16.1 Alcohols

Name: _____ Class: _____ Date: _____ **Total: 12 marks**

KEY WORDS alcohol • primary • secondary • tertiary • acidity

Objective

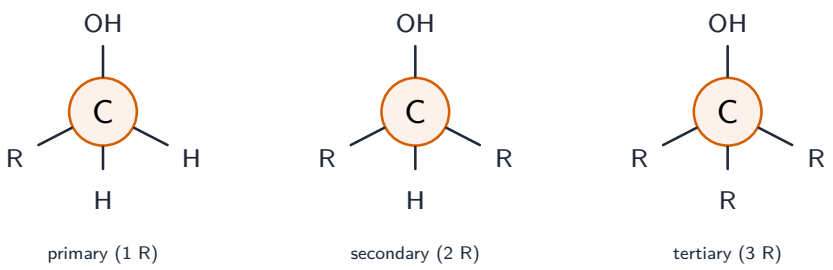
Build the skills to answer exam questions on **alcohols** – their reactions, **oxidation** by class, the **iodoform test**, and their acidity.

You must be able to:

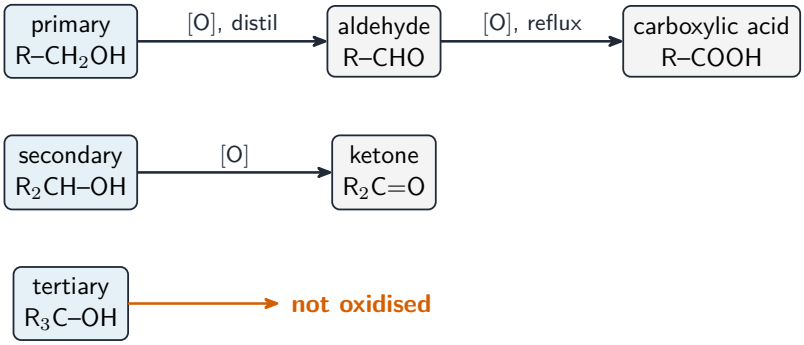
- describe the reactions of alcohols (combustion, substitution, Na, oxidation, dehydration, ester)
- classify alcohols and explain how oxidation distinguishes the classes
- describe the iodoform test and explain the acidity of alcohols

1 Key knowledge and worked examples

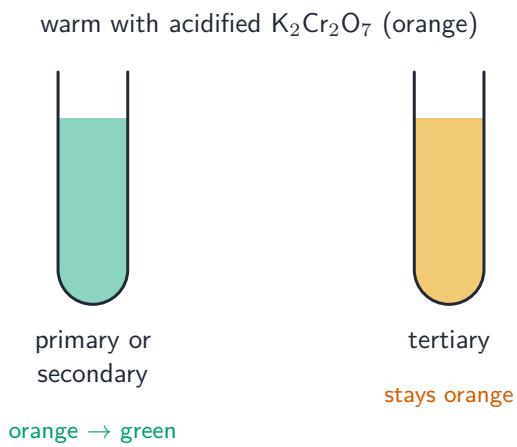
Classes and oxidation



The class is set by the carbon holding the –OH



Oxidation (acidified $K_2Cr_2O_7$): primary → aldehyde (distil) → acid (reflux); secondary → ketone; tertiary not oxidised



Acidified dichromate goes orange → green with primary/secondary; stays orange with tertiary

Distillation removes the aldehyde as it forms; **reflux** fully oxidises to the acid.

■ Other reactions and acidity

Alcohols also: burn; react with Na (→ H_2 + alkoxide); dehydrate to alkenes (hot Al_2O_3 or conc. acid); form esters with carboxylic acids (conc. H_2SO_4). The **iodoform test** (warm with alkaline I_2) gives a yellow CHI_3 precipitate for a $CH_3CH(OH)-$ group. Alcohols are **less acidic** than water (the alkyl group destabilises RO^-).

2 Practice

2.1 State the oxidation product of (a) a primary alcohol (refluxed) and (b) a secondary alcohol. [2]

2.2 State the colour change when acidified $K_2Cr_2O_7$ oxidises a primary alcohol. [1]

3 Exam-style questions

3.1 Which alcohol is **not** oxidised by acidified $K_2Cr_2O_7$? [1]

- ☐ **A** primary
- **B** secondary
- **C** tertiary
- **D** all are oxidised

3.2 To oxidise a primary alcohol only as far as the aldehyde, you should: [1]

- ☐ **A** reflux with excess oxidising agent
- **B** distil off the aldehyde as it forms
- **C** add sodium metal
- **D** add concentrated sulfuric acid

3.3 (a) Describe a chemical test to distinguish a secondary alcohol from a tertiary alcohol. [3]

(b) State the reagents and conditions to dehydrate ethanol to ethene. [2]

3.4 Explain why ethanol is a weaker acid than water. [2]