 3

sp
sp2
sp3

σ bonds



sp2 - sp3

sp3 - sp3

sp → s+p
sp2 → s+2p
sp3 → s+3p

↑ bond → pure + pure

sp^4 ?

×

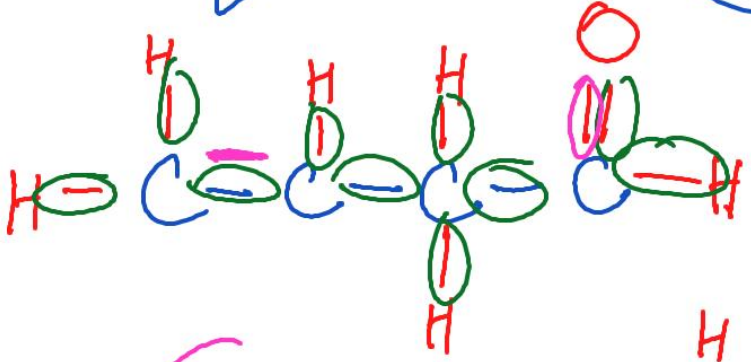
Difference between sigma (σ) and pi (π) bond

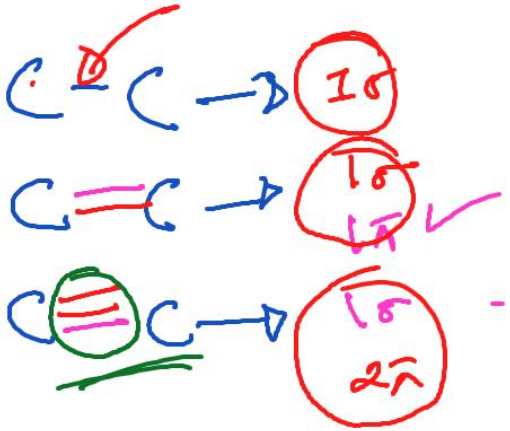
Sigma (σ) bond	Pi (π) bond
(i)Edge to edge Overlapping	(i)Side to side overlapping
(ii) Overlapping is high here thus it is stronger than pi bond.	(ii)Overlapping is low thus it is weaker than sigma bond.
(iii)The compounds formed with sigma bond are stable and comparatively inactive(not interested in chemical reactions)	(iii) The compounds formed with(π)bond are less stable than sigma bond and more active(very much interested in chemical reactions)
(iv) Sigma bond can be formed singly.এককভাবে গঠিত হতে পারে।	(iv)Pi bond can not be formed singly. এককভাবে গঠিত হতে পারে না।
(v)The organic compounds which have sigma bond are saturated	(v) The organic compounds which have pi bond are unsaturated.
(vi)Sigma electrons remains fixed in a place.	(vi) *pi electrons remains in motion all the time.*
(vii) Structure of molecule is determined by the number of σ bond.	(vii)There is no contribution of pi bond while forming molecule's

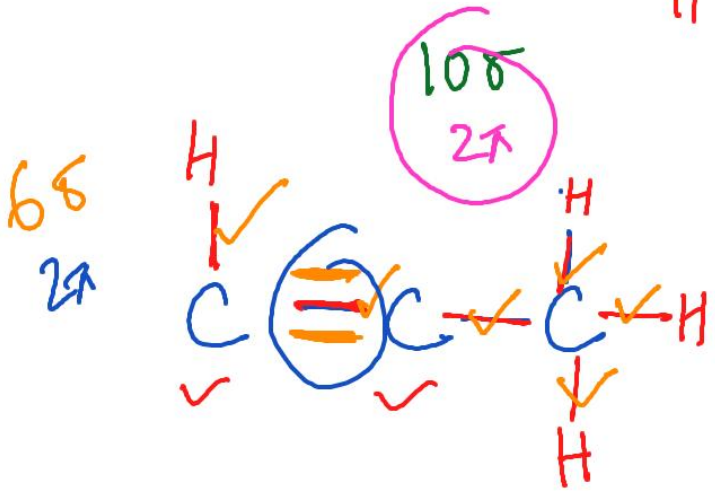
❑ Calculation of Sigma (σ) and Pie (π)bond

