CLASS XII ACADEMIC PROGRAMM 2020

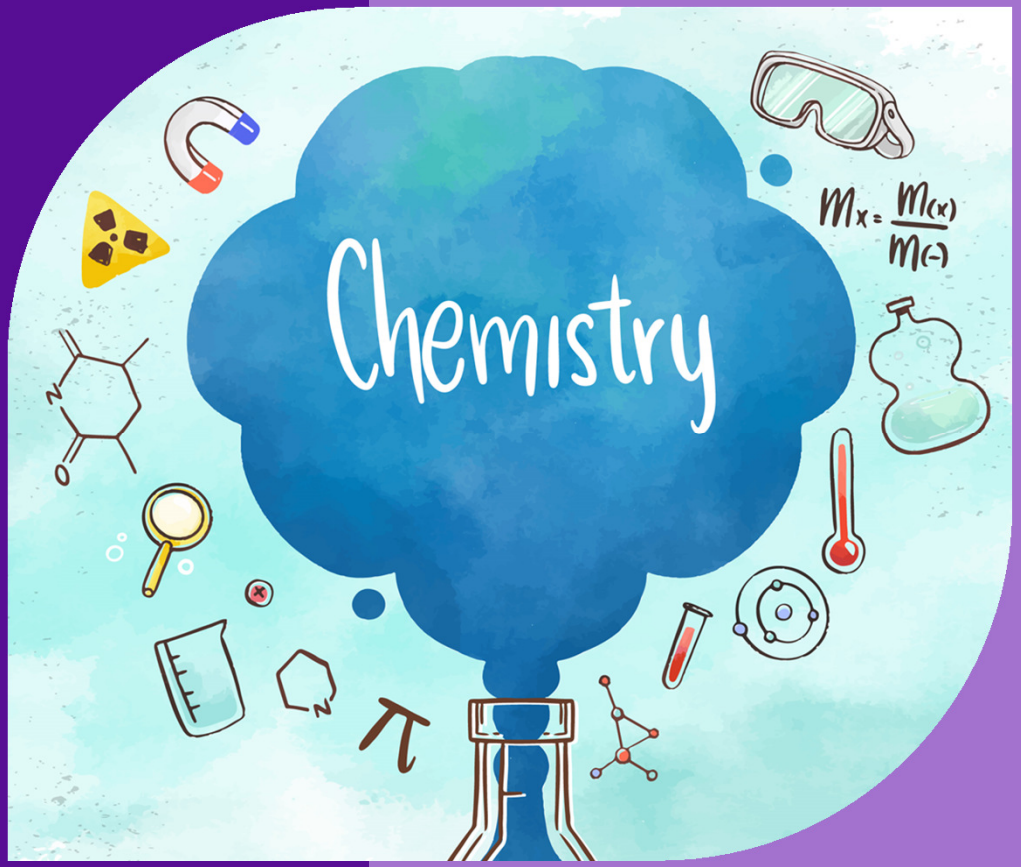
CHEMISTRY 2ND PAPER

LECTURE : C 09

CHAPTER 02 : ORGANIC CHEMISTRY

(Alkene, Alkyne)

