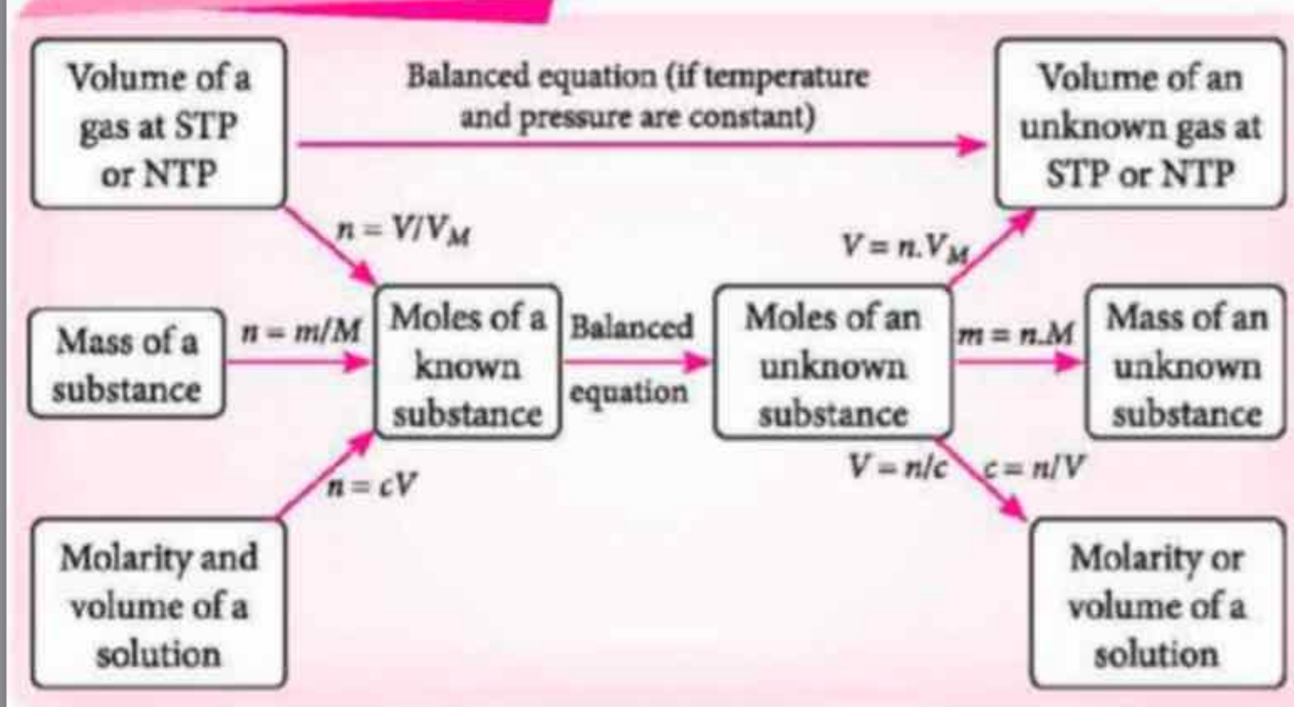
CONCEPT MAP

SOME IMP

Moles Calculation



Enzymatic Catalysed Reactions

Enzymes	Reactions which are catalysed.
Amylase	Starch → n × Glucose
Maltase	Maltose → 2 × Glucose
Lactase	Lactose → Glucose + galactose
Invertase	Sucrose → Glucose + fructose
Pepsin	Proteins → Amino acid
Trypsin	Polypeptides → Amino acid
Nuclease	DNA, RNA → Nucleotides
Urease	Urea → $NH_3 + CO_2$
Carbonic anhydrase	$H_2CO_3 \rightarrow CO_2 + H_2O$