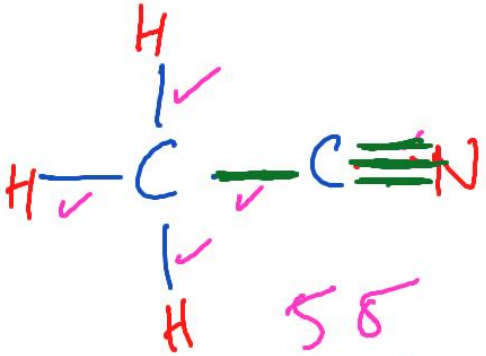
DU → HCQ

$CH_2 = CH - CH_2CHO$ CH_3CN C_3H_4

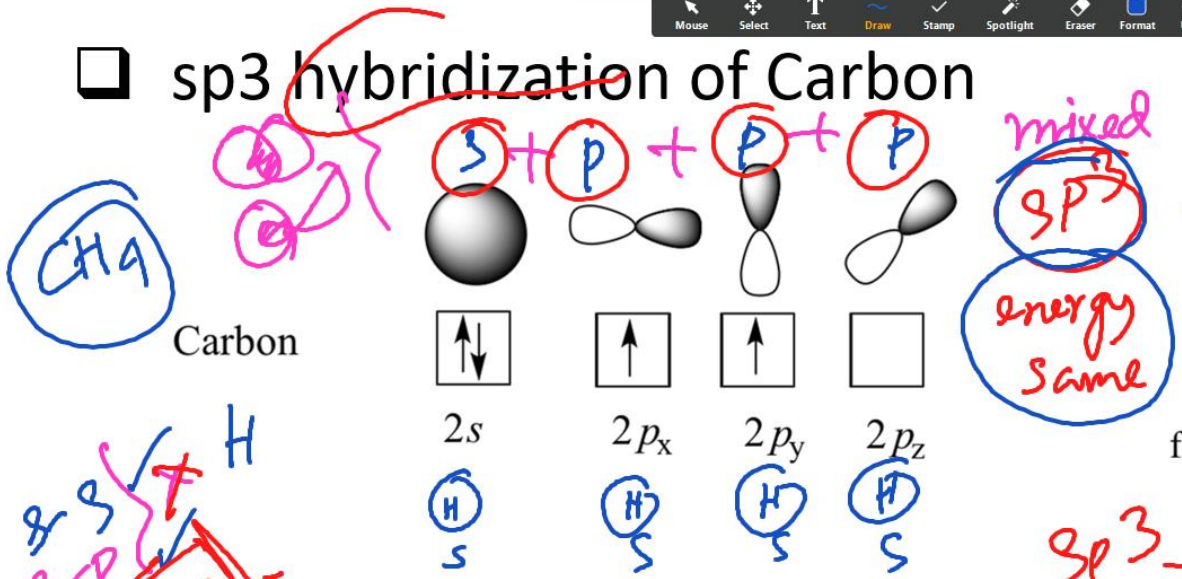


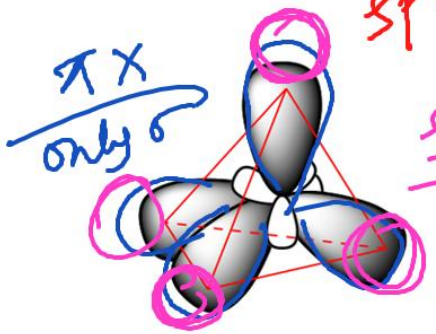


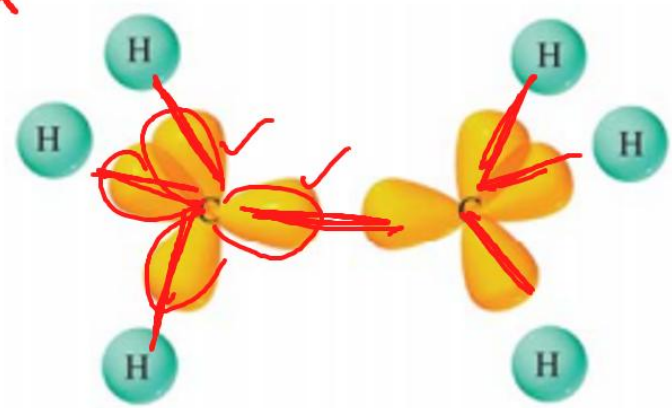


