

17 Aldehydes and ketones – Part 1

Name: _____ Class: _____ Date: _____

Vocabulary 词汇

Write each word three times. 把每个单词抄写三遍。

English	中文	Write it 3 times (English)
aldehyde	醛	_____
ketone	酮	_____
C=O carbonyl	羰基	_____
reduction	还原	_____
hydrogen cyanide	氰化氢	_____
nucleophilic addition	亲核加成	_____

Recall

From the Alcohols sheet you know that oxidising an alcohol can give an **aldehyde** 醛 or a **ketone** 酮. Both contain the **C=O carbonyl** 羰基 group.

- They are made by oxidising alcohols.
- The carbonyl carbon is slightly positive, so it is attacked by nucleophiles.

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

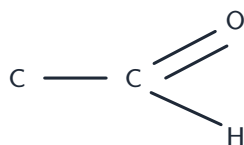
New ideas

Read these first, then do the Practice.

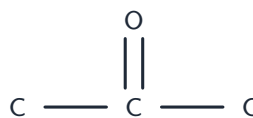
■ 1 Aldehyde vs ketone

Both have the **C=O** group, but in a different place:

- in an **aldehyde** 醛 the C=O carbon is on the **end** of the chain (it also has an H) — written **-CHO**.
- in a **ketone** 酮 the C=O carbon is in the **middle**, between two carbons.



aldehyde (end)



ketone (middle)

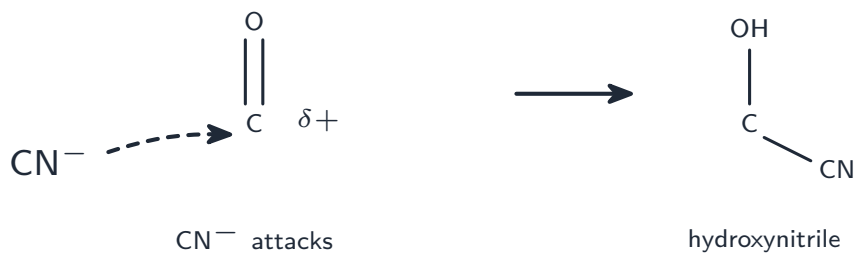
■ 2 Making and reducing them

- oxidise a **primary** alcohol (with distillation) → an **aldehyde**.
- oxidise a **secondary** alcohol → a **ketone**.
- **reduction** 还原 (NaBH_4 or LiAlH_4) turns them back into alcohols.

■ 3 Nucleophilic addition

The reaction with **hydrogen cyanide** 氰化氢 (HCN) is a **nucleophilic addition** 亲核加成. The carbonyl carbon is $\delta+$ (oxygen pulls the electrons):

1. the CN^- nucleophile attacks the $\delta+$ carbon.
2. the C=O breaks, leaving a negative oxygen (O^-).
3. the O^- takes an H^+ to finish the product.



Watch out: an aldehyde has its C=O at the *end* of the chain ($-\text{CHO}$); a ketone has it in the *middle*. The HCN reaction is *addition* — the C=O opens and nothing leaves (unlike substitution).

Practice

Try these in order.

17.1 Name the functional group in aldehydes and ketones. [1]

17.2 State where the C=O group sits in (a) an aldehyde, (b) a ketone. [2]

17.3 Which class of alcohol is oxidised to a ketone? [1]

17.4 What is formed when an aldehyde is reduced? [1]

17.5 Why is the carbonyl carbon open to attack by a nucleophile? [2]

17.6 Name the type of mechanism when HCN reacts with a carbonyl compound. [1]

17.7 Challenge. Explain why the reaction of a carbonyl compound with HCN is called nucleophilic *addition* rather than substitution. [2]
