CONCEPT MAP
CLASS XI

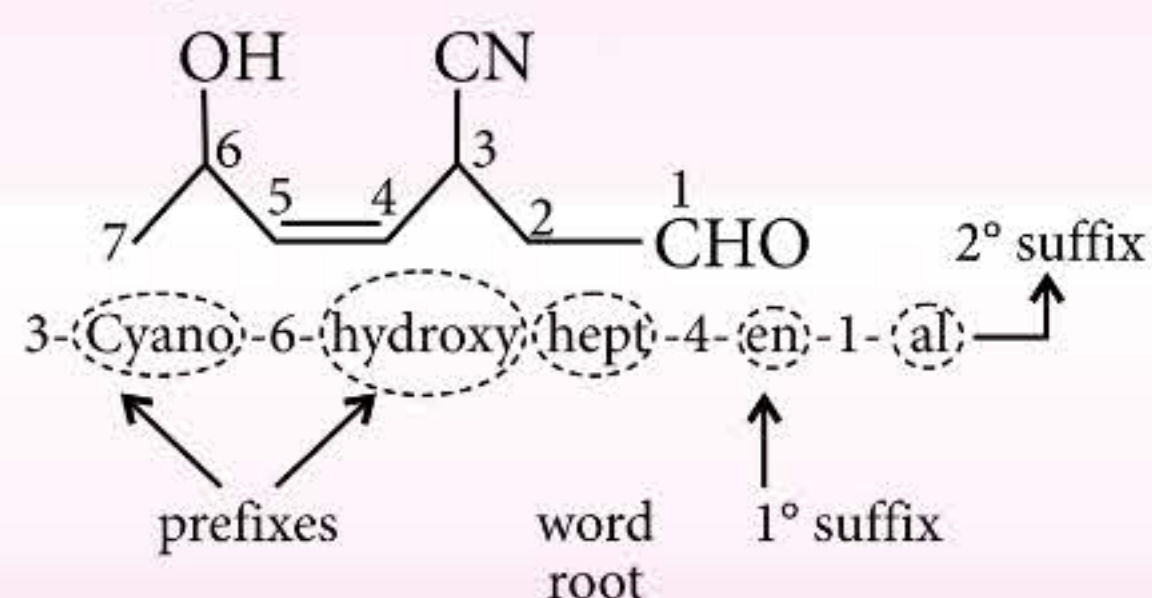# ESSENTIAL CONCEPTS OF ORGANIC CHEMISTRY

Get well-prepared for exams with quick revision of important concepts of organic chemistry.

Organic Chemistry - Some Basic Principles and Techniques

IUPAC Nomenclature

IUPAC name = prefixes + word root + 1° suffix + 2° suffix

e.g.,

3-Cyano-6-hydroxy-hept-4-en-1-al

prefixes   word root   1° suffix   2° suffix

Order of Species Showing Inductive Effect

- $-I$-effect: $\overset{+}{R_3N}- \,>\, -NO_2 > -SO_2R > -CN > -COOH > -F > -Cl > -Br > -I > -OR > -COR > -OH > -C_6H_5 > -CH=CH_2 > -H$

- $+I$-effect: $(CH_3)_3C- > (CH_3)_2CH- > CH_3CH_2- > CH_3- > -D > -H$

Order of Species Showing Resonance or Mesomeric Effect

- $+R$-effect: $-Cl, -Br, -I, -NH_2, -NHR, -NR_2, -NHCOR, -OH, -OR, -SR, -SH, -OCH_3, -OCOR$

- $-R$-effect: $-NO_2, -CN, {>}C=O, -CHO, -COOH, -COOR$

- Bond order in compounds which exhibit resonance

$$= \frac{\text{Total number of bonds between two atoms in all the structures}}{\text{Total number of resonating structures}}$$

Hyperconjugation

Number of hyperconjugating structures $\propto$ number of α-hydrogens $\propto$ stability $\propto$ 1/heat of hydrogenation $\propto$ polarity $\propto$ dipole moment $\propto$ 1/bond length

