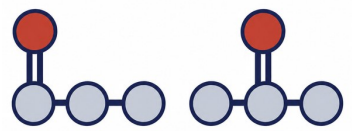
Carbonyl Compounds Summary Map

Cambridge International AS & A Level Chemistry · Topic 17 Carbonyl compounds

1 Naming and formulae

13

- **Aldehyde**: –CHO at the end, **-al**
- **Ketone**: C=O inside, **-one**
- Lowest number to the C=O carbon
- Structural, displayed, skeletal



2 Making carbonyls

17.1.1

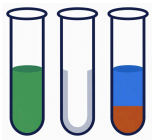
- Acidified $K_2Cr_2O_7$ or $KMnO_4$
- 1° alcohol → **aldehyde**
- **Distil** it off as it forms
- 2° alcohol → **ketone**

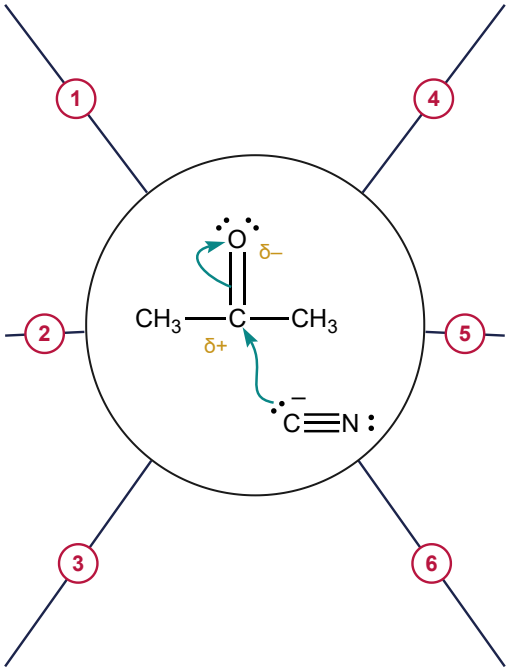


3 Telling them apart

17.1.5

- $Cr_2O_7^{2-}$ / H^+: orange → green
- Tollens': **silver mirror**
- Fehling's: **red-brown Cu_2O**
- Aldehydes only: ketones resist

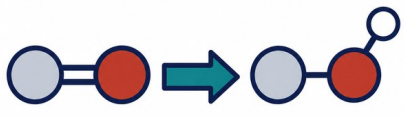




4 Reduction

17.1.2

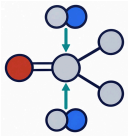
- $NaBH_4$ or $LiAlH_4$, [H]
- Aldehyde → **primary** alcohol
- Ketone → **secondary** alcohol
- $LiAlH_4$ needs dry ether



5 Adding HCN

17.1.2–17.1.3

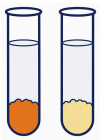
- HCN, **KCN catalyst**, heat
- $:CN^-$ attacks the **δ+ C**
- O^- takes H^+ from HCN
- Product: a **hydroxynitrile**



6 2,4-DNPH and CHI_3

17.1.4, 17.1.6

- 2,4-DNPH: **orange** solid, any C=O
- Alkaline I_2: yellow **CHI_3**
- Shows **CH_3CO–**; RCO_2^- left
- $CH_3CH(OH)$– positive too



Which tests are positive?

✓ positive result; – no change

Compound	2,4-DNPH	Tollens' / Fehling's	Alkaline I_2
ethanal, CH_3CHO	✓	✓	✓
propanal, CH_3CH_2CHO	✓	✓	–
propanone, CH_3COCH_3	✓	–	✓
pentan-3-one	✓	–	–
ethanol, CH_3CH_2OH	–	–	✓
propan-1-ol	–	–	–

Worked examples

Identify the unknown

- 2,4-DNPH ✓, Tollens' –
- CHI_3 ✓, C_4H_8O
- **butanone**

Make it

- butan-2-ol
- $K_2Cr_2O_7$ / H^+, warm
- **butanone**

Add HCN

- propanone + HCN
- KCN catalyst, heat
- **$(CH_3)_2C(OH)CN$**

Aldehydes lead to carboxylic acids in Topic 18; carbonyls are identified by spectra in Topics 22 and 37.

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