

# 16 Alcohols – Part 1

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Name: \_\_\_\_\_ Class: \_\_\_\_\_ Date: \_\_\_\_\_

## Vocabulary

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*Write each word three times.*

| English         | Write it 3 times (English) |       |       |
|-----------------|----------------------------|-------|-------|
| ethanol         | _____                      | _____ | _____ |
| alcohol         | _____                      | _____ | _____ |
| primary         | _____                      | _____ | _____ |
| secondary       | _____                      | _____ | _____ |
| tertiary        | _____                      | _____ | _____ |
| dehydration     | _____                      | _____ | _____ |
| carboxylic acid | _____                      | _____ | _____ |
| ester           | _____                      | _____ | _____ |
| oxidation       | _____                      | _____ | _____ |

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## Recall

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At IGCSE you met **ethanol**, the alcohol in drinks and fuel. An **alcohol** has the **–OH** (hydroxyl) functional group.

- The **–OH** group gives the family its reactions.
- Like halogenoalkanes, alcohols come in three classes.

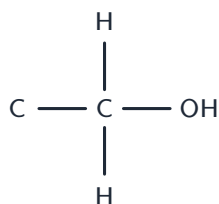
Nothing here is harder than IGCSE – it just adds the reactions.

## New ideas

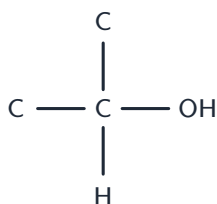
Read these first, then do the Practice.

### ■ 1 Three classes

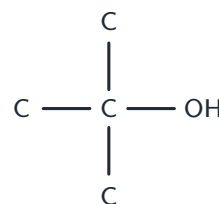
An alcohol is **primary**, **secondary** or **tertiary**, set by how many carbons are joined to the carbon holding the **–OH**.



primary



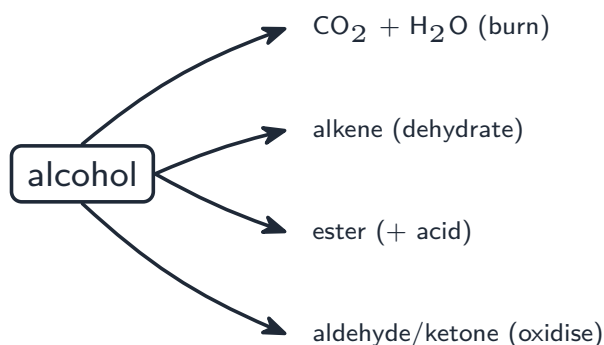
secondary



tertiary

### ■ 2 Reactions of alcohols

- **combustion** – burn in oxygen  $\rightarrow \text{CO}_2 + \text{water}$ .
- **with sodium** – react with sodium metal  $\rightarrow$  hydrogen + a sodium alkoxide.
- **dehydration** – hot  $\text{Al}_2\text{O}_3$  (or conc. acid) removes water  $\rightarrow$  an **alkene**.
- **esterification** – with a **carboxylic acid** (conc.  $\text{H}_2\text{SO}_4$  catalyst)  $\rightarrow$  an **ester**.
- **oxidation** – with acidified  $\text{K}_2\text{Cr}_2\text{O}_7$  (Part 2).



**Watch out:** an alcohol's class (primary/secondary/tertiary) is set by the number of carbons on the C–OH carbon – exactly like halogenoalkanes – and it controls the product of oxidation (Part 2).

## Practice

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Try these in order.

**16.1** Name the functional group of an alcohol. [1]

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**16.2** What decides whether an alcohol is primary, secondary or tertiary? [1]

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**16.3** Name the products when an alcohol reacts with sodium metal. [2]

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**16.4** What is formed when an alcohol is dehydrated? [1]

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**16.5** An alcohol reacts with a carboxylic acid (with a sulfuric acid catalyst). Name the product. [1]

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**16.6** Write the products of the complete combustion of ethanol. [1]

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**16.7 Challenge.** Propan-1-ol and propan-2-ol share the formula  $C_3H_8O$ . Classify each as primary or secondary, and explain. [2]

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