SADAT AHMED DIPRO



Organic Reaction

Alkane X

↑ bond break

- Addition
- Elimination
- Substitution
- Isomeric

Opposite

AB + C

C ↳ ABC

ABC

↳ AB + C

AB + C

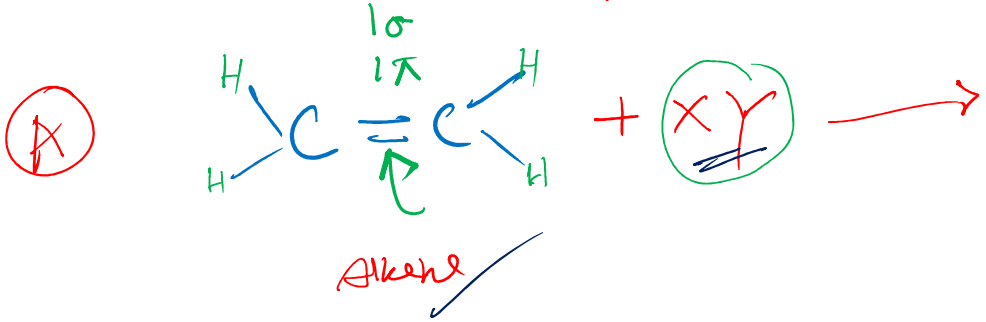
↳ AC + B

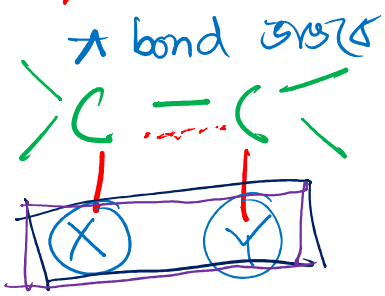
↑ bond ভাঙ্গে

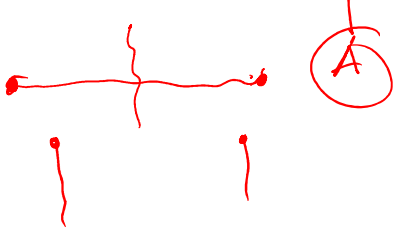
ABCD

↳ BCD

A







XY +

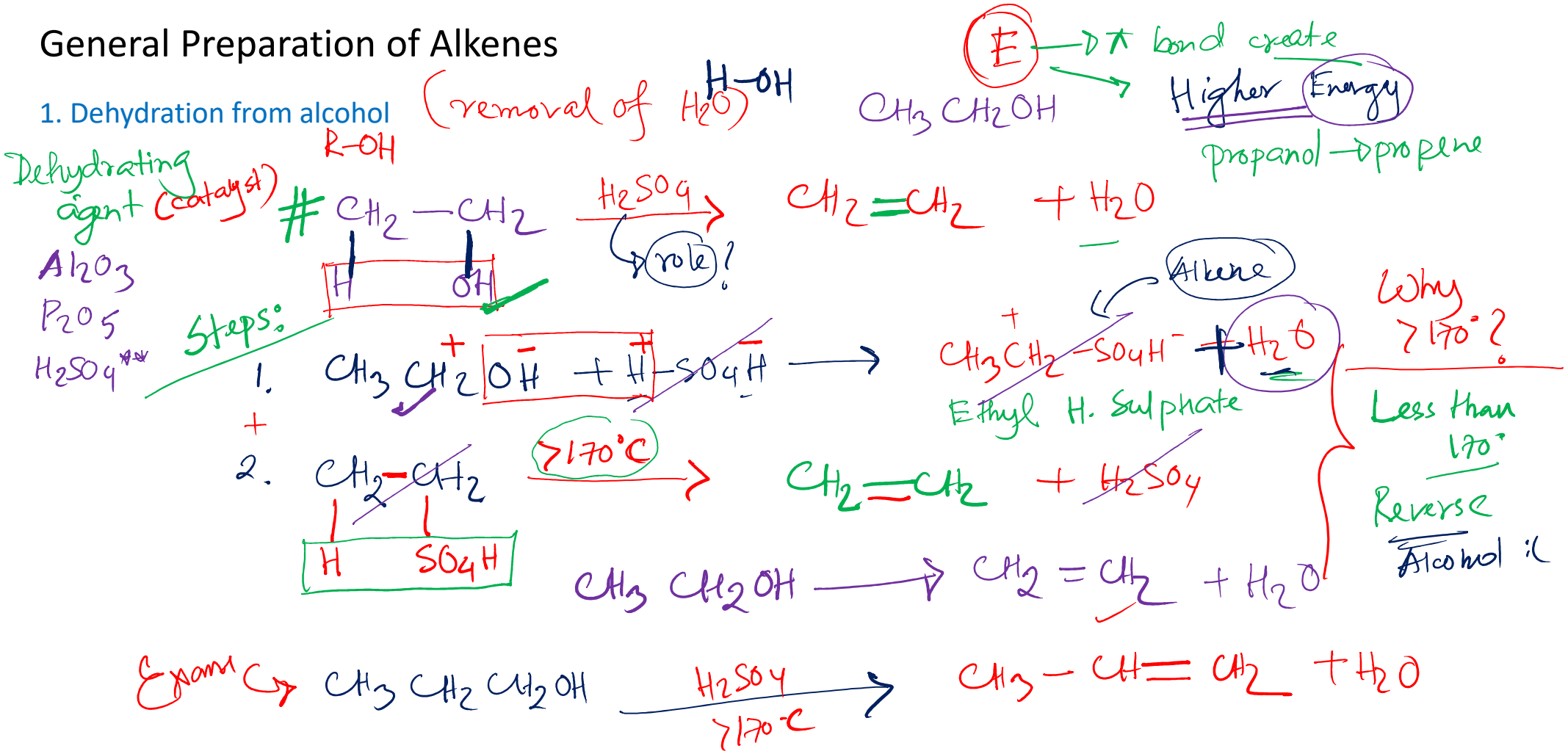
Alkene

Elimin.

↑ bond create

General Preparation of Alkenes

1. Dehydration from alcohol



General Preparation of Alkenes

2. Removal of hydrogen halide from alkyl halide

HX, RX

CH_3CH_2Cl

E

alc

Alcoholic medium

CH_3CH_2OH

$RX + KOH \xrightarrow{(alc)}$

CH_2-CH_2 (H, Cl)