Stability of Free Radicals

- Stability of free radicals $\propto +I$-effect $\propto \dfrac{1}{-I\text{-effect}} \propto +R$-effect $\propto \dfrac{1}{-R\text{-effect}}$

$Ph_3\overset{\bullet}{C} > Ph_2\overset{\bullet}{C}H > Ph\overset{\bullet}{C}H_2 > \text{Allyl} > 3° > 2° > 1° > \overset{\bullet}{C}H_3 > CH_2=\overset{\bullet}{C}H$

Stability of Carbocations

- Stability of carbocations $\propto +I$-effect $\propto \dfrac{1}{-I\text{-effect}} \propto +R$-effect $\propto \dfrac{1}{-R\text{-effect}}$

$Ph_3\overset{+}{C} > Ph_2\overset{+}{C}H > Ph\overset{+}{C}H_2 > \text{Allyl} > 3° > 2° > 1° > \overset{+}{C}H_3$

Stability of Carbanions

- Stability of carbanions $\propto -I$-effect $\propto \dfrac{1}{+I\text{-effect}} \propto -R$-effect $\propto \dfrac{1}{+R\text{-effect}}$

$Ph_3\bar{C} > Ph_2\bar{C}H > Ph\bar{C}H_2 > \text{Allyl} > \bar{C}H_3 > 1° > 2° > 3°$

Stability of Carbene

Triplet > Singlet

Thin Layer Chromatography

Retention factor (R_f)

$$= \frac{\text{Distance travelled by the compound from base line } (x)}{\text{Distance travelled by the solvent from base line } (y)}$$

Quantitative Analysis

- $\%$ of C $= \dfrac{12}{44} \times \dfrac{\text{mass of } CO_2 \text{ formed}}{\text{mass of compound taken}} \times 100$ (Liebig's combustion method)

- $\%$ of H $= \dfrac{2}{18} \times \dfrac{\text{mass of } H_2O \text{ formed}}{\text{mass of compound taken}} \times 100$

- $\%$ of N $= \dfrac{28}{22400} \times \dfrac{\text{vol. of } N_2 \text{ at STP}}{\text{mass of compound taken}} \times 100$ (Dumas method)

- $\%$ of N $= \dfrac{1.4 \times \text{normality of acid} \times \text{vol. of acid used}}{\text{mass of compound taken}}$

- $\%$ of N $= \dfrac{1.4 \times \text{molarity of acid} \times \text{vol. of acid used} \times \text{basicity of acid}}{\text{mass of compound taken}}$ (Kjeldahl's method)

- $\%$ of Cl $= \dfrac{35.5}{143.5} \times \dfrac{\text{mass of AgCl formed}}{\text{mass of compound taken}} \times 100$

- $\%$ of Br $= \dfrac{80}{188} \times \dfrac{\text{mass of AgBr formed}}{\text{mass of compound taken}} \times 100$ (Carius method)

- $\%$ of I $= \dfrac{127}{235} \times \dfrac{\text{mass of AgI formed}}{\text{mass of compound taken}} \times 100$

- $\%$ of S $= \dfrac{32}{233} \times \dfrac{\text{mass of } BaSO_4 \text{ formed}}{\text{mass of compound taken}} \times 100$

- $\%$ of P $= \dfrac{62}{222} \times \dfrac{\text{mass of } Mg_2P_2O_7 \text{ formed}}{\text{mass of compound taken}} \times 100$ (Ignition method)

- $\%$ of O $= \dfrac{32}{88} \times \dfrac{\text{mass of } CO_2 \text{ formed}}{\text{mass of compound taken}} \times 100$ (Iodine method)

- $\%$ of O $= \dfrac{5 \times 16}{2 \times 127} \times \dfrac{\text{mass of } I_2 \text{ formed}}{\text{mass of compound taken}} \times 100$