Relations between Different Periodic Properties

S. No.	Ionisation potential	Electron affinity	Electronegativity	Metallic character	Basic character	Acidic character
1.	$\propto \frac{1}{\text{Atomic size}}$	$\propto \frac{1}{\text{Atomic size}}$	$\propto \frac{1}{\text{Atomic size}}$	$\propto$ Atomic size	$\propto$ Atomic size	$\propto \frac{1}{\text{Atomic size}}$
2.	$\propto$ Effective nuclear charge	$\propto$ Effective nuclear charge	$\propto$ Effective nuclear charge	$\propto \frac{1}{\text{Ionisation potential}}$	$\propto \frac{1}{\text{Ionisation potential}}$	$\propto$ Effective nuclear charge
3.	$\propto \frac{1}{\text{Shielding effect}}$	$\propto \frac{1}{\text{Shielding effect}}$	$\propto$ Ionisation potential	$\propto \frac{1}{\text{Effective nuclear charge}}$	$\propto \frac{1}{\text{Electronegativity}}$	$\propto$ Ionisation potential
4.	$\propto$ Stability of fully and half-filled orbitals	$\propto$ 1/Stability of fully and half-filled orbitals	$\propto$ s-character in hybrid orbitals	$\propto \frac{1}{\text{Electronegativity}}$	$\propto \frac{1}{\text{Oxidation number}}$	$\propto$ Electronegativity
5.	$\propto$ Penetrating power	$\propto$ Oxidation number	$\propto \frac{1}{p\text{-character in hybrid orbitals}}$	$\propto$ Oxidation number	$\propto$ Metallic character	$\propto$ Oxidation number
6.	$\propto$ Oxidation number		$\propto$ Oxidation number		$\propto \frac{1}{\text{Effective nuclear charge}}$	$\propto \frac{1}{\text{Metallic charge}}$

Comparative Oxidising Nature of $KMnO_4$, $K_2Cr_2O_7$ and H_2O_2

In Acidic Medium

$2KMnO_4 + 3H_2SO_{4(dil.)} \rightarrow K_2SO_4 + 2MnSO_4 + 3H_2O + 5[O]$

or $MnO_4^- + 8H^+ + 5e^- \rightarrow Mn^{2+} + 4H_2O$

$K_2Cr_2O_7 + 4H_2SO_4 \rightarrow K_2SO_4 + Cr_2(SO_4)_3 + 4H_2O + 3[O]$

or $Cr_2O_7^{2-} + 14H^+ + 6e^- \rightarrow 2Cr^{3+} + 7H_2O$

$H_2O_2 + 2H^+ + 2e^- \rightarrow 2H_2O$

In Neutral Medium

$2KMnO_4 + H_2O \rightarrow 2KOH + 2MnO_2 + 3[O]$

or $MnO_4^- + 2H_2O + 3e^- \rightarrow MnO_2 + 4OH^-$

$\therefore$ Eq. weight of $KMnO_4$

$$= \frac{\text{Mol. weight}}{3} = \frac{158}{3} = 52.67$$

It oxidises H_2S to S.

$2KMnO_4 + 3H_2S \rightarrow 3S + 2KOH + 2H_2O + 2MnO_2$

It oxidises thiosulphate to sulphate and sulphur

$2KMnO_4 + 3Na_2S_2O_3 + H_2O \rightarrow 2MnO_2 + 3Na_2SO_4 + 2KOH + 3S$

In Alkaline Medium

$2KMnO_4 + H_2O \longrightarrow 2MnO_2 + 2KOH + 3[O]$

$K_2Cr_2O_7 + 2KOH \rightarrow 2K_2CrO_4 + H_2O$

Orange Yellow

$K_2Cr_2O_7$, exists as K_2CrO_4 in basic medium so it does not act as oxidising agent in basic medium.

