

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.

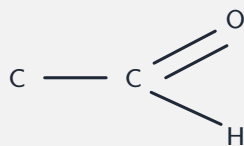
■ 1 Aldehyde vs ketone

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

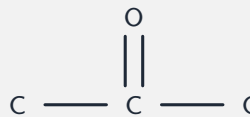
- in an **aldehyde** 醛 the C=O carbon is on the **end** of the chain (it also has an H)

—written -CHO .

- in a **ketone** 酮 the C=O carbon is in the **middle**, between two carbons.



aldehyde (end)



ketone (middle)

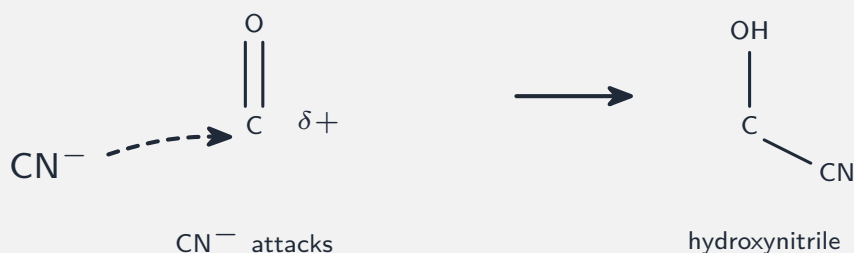
■ 2 Making and reducing them

- oxidise a **primary** alcohol (with distillation) $\rightarrow$ an **aldehyde**.
- oxidise a **secondary** alcohol $\rightarrow$ a **ketone**.
- **reduction** 还原 (NaBH or LiAlH) 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 (-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]
