

Hydroxy Compounds

A-Level Chemistry • Topic 16

A-Level Chemistry



Hydroxy Compounds

What we will cover

- 1 Alcohols & three classes
- 2 Oxidation by class
- 3 The dichromate test
- 4 Distillation vs reflux
- 5 Other reactions



ethanol kills microbes

1

Alcohols

Hydroxy Compounds

↳ Alcohols

Alcohols and three classes

Count how many carbons are attached to the C that carries the OH.

primary

one C – ethanol,
oxidises to aldehyde then acid

secondary

two C – propan-2-ol,
oxidises to a ketone

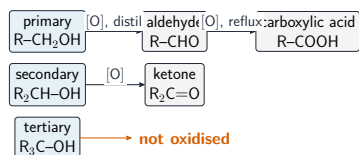
tertiary

three C – 2-methylpropan-2-ol,
does *not* oxidise

Hydroxy Compounds

↳ Alcohols

Oxidation by class



With acidified $K_2Cr_2O_7$:

- primary → **aldehyde** 醛 → **carboxylic acid** 羧酸
- secondary → a **ketone** 酮
- tertiary → **not oxidised**

Hydroxy Compounds

↳ Alcohols

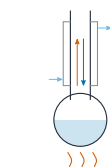
The dichromate test

Acidified **dichromate** 重铬酸盐 turns **orange** to **green** with a primary or secondary alcohol, but stays orange with a tertiary one.

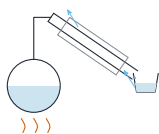
warm with acidified $K_2Cr_2O_7$ (orange)



Distillation vs reflux



reflux
vapour returns: fully oxidised to the acid



distillation
product distils off as it forms (the aldehyde)

- **distillation** 蒸馏 removes the aldehyde as it forms – stops at the aldehyde
- **reflux** 回流 keeps boiling & returning the vapour – fully oxidises to the acid

Other reactions

combustion 燃烧

dehydration 脱水 → alkene

esterification 酯化

with Na → H₂

substitution → halogenoalkane

Alcohols are very weakly acidic – **less** than water (the alkyl group destabilises RO⁻). The **iodoform test** 碘仿试验 detects the CH₃CH(OH)– group.

2

Recap

Worked example – oxidising an alcohol

Oxidise (a) propan-1-ol and (b) propan-2-ol. How do you stop at the aldehyde?

- (a) Primary → **propanal** (aldehyde) → **propanoic acid**.
- Stop at the aldehyde by **distilling it off as it forms** (its b.p. is lower – no O–H bonding).
- **Reflux** with excess oxidant to go all the way to the acid.
- (b) Secondary → **propanone**, and it stops there.
- Both turn the dichromate **orange** → **green**.

Primary → aldehyde → acid; secondary → ketone; tertiary → **no reaction** (no H on the C–OH carbon).

Topic 16 – key takeaways

1 Classes

primary, secondary, tertiary

2 Oxidation

1° to aldehyde/acid; 2° to ketone; 3° none

3 Dichromate

orange to green for 1° & 2°

4 Apparatus

distillation stops early; reflux goes all the way

Check yourself

- 1 What does a secondary alcohol oxidise to?
- 2 Which class is not oxidised by dichromate?
- 3 Which apparatus fully oxidises to the acid?
- 4 Are alcohols more or less acidic than water?



Answers 1. a ketone 2. tertiary 3. reflux 4. less acidic