$\xrightarrow{KOH\ (strong),\ (alc)}$ $CH_2=CH_2$ + KCl + H_2O

Alkene

B KOH + HCl A

E

1. alc : Elimination
2. aq : Substitution

H_2O

polar

$CH_3CH_2Cl + KOH \xrightarrow{(aq)} CH_3CH_2OH + KCl$

Weak

5

$KOH \rightarrow K^+ + OH^-$

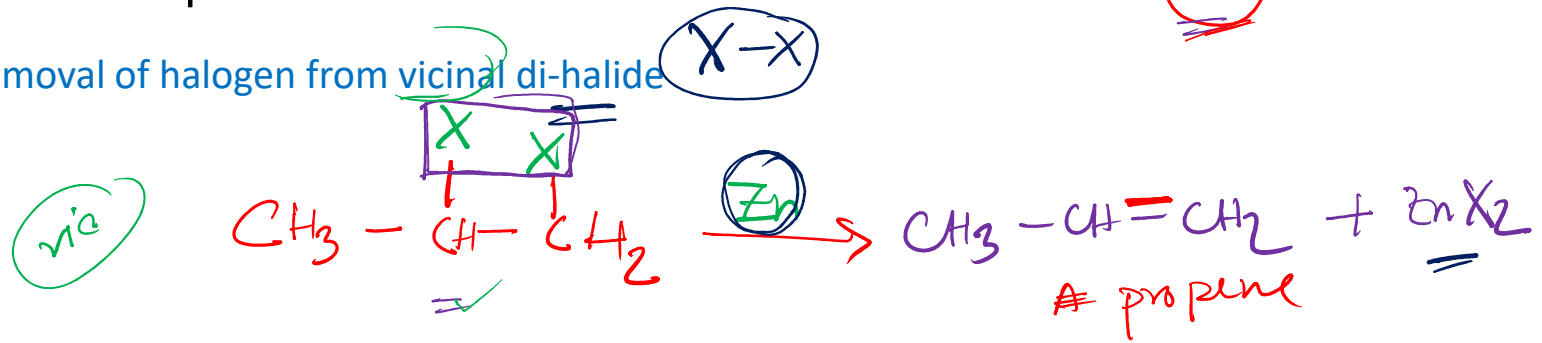
Base

Alcohol

$CH_3CH_2CH_2Cl \xrightarrow[(alc)]{KOH} CH_3CH=CH_2 + KCl + H_2O$

General Preparation of Alkenes

3. Removal of halogen from vicinal di-halide



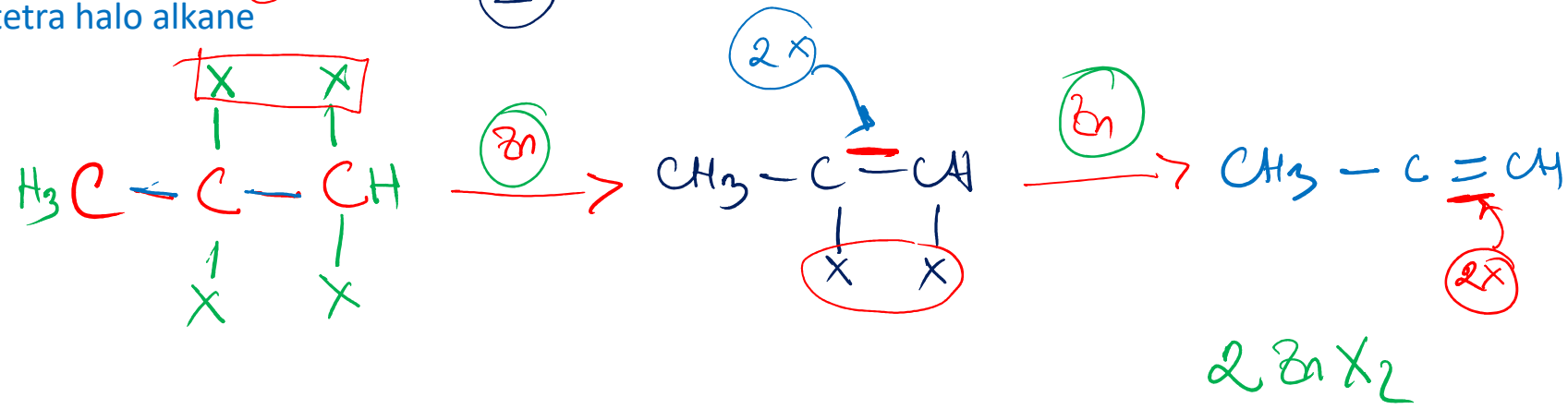
General Preparation of Alkynes

01.from calcium carbide (Industrial process) Ethyne

$$CaC_2 + H_2O \longrightarrow C_2H_2 + Ca(OH)_2$$

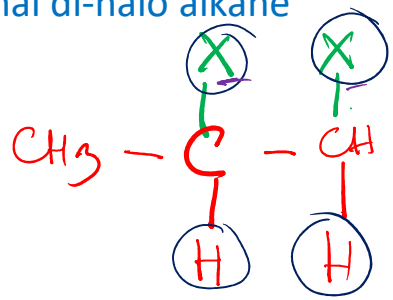
4 (X) single

2.From tetra halo alkane



General Preparation of Alkynes

3. From vicinal di-halo alkane



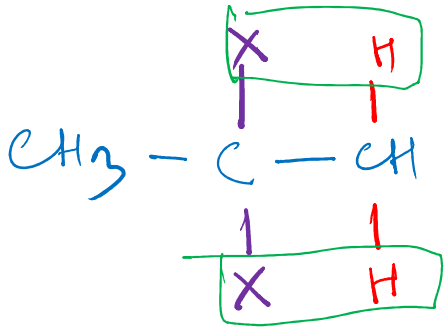
$$\xrightarrow[\text{alc.}]{2KOH} CH_3-C\equiv CH + 2KX + 2H_2O$$

propyne

1 HX → 1 π bond

2 HX → 2 π bond

gem.



$$\xrightarrow[\text{alc.}]{KOH} CH_3-C\equiv CH + 2KX + 2H_2O$$

Chemical Reactions of Alkenes & Alkynes

shows mainly 5 types of reaction.

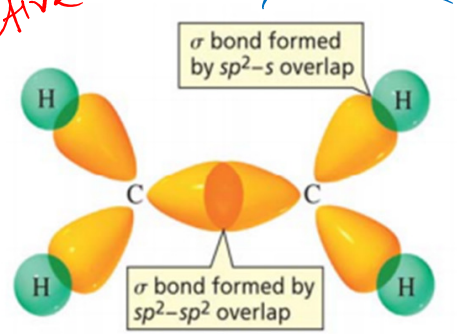
For example:

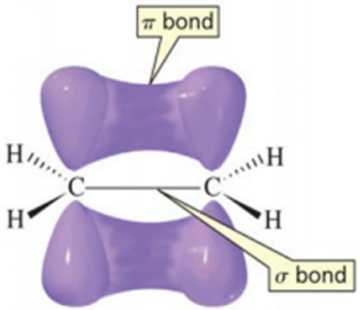
1. electrophilic addition reaction
2. Ozonolysis
3. oxidation reaction
4. polymerisation

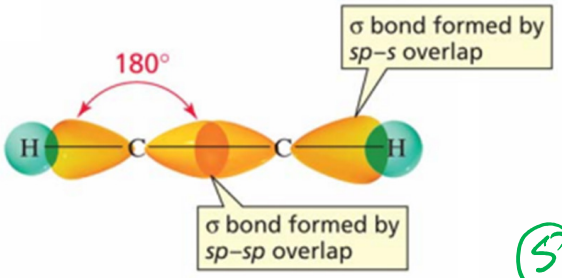
for both Alkene & Alkynes.

