Mass Spec:

m/z ratio	group
88	C ₂ H ₄ O is the empirical formula and has a mass of 44 so compound must have formula C ₄ H ₈ O ₂ . This is the molecular ion peak. And the base peak as it has 100% absorbance.
89	Peak due to relative isotopic abundance of ¹³ C isotope
45	COOH+
43	C ₃ H ₅ +
29	C ₂ H ₅

Student 2: High Merit NZ@A Intended for teacher use only

IR:

Wavenumber(cm ⁻¹)	Characteristic group
2980 broad	Carboxylic acid
1710 sharp	C=O Aldehydes, ketones, carboxylic acids, esters

NMR:

Chemical shift (ppm)	Characteristic group
13	CH₃
19	CH ₂
38	CH ₂
180	C downfield shift due to C bonded to highly electronegative atom or atoms

There are 4 carbons in the compound

Justification:

With the mass spectrum showing a peak at 88 and an empirical formula of C₂H₄O the chemical formula of the compound is C₄H₈O₂. The peak at 29 is characteristic of a fragment formed due to the breakup of the compound in the mass spectrometer to form a C₂H₅+ion. The peak at 45 is due to the COOH+ ion. This indicates that compound A could be butanoic acid.

(1)

The 4 different chemical shifts indicating that the carbons are all in different environments in the ¹³C spectra suggest that the compound would be the straight chain butanoic acid. The peak at 180 would be due to the carbon with two oxygen atoms bonded to it.

Analysis of the IR spectra shows a broad peak at 2980 cm⁻¹ confirming the presence of the O-H group on the butanoic acid. The acid is further confirmed by the peak at 1750cm⁻¹ which is characteristic of the C=O.

This makes me believe the molecule is butanoic acid.