

22 Analysis (spectroscopy) – 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)
Infrared spectroscopy	spec- 红外光谱	_____
absorbs	吸收	_____
wavenumber	波数	_____

Recall

You now know the functional groups. **Infrared spectroscopy** 红外光谱 is a tool that helps you **find** which group a molecule has —without any chemical test.

- Each kind of bond absorbs infrared light at its own frequencies.
- Where a bond absorbs strongly, the spectrum shows a **dip**.

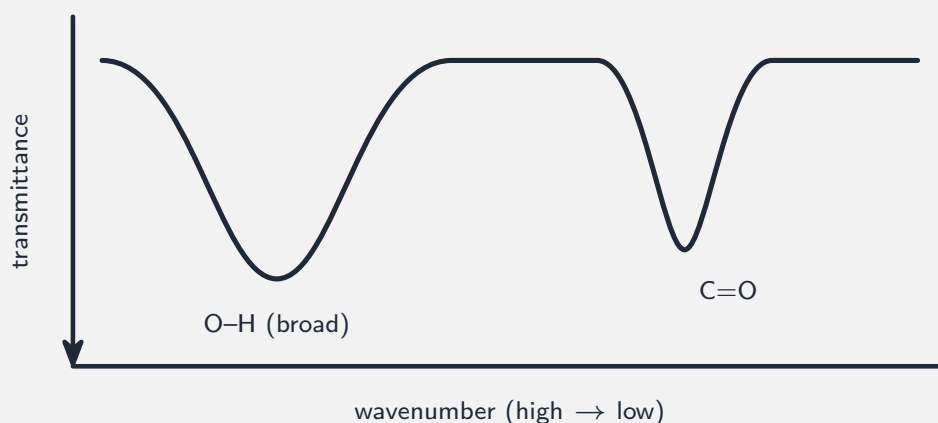
Nothing here is harder than IGCSE —it just reads a graph.

New ideas

Read these first, then do the Practice.

■ 1 How it works

Each kind of bond soaks up (**absorbs** 吸收) infrared at its own range of frequencies. The position is measured in **wavenumber** 波数 (cm^{-1}). You are **given a data table**, so you do not memorise the numbers —you just match the dips to bonds.



■ 2 Key absorptions

Bond	Wavenumber (cm^{-1})
O–H (alcohol)	3200–3650 (broad)
C=O	~1700
O–H (acid)	2500–3000 (very broad) + a C=O dip

O–H (alcohol) $3200\text{--}3650\text{cm}^{-1}$

C=O $\sim 1700\text{cm}^{-1}$

O–H (acid) $2500\text{--}3000\text{ (broad)}\text{cm}^{-1}$

■ 3 Checking a reaction

If propene has been turned into propan-2-ol, the **C=C dip should disappear** and an **O–H dip should appear**—so the spectrum confirms the change.

Watch out: you are *given* the IR data table—match the dips to bonds rather than memorising numbers. Note the alcohol O–H (broad, 3200–3650) sits higher than the acid O–H (very broad, 2500–3000), which also comes with a C=O dip.

Practice

Try these in order.

22.1 In what unit is the position of an infrared absorption measured?

[1]

22.2 Do you need to memorise the absorption numbers? Explain. [1]

22.3 A broad dip at $3200\text{--}3650\text{ cm}^{-1}$ shows which bond? [1]

22.4 A dip at about 1700 cm^{-1} shows which bond? [1]

22.5 An alcohol is oxidised to a carboxylic acid. What new dip would you expect in the infrared spectrum? [1]

22.6 Challenge. An infrared spectrum has a strong dip at about 1700 cm^{-1} *and* a very broad dip at $2500\text{--}3000\text{ cm}^{-1}$. Suggest the functional group present, and explain. [2]