$H_2O_2 + 2e^- \rightarrow 2OH^-$

PORTANT FACTS FOR LAST MINUTE PREPARATION

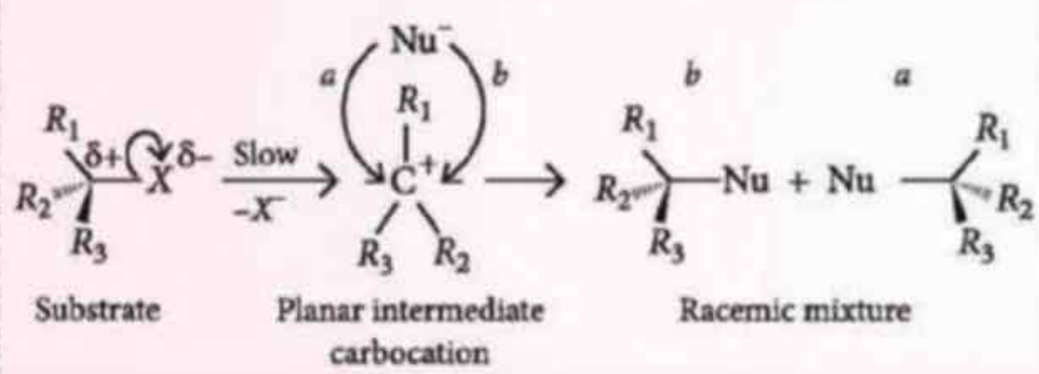
Important Orders of Organic Species

- **-I-effect** : $R_3\overset{+}{N}- > -NO_2 > -SO_2R > -CN > -COOH > -F > -Cl > -Br > -I > -OR > -COR > -OH > -C_6H_5 > -CH=CH_2 > -H$
- **+I-effect** : $(CH_3)_3C- > (CH_3)_2CH- > CH_3CH_2- > CH_3- > -T > -D > -H$
- **+R-effect** : $-Cl, -Br, -I, -NH_2, -NHR, -NR_2, -NHCOR, -OH, -OR, -SR, -SH, -OCH_3, -OCOR$
- **-R-effect** : $-NO_2, -CN, >C=O, -CHO, -COOH, -COOR$
- Stability of free radicals $\propto$ +I-effect $\propto \frac{1}{-I\text{-effect}} \propto$ +R-effect $\propto \frac{1}{-R\text{-effect}}$; $Ph_3\dot{C} > Ph_2\dot{C}H > 3^\circ > Ph\dot{C}H_2 > 2^\circ > 1^\circ > \dot{C}H_3 > CH_2=\dot{C}H$
- Stability of carbocations $\propto$ +I-effect $\propto \frac{1}{-I\text{-effect}} \propto$ +R-effect $\propto \frac{1}{-R\text{-effect}}$; $Ph_3\overset{+}{C} > Ph_2\overset{+}{C}H > 3^\circ > Ph\overset{+}{C}H_2 > 2^\circ > 1^\circ > \overset{+}{C}H_3$
- Stability of carbanions $\propto$ -I-effect $\propto \frac{1}{+I\text{-effect}} \propto$ -R-effect $\propto \frac{1}{+R\text{-effect}}$; $Ph_3\bar{C} > Ph_2\bar{C}H > Ph\bar{C}H_2 > \bar{C}H_3 > 1^\circ > 2^\circ > 3^\circ$

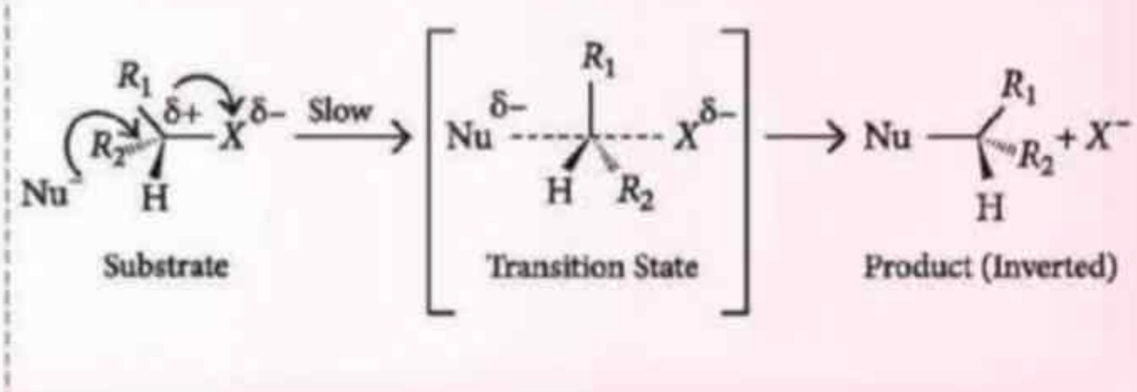
Elimination *vs* Substitution Reactions

Nucleophilic Substitution Reactions

S_N1 (Racemisation)



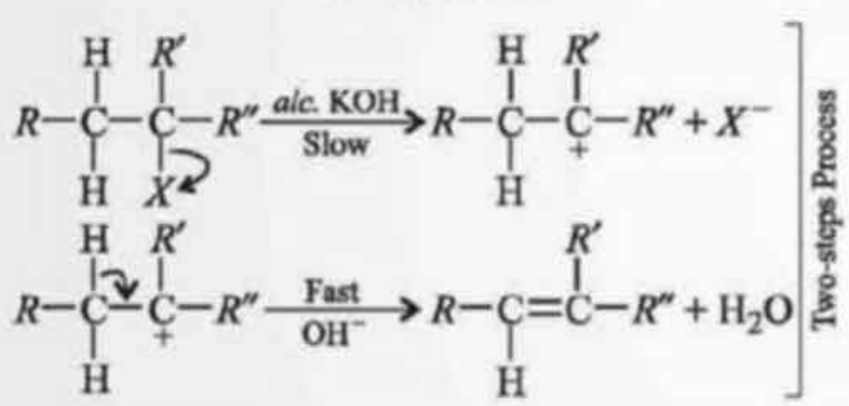
S_N2 (Inversion of Configuration)



