

CLASS 12

CHEMISTRY

REVISION NOTES

Class 12 Chemistry Chapter 8 Aldehydes, Ketones and Carboxylic Acids – Revision Notes

Quick revision notes for Class 12 Chemistry Chapter 8 – Aldehydes, Ketones and Carboxylic Acids, covering nomenclature, preparation, name reactions, distinguishing tests, and the acidity of carboxylic acids. Ideal for last-minute board exam revision.

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Nomenclature and Structure

Aldehydes ($-\text{CHO}$) and ketones ($>\text{C}=\text{O}$ between two carbons) share the polar carbonyl group; carboxylic acids ($-\text{COOH}$) combine a carbonyl with a hydroxyl. Aldehydes are generally **more reactive than ketones** towards nucleophilic addition (less steric hindrance, only one electron-donating group on the carbonyl carbon).

Preparation

Aldehydes/ketones are made by oxidation of alcohols (PCC for aldehydes, stopping short of the acid), Rosenmund reduction of acid chlorides ($\text{H}_2/\text{Pd}-\text{BaSO}_4$, poisoned catalyst) for aldehydes, and Friedel–Crafts acylation for aryl ketones. Carboxylic acids are made by oxidation of primary alcohols/aldehydes, hydrolysis of nitriles/esters, and via Grignard reagents+ CO_2 .

Name Reactions

Aldol condensation: a carbonyl compound with α -hydrogen self- or cross-condenses (dilute base) to a β -hydroxy carbonyl compound, which dehydrates on heating to an α,β -unsaturated carbonyl compound.
Cannizzaro reaction: an aldehyde with **no α -hydrogen** disproportionates with concentrated alkali into the alcohol+the carboxylate salt. **Haloform (iodoform) reaction:** positive only for methyl ketones ($\text{CH}_3\text{CO}-$) and compounds oxidisable to them (including ethanol and acetaldehyde), giving a yellow CHI_3 precipitate.
Clemmensen reduction: $\text{Zn}(\text{Hg})/\text{conc. HCl}$ reduces $\text{C}=\text{O}$ all the way to CH_2 under acidic conditions.
Wolff–Kishner reduction: $\text{NH}_2\text{NH}_2/\text{KOH}$, heat, does the same reduction under basic conditions (for acid-sensitive substrates). **Hell–Volhard–Zelinsky (HVZ) reaction:** a carboxylic acid with an α -hydrogen+ Cl_2/Br_2 with catalytic red phosphorus gives the α -halo acid.

Distinguishing Tests

Tollens' test: a silver mirror forms with any aldehyde (aliphatic or aromatic); ketones give no reaction.
Fehling's test: positive only for **aliphatic** aldehydes — aromatic aldehydes like benzaldehyde do not respond. **Iodoform test:** positive for methyl ketones and $\text{CH}_3\text{CH}(\text{OH})-$ -type alcohols (and acetaldehyde).
 NaHCO_3 test: carboxylic acids effervesce (release CO_2); phenols and esters do not.

Acidity of Carboxylic Acids

Carboxylic acids are acidic because the carboxylate ion delocalises its negative charge **equally over two electronegative oxygen atoms**, a highly effective form of resonance stabilisation — more effective than phenoxide's delocalisation partly onto less electronegative ring carbons, which is why carboxylic acids are stronger acids than phenols despite phenoxide having more resonance structures. **Electron-withdrawing substituents** (halogens, $-\text{NO}_2$) increase acid strength and this effect weakens rapidly with distance from $-\text{COOH}$; **electron-donating substituents** (alkyl, $-\text{OCH}_3$) decrease it.

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