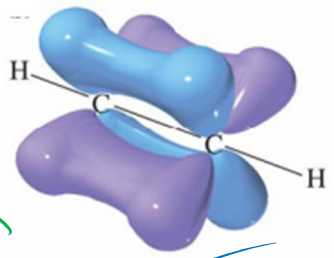
5. Substitution reaction (acidity) → (Only for Alkyne)

Chemical Reactivity of Alkenes & Alkynes









Acidity of Alkyne

Substitution Reaction

$$H-C^{2}\equiv C^{1}-H \rightarrow -C\equiv C- +2H^{+}$$

Ethyne (Acidic)

Weak Acid

Acid → H^+

$R-C\equiv CH$

$R-C\equiv C-CH_3$

X

$2.CH_3-C^{2}\equiv C-CH_3$

Butyne-2 (Acidic X)

$CH_3-CH_2-C\equiv CH$ (Acidic)

(memorize)

Ammoniacal cuprous chloride solution

$$CH_3-C\equiv CH + [Cu(NH_3)_2]Cl \rightarrow CH_3-C\equiv C.Cu\downarrow + NH_4Cl + NH_3\uparrow$$

main

(ii) With Sodium

Acid + metal

$$H_2SO_4 + Zn \rightarrow ZnSO_4 + H_2\uparrow$$

$$2CH_3-C\equiv CH + 2Na \rightarrow 2CH_3-C\equiv C.Na + H_2\uparrow$$

Acid → H^+ ; metal

bubble

Electrophilic Addition Reaction

Hydrogenation

(C-08) → Prep. of Alkane.

(A) : H—H (sym)

$CH \equiv CH + H_2 \xrightarrow[200^\circ C]{Ni} CH_2 = CH_2 \xrightarrow[200^\circ C]{Ni} CH_3 - CH_3$

Ethyne (A) — Ethene (B) — Ethane (C) final

(B inter. product)

A → C

B → C

Rosenmund Reagent

Pd + $BaSO_4$

Catalyst — Catalyst Poison

$CH \equiv CH \xrightarrow[BaSO_4]{Pd} CH_2 = CH_2$

Ethyne — Ethene.

Electrophilic Addition Reaction

Addition of Halogens

Halogination

Unsaturation test / Br_2 test

$CH_2 = CH_2 + Br_2$ (Red) $\xrightarrow{CCl_4}$ $CH_2(Br)-CH_2(Br)$ (colorless) (more reactive)

Sym. 1π e

$CH \equiv CH + 2Br_2$ (Red) $\xrightarrow{CCl_4}$ $CHBr_2-CHBr_2$ (colorless)

Sym. 2π e

Cl_2 — hetero

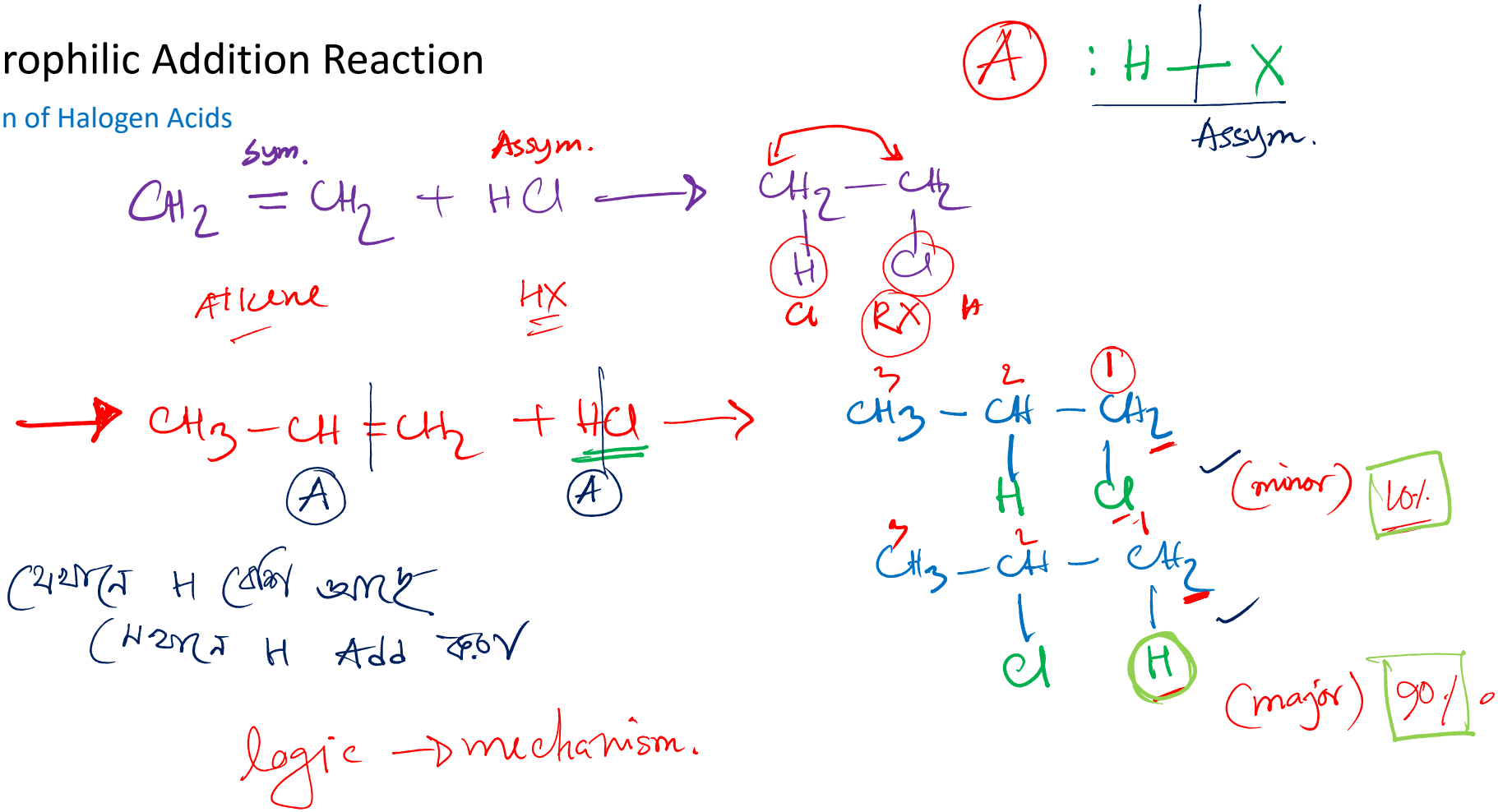
Alkane + Br_2 $\xrightarrow{CCl_4}$ no reaction

$CH_3-CH=CH_2 + Cl_2 \longrightarrow CH_3-CHCl-CH_2Cl$

Asym. s.