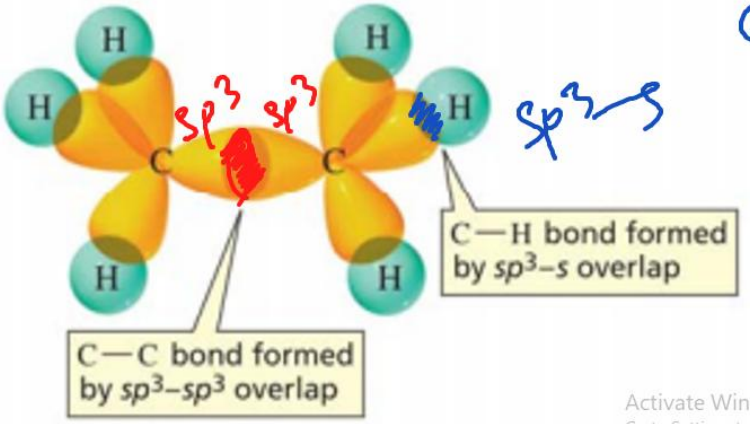


❑ sp3 hybridization of Carbon

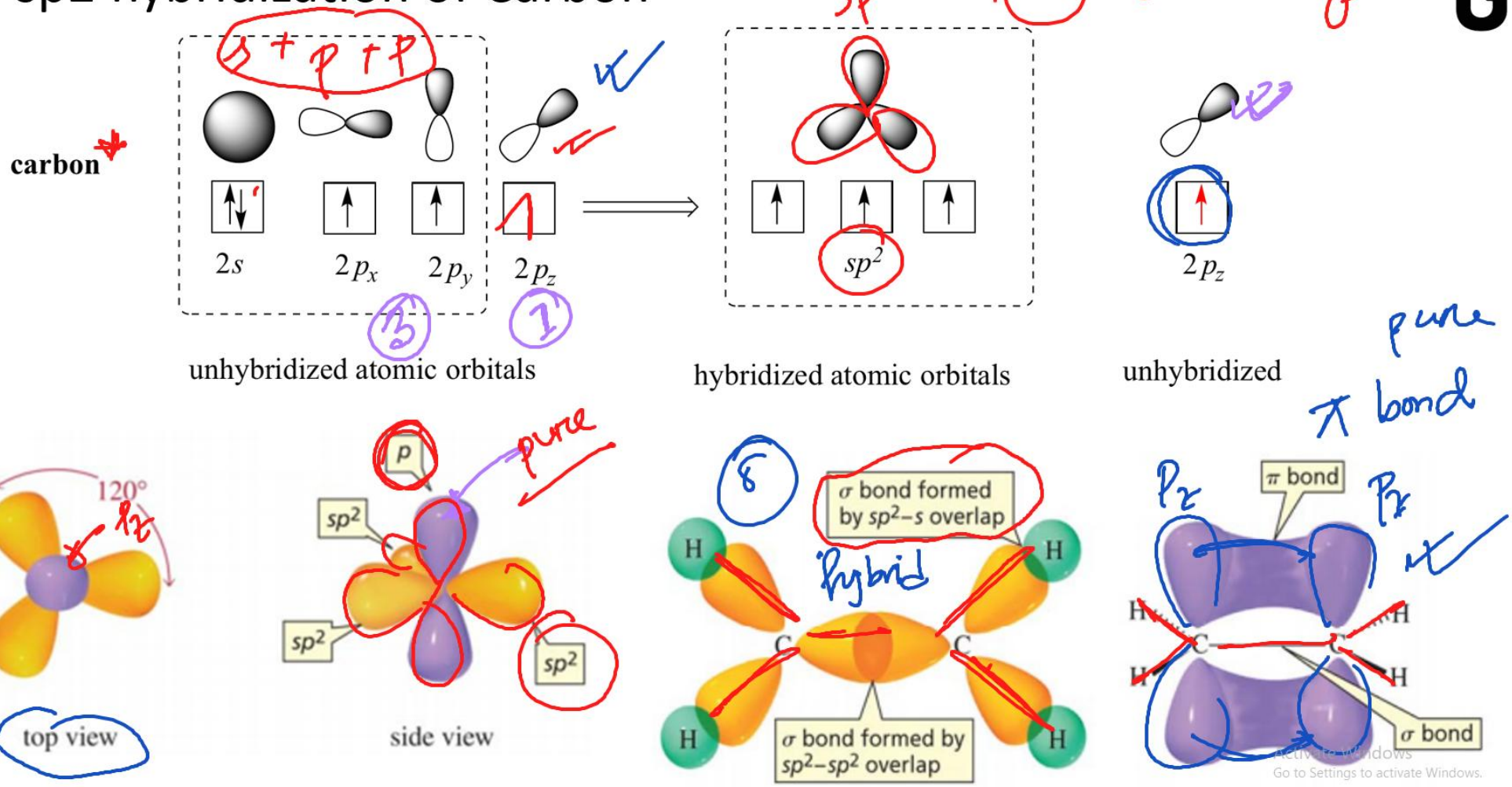




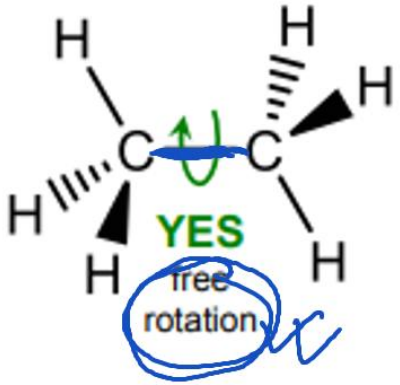


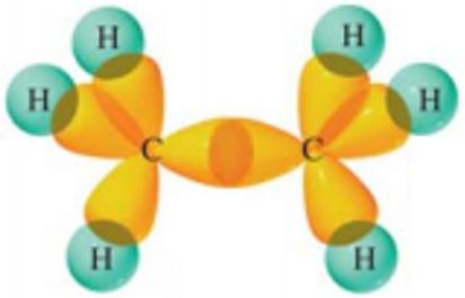


❑ sp2 hybridization of Carbon



