Quadrant II – Notes

Programme: BSc

Subject: Chemistry

Paper Code: CHC101

Paper Title: Inorganic and Organic Chemistry (Section B – Organic Chemistry)

Unit: 01

Module Name: Inductive Effect

Module No: 02

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Notes

Inductive Effect

Inductive effect is the electron-donating or electron-withdrawing effect of an atom or group that is transmitted by the polarisation of electrons in sigma (σ) bonds.

Types of Inductive Effects

Positive Inductive Effect (+I)

Is due to the presence of atoms or groups which increase electron density by their electron releasing or donating effect.

E.g $-CH_3$, $-CH_2R$, $-CHR_2$ and $-CR_3$

Negative Inductive Effect (-I)

Is due to the presence of atoms or groups which decrease electron density by their electron withdrawing effect.

E.g $-NO_2$, -CN, -F, -Cl, -Br, -I, etc.

Factors affecting Inductive Effect

1. Electronegativity

Presence of an electronegative atom or group increases the acidity E.g. Chloroacetic acid is stronger than Acetic acid.

2. Inductive effect is Additive

Case1- Alkyl groups have +I effect and more the number of alkyl groups, the greater the effect.

Case 2- Halogens have –I effect. Strength of the following acids increases as the number of halogen atoms increase.

3. Inductive effect decreases with distance.

Inductive effect is transmitted along the chain and its effect falls off with distance (usually not very effective beyond a distance of two covalent bonds).