Electrophilic Addition Reaction

Addition of Halogen Acids

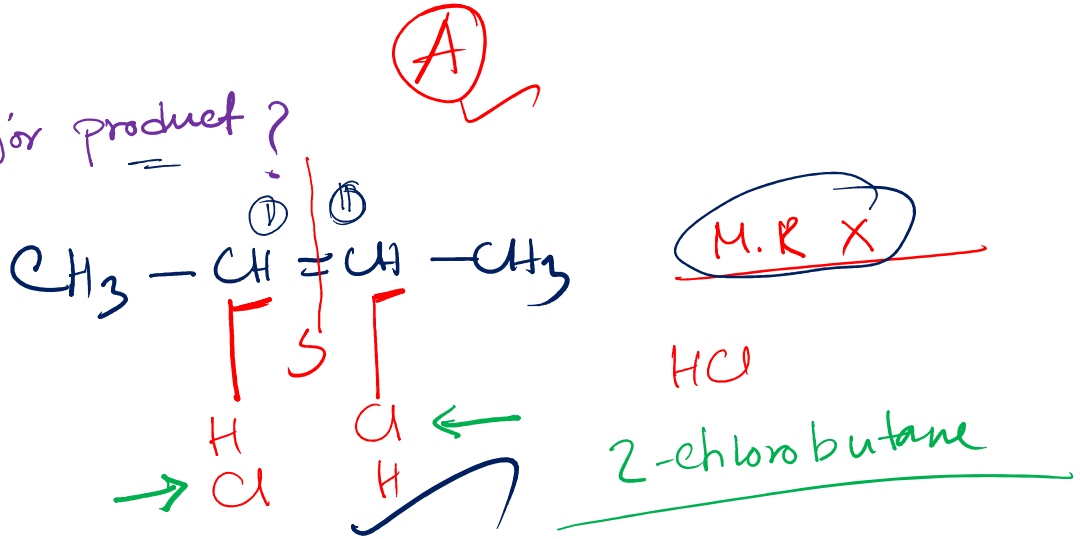


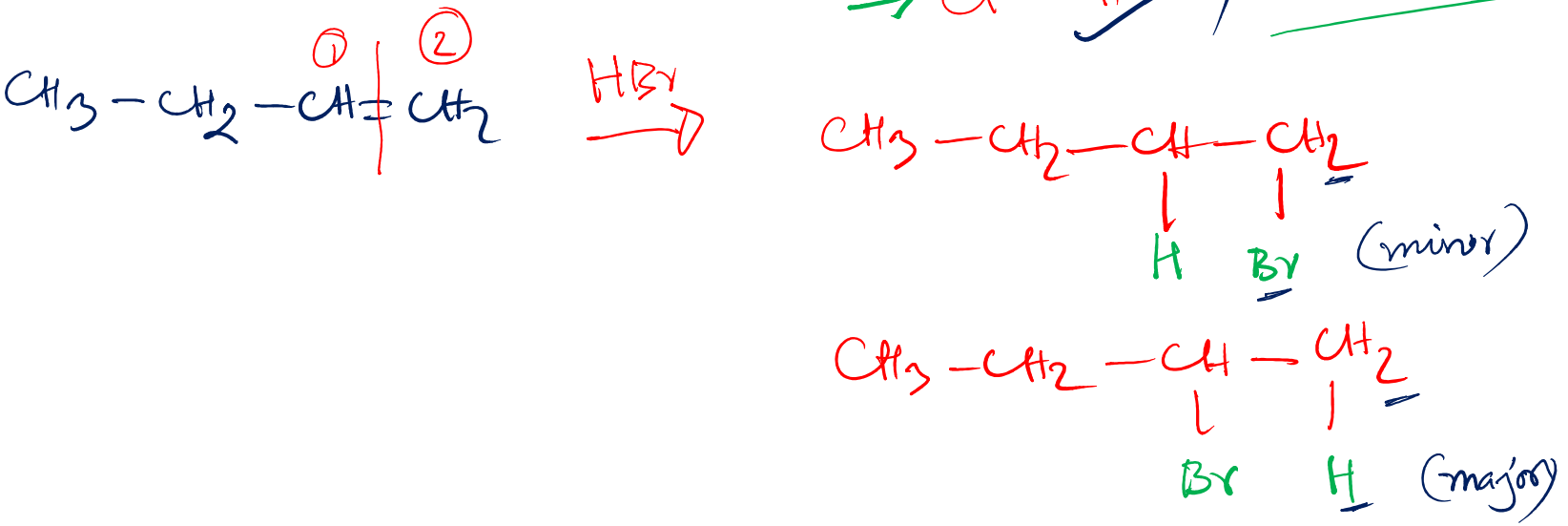
Electrophilic Addition Reaction

Markownikov's Rule → 1. Which one is major product ?

