Solutions

Each answer shows the steps, then the **result**.

2.1

- a C=O (carbonyl) bond

2.2

- an O–H group (in an alcohol)

2.3

- the **N–H** bond

2.4

- the **fingerprint region**
- it is compared with the spectra of known compounds to identify the exact compound

3.1 C

- The broad 2500–3000 cm^{-1} plus a C=O peak indicates a carboxylic acid

3.2 B

- IR identifies the functional groups present

3.3

(a)

- the broad O–H absorption (~3200–3650 cm^{-1}) disappears; a C=O absorption (~1700 cm^{-1}) appears

(b)

- losing the O–H and gaining a C=O shows the alcohol has been oxidised to a carbonyl (ketone)

3.4

(a)

- ethanoic acid

(b)

- the product shows a C=O absorption at about 1700 cm^{-1}, which ethanol lacks
- the narrower alcohol O–H band (3200–3650 cm^{-1}) is replaced by the very broad acid O–H band at 2500–3000 cm^{-1}

3.5

- the absorption at 1720 cm^{-1} shows a C=O bond
- no broad band above 3000 cm^{-1}, so there is no O–H: it is not an alcohol or a carboxylic acid
- no reaction with Tollens' reagent, so it is a ketone, not an aldehyde: the compound is **propanone**, CH_3COCH_3