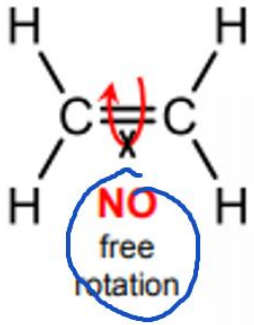
❑ sp3 and sp2 hybridization of Carbon



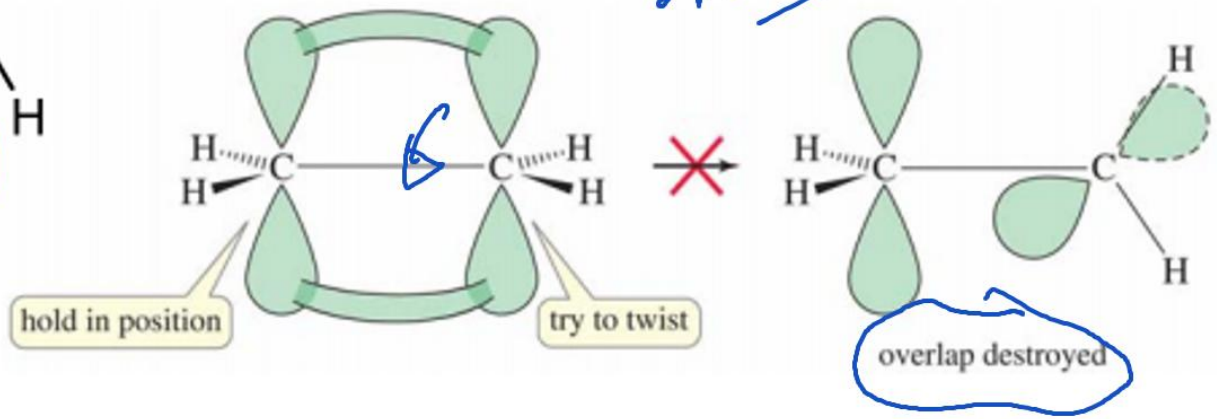


Isomers

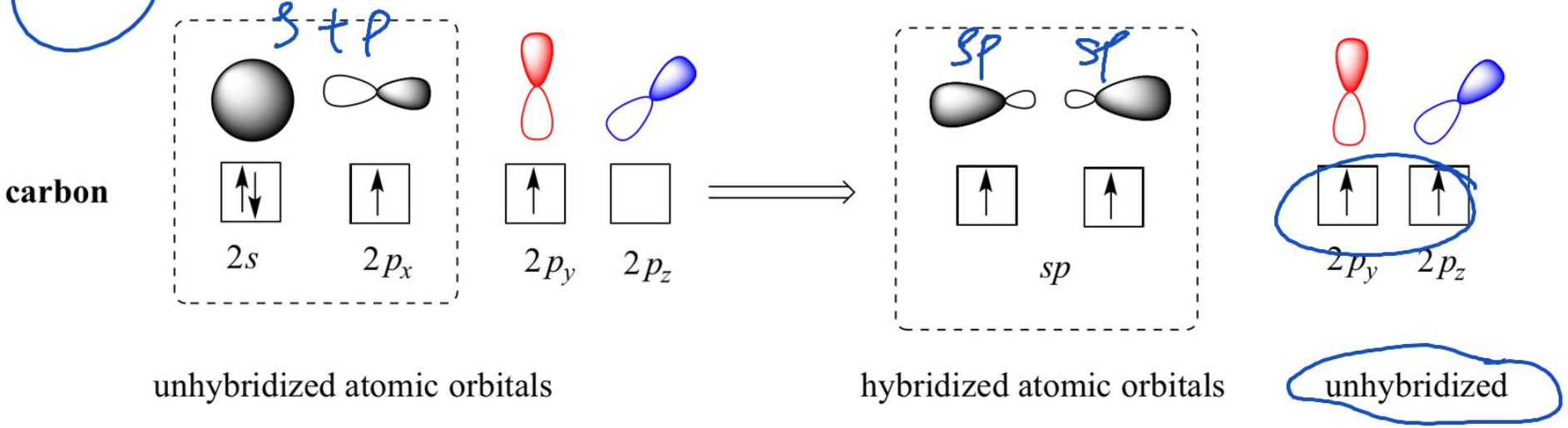
Alkene



Hinder