Alkene + Reagent

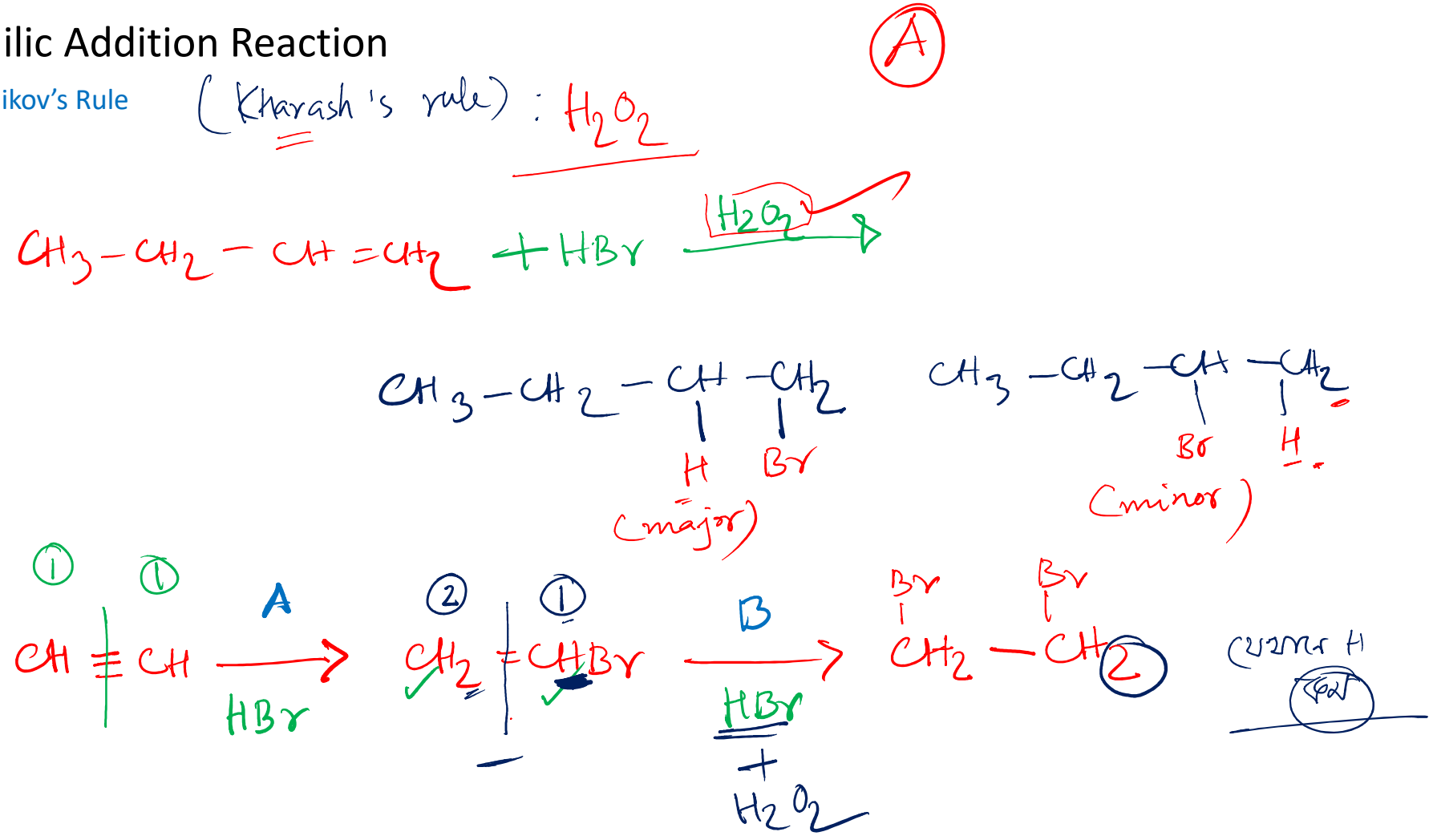
Assym. Assym.





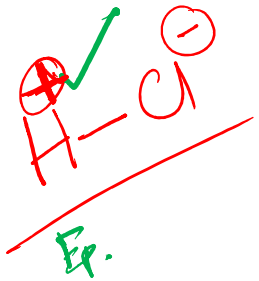
Electrophilic Addition Reaction

Anti Markownikov's Rule (Kharash's rule) : H_2O_2

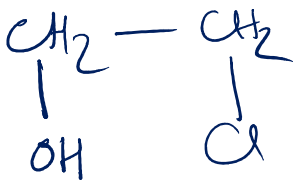


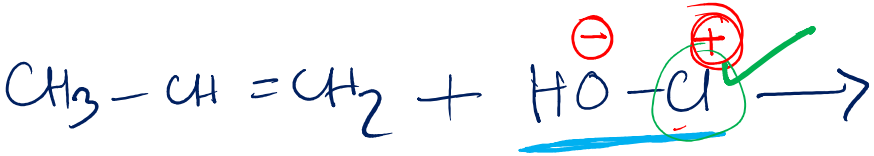
Electrophilic Addition Reaction

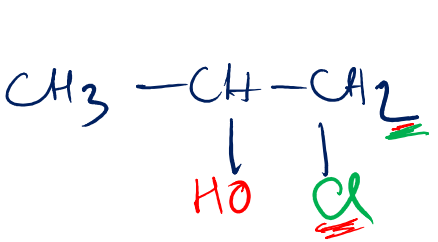
Addition of Hypohalous Acid (HOX) HOCl, HOBr.



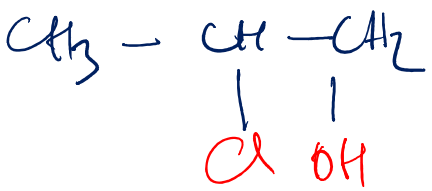
Ep.







