

Tests for Aldehydes and Ketones: summary table

Order to think in: (1) Is there a C=O at all? 2,4-DNPH. (2) Aldehyde or ketone? An oxidising test: Tollens', Fehling's or acidified dichromate. (3) Is there a CH₃CO- group? Iodoform.

Test	Reagent and conditions	Aldehyde	Ketone	Note
2,4-DNPH (Brady's)	2,4-dinitrophenylhydrazine in acid	yellow/orange precipitate	yellow/orange precipitate	shows C=O only
Tollens' reagent	[Ag(NH ₃) ₂] ⁺ , warm in water bath	silver mirror	no change	all aldehydes, incl. aromatic
Fehling's solution	A: CuSO ₄ (aq), B: alkaline tartrate; warm	blue to brick-red Cu ₂ O	stays blue	NOT benzaldehyde
Benedict's solution	alkaline Cu ²⁺ with citrate; warm	brick-red precipitate	stays blue	same chemistry as Fehling's
Acidified dichromate	K ₂ Cr ₂ O ₇ + dilute H ₂ SO ₄ ; warm	orange to green	stays orange	alcohols also turn it green
Iodoform test	I ₂ + NaOH(aq); warm	yellow CHI ₃ : ethanal only	yellow CHI ₃ : methyl ketones	needs CH ₃ CO-; also ethanol
Schiff's reagent	decolourised magenta dye	pink/magenta returns	no colour	CBSE

Equations

Tollens': $\text{RCHO} + 2[\text{Ag}(\text{NH}_3)_2]^+ + 3\text{OH}^- \rightarrow \text{RCOO}^- + 2\text{Ag} + 4\text{NH}_3 + 2\text{H}_2\text{O}$

Fehling's: $\text{RCHO} + 2\text{Cu}^{2+} + 5\text{OH}^- \rightarrow \text{RCOO}^- + \text{Cu}_2\text{O} + 3\text{H}_2\text{O}$

Iodoform: $\text{RCOCH}_3 + 3\text{I}_2 + 4\text{NaOH} \rightarrow \text{RCOONa} + \text{CHI}_3 + 3\text{NaI} + 3\text{H}_2\text{O}$

Dichromate: $\text{RCHO} + [\text{O}] \rightarrow \text{RCOOH}$ (orange Cr₂O₇²⁻ reduced to green Cr³⁺)

Gives iodoform / does not

Gives: ethanal; propanone, butanone, pentan-2-one, acetophenone; ethanol; propan-2-ol, butan-2-ol.

Does not: methanal, propanal, benzaldehyde; pentan-3-one, benzophenone; methanol, propan-1-ol, 2-methylpropan-2-ol.

Which test tells which pair apart

Pair	Test	Result
Propanal / propanone	Tollens'	propanal: silver mirror; propanone: none
Ethanal / propanal	Iodoform	ethanal: yellow precipitate; propanal: none
Pentan-2-one / pentan-3-one	Iodoform	pentan-2-one: yellow precipitate; pentan-3-one: none
Benzaldehyde / acetophenone	Tollens' (or iodoform)	benzaldehyde: silver mirror; acetophenone: none (it gives iodoform)
Benzaldehyde / ethanal	Fehling's (or iodoform)	ethanal: brick-red precipitate; benzaldehyde: stays blue
Ethanal / propanone	Tollens'	ethanal: silver mirror; propanone: none (both give iodoform)
Methanal / ethanal	Iodoform	ethanal: yellow precipitate; methanal: none
Propan-1-ol / propan-2-ol	Iodoform	propan-2-ol: yellow precipitate; propan-1-ol: none

The two-mark answer

Reagent and conditions; what you see; which compound gives it and which does not. Example: 'Add Tollens' reagent and warm. Propanal gives a silver mirror; propanone gives no change.'

Six mistakes

1) 'Silver precipitate' instead of silver mirror. 2) Saying benzaldehyde gives Fehling's (it does not). 3) Using iodoform to tell ethanal from propanone (both positive). 4) Forgetting ethanol gives iodoform. 5) 'Orange to green' with no reagent named. 6) Heating over a flame: use a water bath; make Tollens' fresh and rinse it away after use.

1-on-1 online chemistry, CBSE Class 11-12, A-level, IB, AP: sciencewithshobha.com/subjects/chemistry/