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	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**.

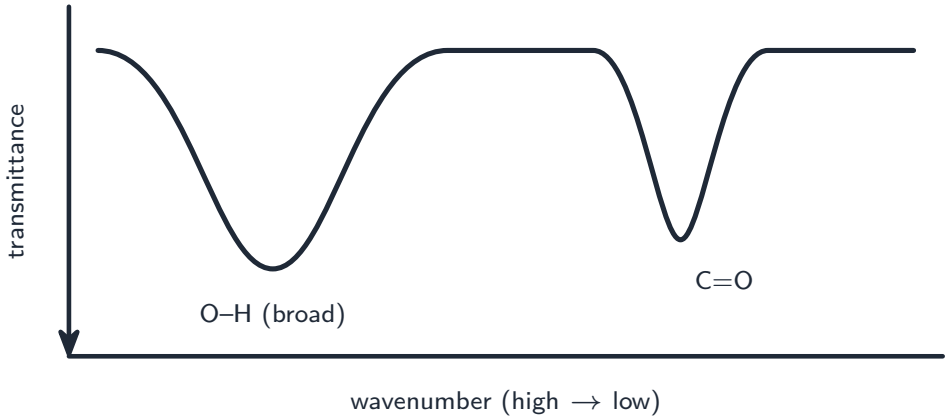
Nothing here is harder than IGCSE — it just reads a graph.

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)	$3200–3650 cm^{-1}$
C=O	$\sim 1700 cm^{-1}$
O–H (acid)	$2500–3000 \text{ (broad)} cm^{-1}$

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 3200–3650 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 2500–3000 cm^{-1}. Suggest the functional group present, and explain. [2]