Elimination Reactions

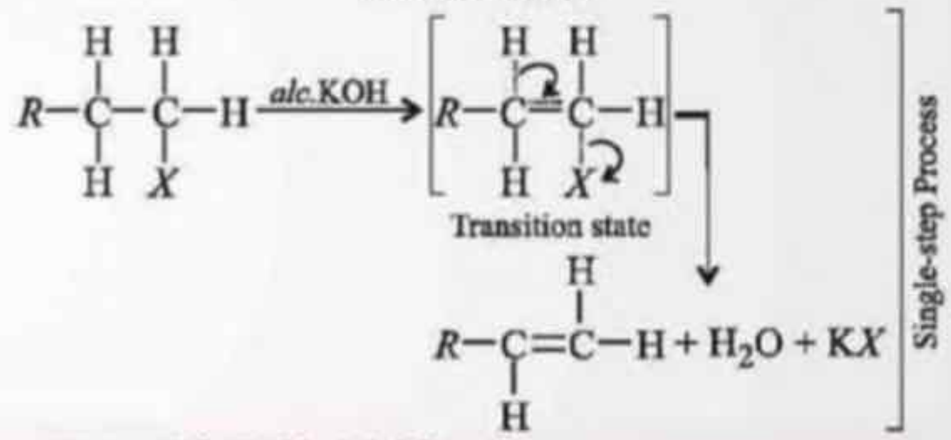
Alkyl halides undergo β-elimination reaction in the presence of potassium hydroxide in ethanol (high temperature) to yield alkenes.

E1 mechanism



Rate = k [Alkyl halide]

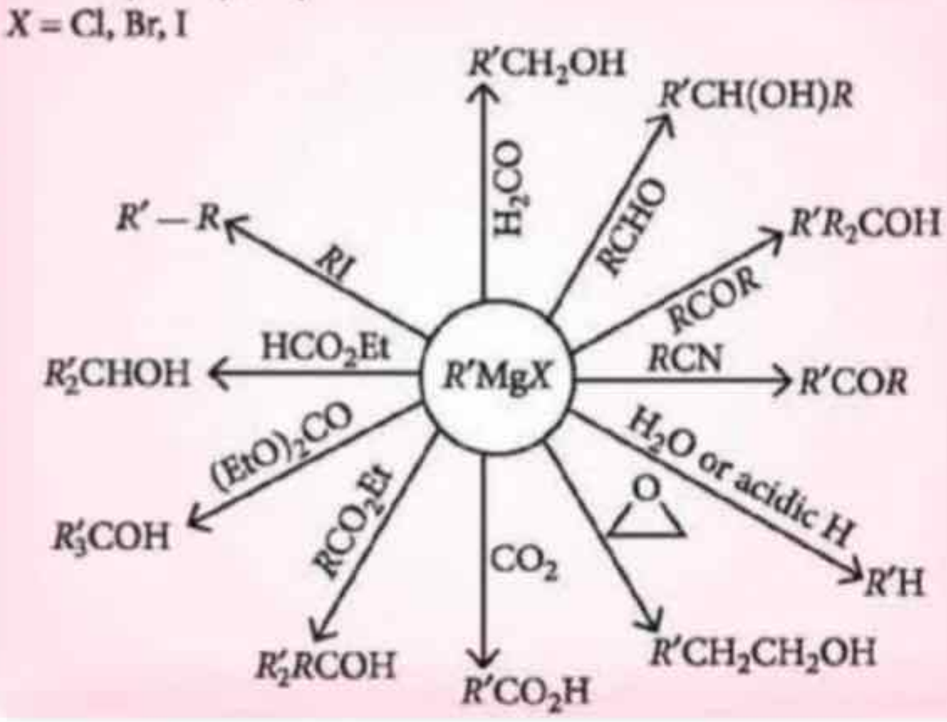
E2 mechanism



Rate = k [Alkyl halide] [base]

Reducing Nature of Different Reagents

Conversions	$LiAlH_4$/ether	$NaBH_4/C_2H_5OH$	H_2/Metal	B_2H_6/THF
$-CHO \rightarrow -CH_2OH$	✓	✓	✓	✓
$>CO \rightarrow >CHOH$	✓	✓	✓	✓
$-COOH \rightarrow -CH_2OH$	✓	×	×	✓
$-COCl \rightarrow -CH_2OH$	✓	✓	×	✓
$(RCO)_2O \rightarrow RCH_2OH$	✓	×	✓	✓
$-COOR \rightarrow -CH_2OH$	✓	×	✓	✓

Applications of Grignard Reagent

R' = alkyl, vinyl, aryl
X = Cl, Br, I