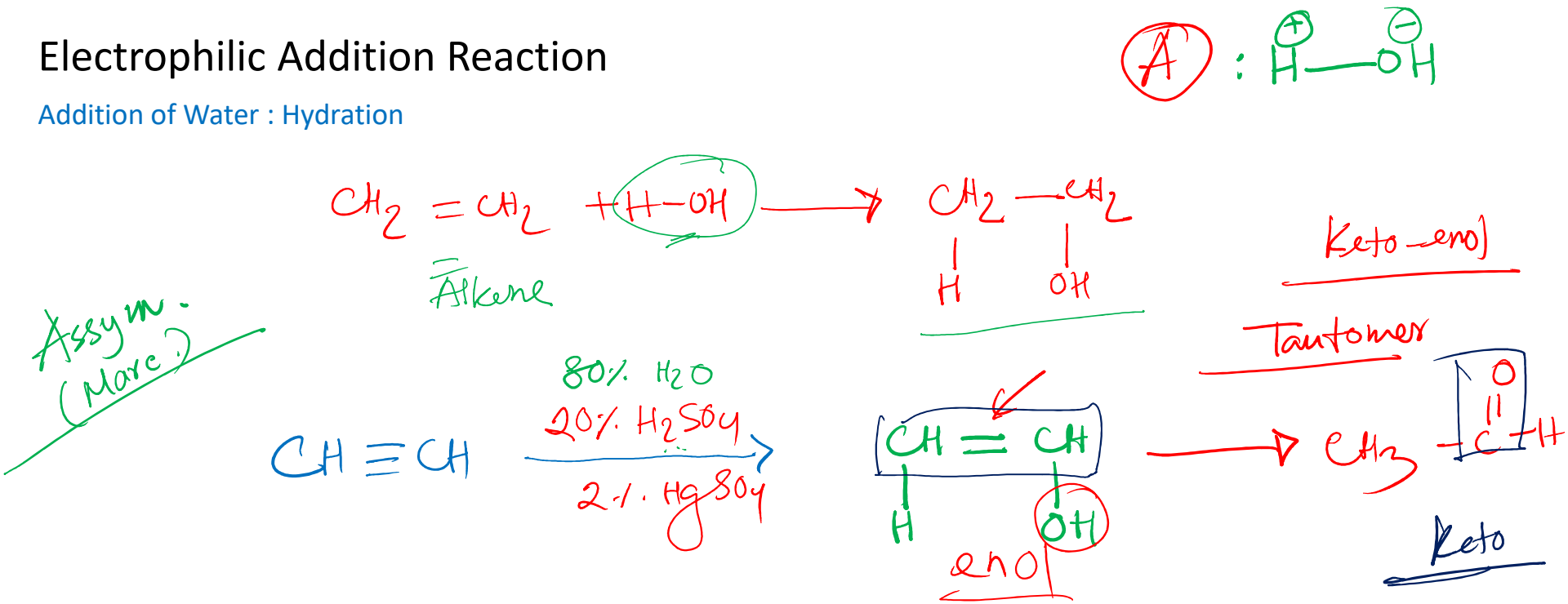
(major)



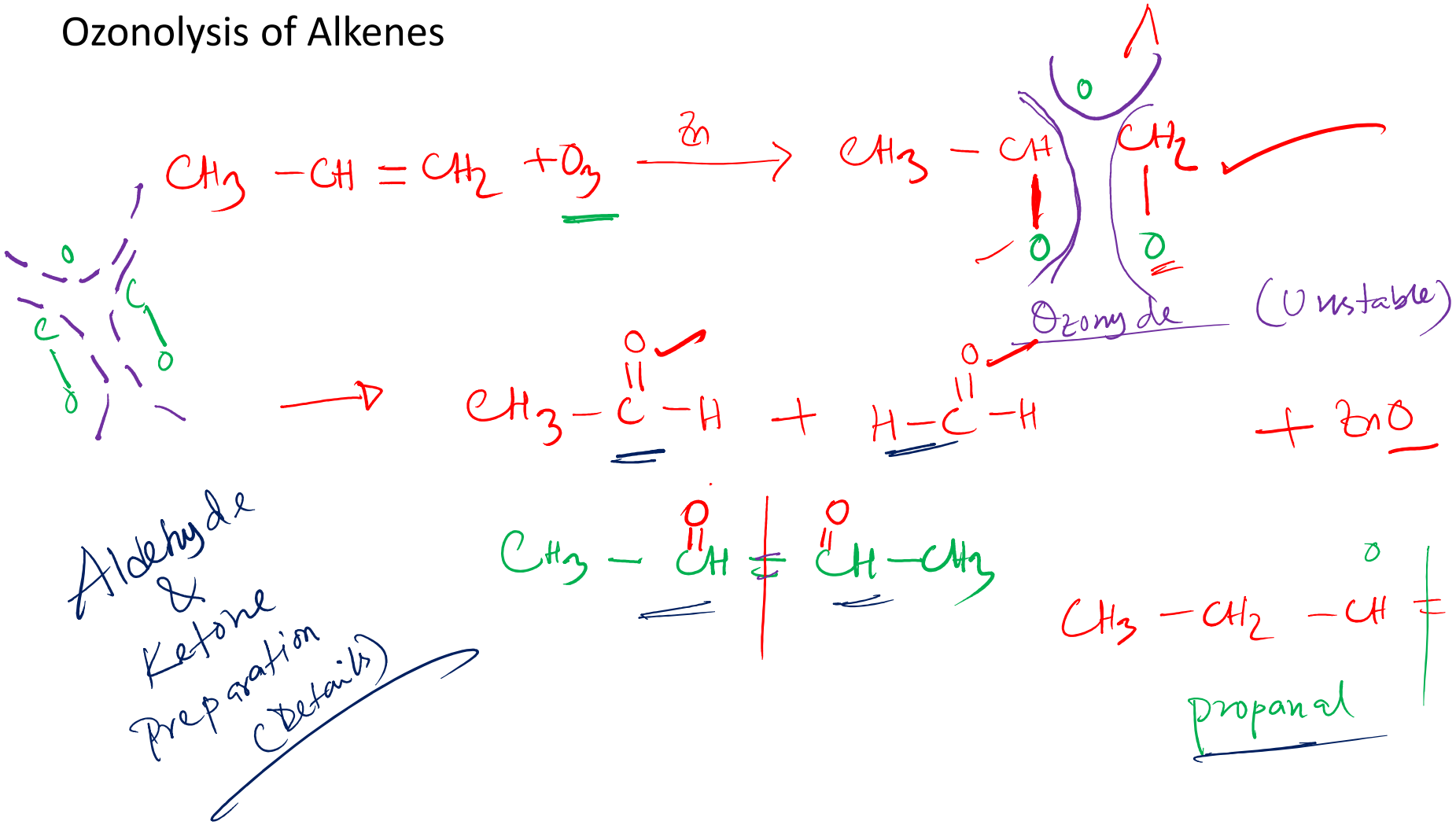
(minor)

