Aldehydes and ketones: nucleophilic addition and named reactions

Formulas and units, JEE Main. Status: Reviewed on 2026-11-20.

Result	Formula	Units or note
Reactivity to nucleophiles	HCHO > RCHO > RCOR (aliphatic > aromatic) Valid when: nucleophilic addition to the carbonyl group	n/a (order)
Grignard product class	HCHO primary, RCHO secondary, ketone tertiary Valid when: Grignard reagent in dry ether, then hydrolysis	n/a (class)
NH2-Z products	NH2OH oxime; NH2NH2 hydrazone; 2,4-DNP orange-red solid; semicarbazide semicarbazone	product
Tollens test	RCHO + 2 Ag(+) giving RCOO(-) + 2 Ag Valid when: aldehydes with ammoniacal silver nitrate, warmed	2 mol Ag per mol RCHO
Clemmensen and Wolff-Kishner	>C=O to >CH2: Zn-Hg/HCl (acid); N2H4, KOH, heat (base) Valid when: Clemmensen needs an acid-stable substrate; Wolff-Kishner needs a base-stable one	n/a (conditions)
Aldol	two RCH2CHO with dilute OH(-) giving RCH2CH(OH)CH(R)CHO Valid when: dilute base; aldehyde or ketone with at least one alpha hydrogen	needs alpha-H
Cannizzaro	2 RCHO + OH(-) giving RCH2OH + RCOO(-) Valid when: concentrated alkali; aldehyde with no alpha hydrogen	no alpha-H; 50 percent each
Iodoform test	CH3CO-R or CH3CH(OH)R with I2/NaOH giving CHI3 (yellow) Valid when: CH3CO- or CH3CH(OH)- group, with I2 and NaOH	1 mol CHI3 per mol
Crossed aldol products	donors (with alpha-H) x acceptors (all carbonyls) Valid when: dilute base; donors need an alpha hydrogen, acceptors can be any carbonyl	count

Full lesson with worked examples:
https://www.engineeringrise.in/learn/learn/jee-main/chemistry/organic-compounds-containing-oxygen/aldehydes-and-ketones-nucle

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