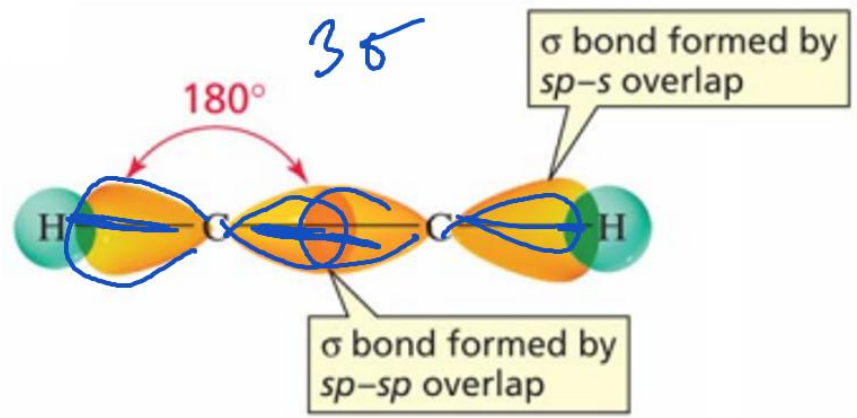
❑ sp hybridization of Carbon

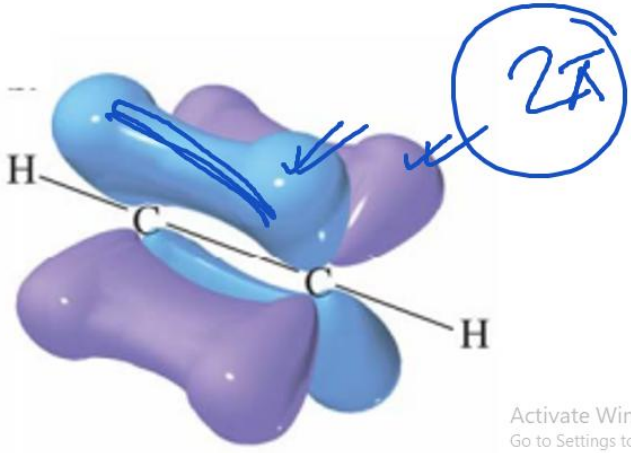


unhybridized atomic orbitals

hybridized atomic orbitals

unhybridized





- Comparison of Carbon's sp3,sp2 and sp hybridization