Electrophilic Addition Reaction

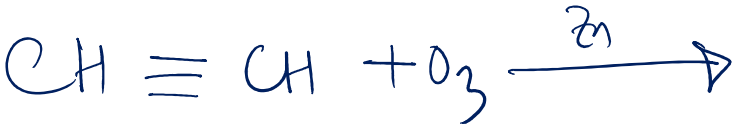
Addition of Water : Hydration

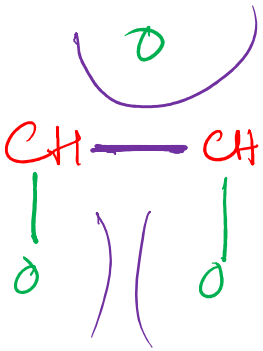


Ozonolysis of Alkenes

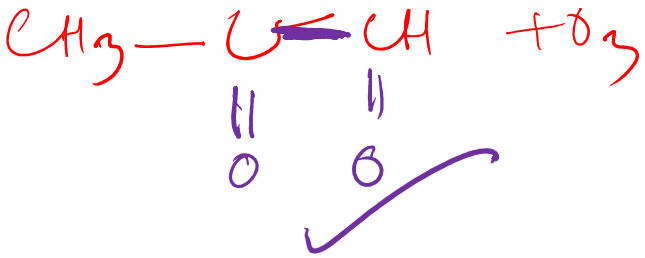


Ozonolysis of Alkynes





C–C bond strong



Oxidation of Alkenes

Baeyer's

Unsaturated

(purple)

$KMnO_4 + KOH \longrightarrow H_2O + [O]$

$CH_2 = CH_2 + H_2O + [O] \longrightarrow CH_2(OH)-CH_2(OH)$

1, 2 - diol

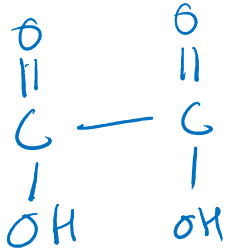
(colorless)

$1\pi \longrightarrow 2[O]$

Oxidation of Alkynes

$2\pi \rightarrow 4[O]$

$$CH \equiv CH + KMnO_4 + KOH \xrightarrow{4[O]}$$



$\longleftrightarrow$ COOH
COOH

dioic acid

Oxalic acid

Test for unsaturation:

test of bromine solution

Test for unsaturation:

Baeyer Test done.

Polymerization of Alkene

Addition or Chain Polymerisations

The polymerisation in which monomer molecules connected to each other one after another to form large chain polymer without removing any smaller part and molecular mass of polymer is multiple of molecular mass of monomer is called Addition or Chain Polymerisation.

(i)polythene

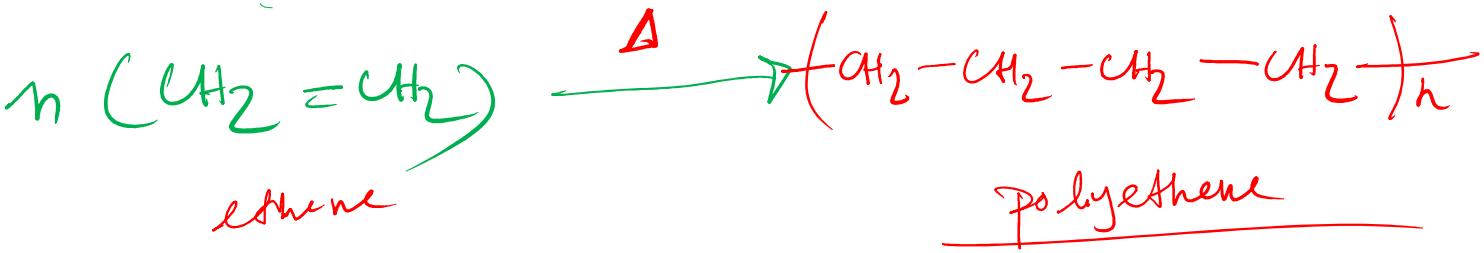
(ii) polypropene

(iii) polychloroethene (poly vinyl chloride)

(iv) poly phenyl ethene (polystyrene) etc

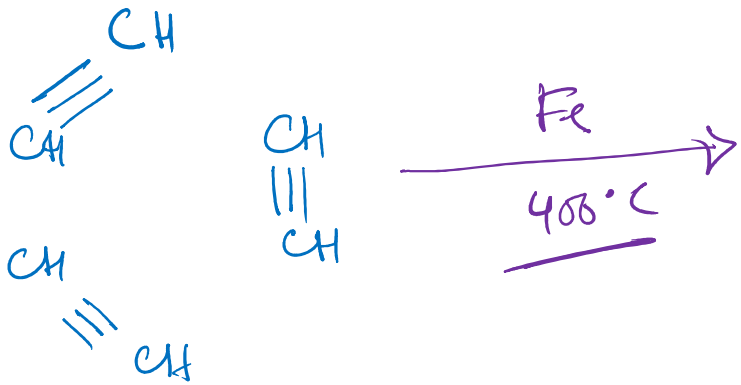
(v) polytetrachloroethene

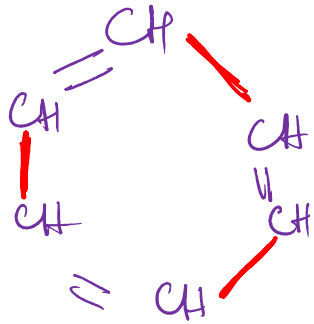
Polymerization of Alkene



Polymerization of Alkyne

Ethyne : $3\,C_2H_2 \xrightarrow[400^\circ C]{Fe} C_6H_6$





C_6H_6

benzene preparation

লেগে থাকো সৎ ভাবে,
স্বপ্ন জয় তোমারই হবে।