Topic Tree – Aldehydes, Ketones & Carboxylic Acids

1. Nomenclature & Structure
- IUPAC rules for aldehydes, ketones, carboxylic acids
- Common names
- Structure of carbonyl group (>C=O)
- Resonance and polarity of C=O bond

2. Preparation Methods
(a) Aldehydes & Ketones
- From alcohols (oxidation of 1° & 2° alcohols)
- From hydrocarbons (ozonolysis, hydration of alkynes, side-chain chlorination + hydrolysis)
- Rosenmund reaction (acid chloride → aldehyde)
- Stephen's reaction (nitriles → aldehyde)
- Friedel–Crafts acylation (benzene → aryl ketone)

(b) Carboxylic Acids
- Oxidation of primary alcohols & aldehydes
- From alkylbenzenes (oxidation)
- From nitriles & amides (hydrolysis)
- From Grignard reagents + CO■
- Kolbe's electrolysis

3. Physical Properties
- Boiling points & melting points
- Solubility (hydrogen bonding, polarity)
- Comparison among aldehydes, ketones, and acids

4. Chemical Properties
(a) Aldehydes & Ketones
- Nucleophilic Addition Reactions (HCN, NaHSO■, Grignard, alcohols, ammonia derivatives)
- Oxidation Reactions (Fehling's, Tollen's, Baeyer–Villiger)
- Reduction Reactions (NaBH■, LiAlH■, catalytic hydrogenation)
- Other: Aldol condensation, Cannizzaro, Haloform, Perkin

(b) Carboxylic Acids
- Acidic nature (inductive effect, resonance)
- Reactions with bases, metals, carbonates
- Reduction → alcohols
- Decarboxylation (soda lime, Kolbe electrolysis)
- Derivatives: acid chlorides, anhydrides, esters, amides

5. Uses and Applications
- Formaldehyde, acetaldehyde, acetone
- Acetic acid, formic acid
- Industrial and biological importance

6. Tests & Identification
- Tollen's test, Fehling's test, Benedict's test (aldehydes)
- Iodoform test (methyl ketones, acetaldehyde)

- Ester test (carboxylic acids)