CHAPTER

# 14 G.0.C

**Electrophiles** are electron deficient species.

**E.g.** $H^{\oplus}$, $R^{\oplus}$, $NO_2^{\oplus}$, $X^{\oplus}$, $PCl_3$, $PCl_5$

($\overset{\oplus}{N}H_4$ and $H_3O^{\oplus}$ are not electrophile)

**Nucleophiles** are electron rich species.

**E.g.** $Cl^{\ominus}$, $\overset{\ominus}{C}H_3$, $\overset{\ominus}{O}H$, $RO^{\ominus}$, $\overset{\ominus}{C}N$, $\ddot{N}H_3$, $R\ddot{\underset{..}{O}}H$, $CH_2=CH_2$, $CH\equiv CH$

**Relative electron withdrawing order (–I order)**

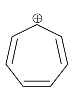
$-\overset{\oplus}{N}F_3 > -\overset{\oplus}{N}R_3 > -\overset{\oplus}{N}H_3 > -NO_2 > -CN > -COOH > -X > -OR > -OH > -C\equiv CH > -NH_2 > -C_6H_5 > -CH=CH_2$

**Relative electron releasing order (+I order)**

$-\overset{\ominus}{N}H > -O^{\ominus} > -COO^{\ominus} > 3°$ alkyl $> 2°$ alkyl $> 1°$ alkyl $> -CH_3$

## Relative Stability Order

**(A) Stability of carbocation**

 $> (Ph)_3\overset{\oplus}{C} > (Ph)_2\overset{\oplus}{C}H > Ph-\overset{\oplus}{C}H_2 > CH_2=CH-\overset{\oplus}{C}H_2 > (CH_3)_3\overset{\oplus}{C} > (CH_3)_2\overset{\oplus}{C}H > CH_3\overset{\oplus}{C}H_2 > \overset{\oplus}{C}H_3 > CH_2=\overset{\oplus}{C}H > CH\equiv\overset{\oplus}{C}$

**(B) Stability of free radical**

$(Ph)_3\dot{C} > (Ph)_2\dot{C}H > CH_2=CH-\dot{C}H_2 > Ph\dot{C}H_2 > (CH_3)_3\dot{C} > (CH_3)_2\dot{C}H > CH_3\dot{C}H_2 > \dot{C}H_3$

**(C) Stability of carbanion**

$(Ph)_3\overset{\ominus}{C} > (Ph)_2\overset{\ominus}{C}H > Ph-\overset{\ominus}{C}H_2 > CH_2=CH-\overset{\ominus}{C}H_2 > \overset{\ominus}{C}H_3 > CH_3\overset{\ominus}{C}H_2 > (CH_3)_2\overset{\ominus}{C}H > (CH_3)_3\overset{\ominus}{C}$

**Reactivity towards nucleophile (NAR)**

(1) $HCHO > CH_3CHO > (CH_3)_2CO$

(2) $CCl_3CHO > CHCl_2CHO > CH_2ClCHO$

- **Reactivity order towards acyl nucleophilic substitution reaction**

  Acid chloride > anhydride > ester > amide

- **Order of electronic effect**

  Mesomeric > Hyperconjugation > Inductive effect

- **Stability of alkene $\propto$ no. of $\alpha$-hydrogen**

  $R_2C{=}CR_2 > R_2C{=}CHR > R_2C{=}CH_2 > \underset{\text{trans form}}{RCH{=}CHR} > \underset{\text{cis form}}{RCH{=}CHR} > RCH{=}CH_2 > CH_2{=}CH_2$

- **Heat of hydrogenation** $\propto \dfrac{1}{\text{Stability of alkene}}$