Alcohols Summary Map

Cambridge International AS & A Level Chemistry · Topic 16 Hydroxy compounds

1 Names and classes

13.1.5, 16.1.2(a), 16.1.3(a)

- **-ol**; count C on the C–OH carbon
- **1°**: 2 H, **2°**: 1 H, **3°**: 0 H
- Burn: $CO_2 + H_2O$
- $C_nH_{2n+1}OH$



2 Producing alcohols

16.1.1

- Alkene + **steam**, H_3PO_4 catalyst
- RX + **NaOH(aq)**, heat
- C=O + **$NaBH_4$** (or $LiAlH_4$)
- Esters: acid or alkaline hydrolysis

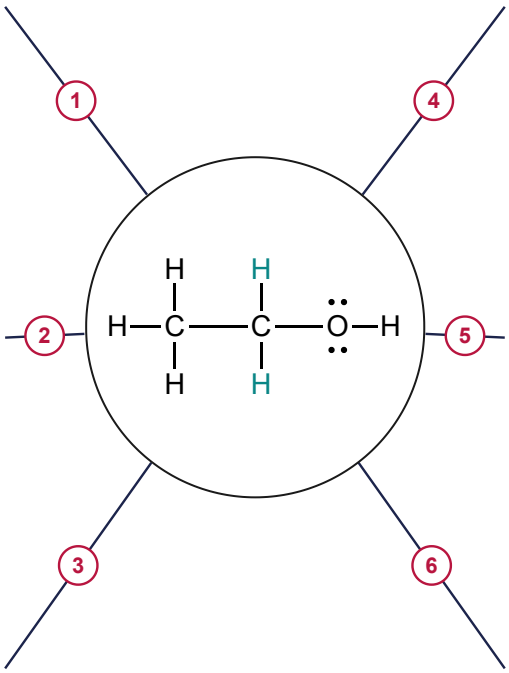


3 Halogenoalkanes and alkenes

16.1.2(b), 16.1.2(e)

- **PCl_5** or **$SOCl_2$**: RCl
- **KBr + H_2SO_4**: RBr
- **Al_2O_3** or conc. acid, heat: alkene
- Check every alkene and E/Z

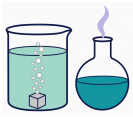




4 Sodium and esters

16.1.2(c), 16.1.2(f), 16.1.5

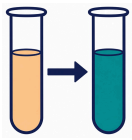
- **Na**: $RO^-Na^+ + H_2$ (fizz)
- Slower than water: a weaker acid
- Acid + alcohol, conc. H_2SO_4: **ester**
- Reversible: heat under reflux



5 Oxidation

16.1.2(d), 16.1.3(b), 16.1.4

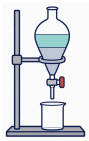
- Acidified $K_2Cr_2O_7$ or $KMnO_4$
- 1° + distil: **aldehyde**
- 1° + reflux: **carboxylic acid**
- 2°: **ketone**; 3°: no reaction



6 Purifying a liquid

Paper 3

- **Reflux**: vapour returns
- **Separate**, wash with $NaHCO_3$
- **Dry**: anhydrous salt until clear
- **Distil**: sharp bp = pure



Which alcohol, which product?

acidified potassium dichromate(VI), then alkaline aqueous iodine; tests on the product

Alcohol	Conditions	Product	Test on the product
propan-1-ol (1°)	distil as it forms	propanal	Fehling's: orange-red
propan-1-ol (1°)	excess, reflux	propanoic acid	$NaHCO_3$: fizzes
propan-2-ol (2°)	reflux	propanone	Fehling's: stays blue
2-methylpropan-2-ol (3°)	reflux	no reaction	stays orange
propan-2-ol (2°)	alkaline I_2(aq), warm	CHI_3	yellow precipitate

Worked examples

Name and class

- $CH_3CH(OH)CH_2CH_3$
- butan-2-ol
- C–OH carbon has 2 C: **secondary**

Organic preparation

- $(CH_3)_3COH + HCl$
- room temperature, shake
- **$(CH_3)_3CCl$**, upper layer

Percentage yield

- 7.4 g alcohol (Mr 74): 0.100 mol
- expect 9.25 g of RCl
- 5.6 g made: **61%**

Alcohols link halogenoalkanes and alkenes to carbonyl compounds (Topic 17) and to carboxylic acids and esters (Topic 18); their products are identified in Topic 22.

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