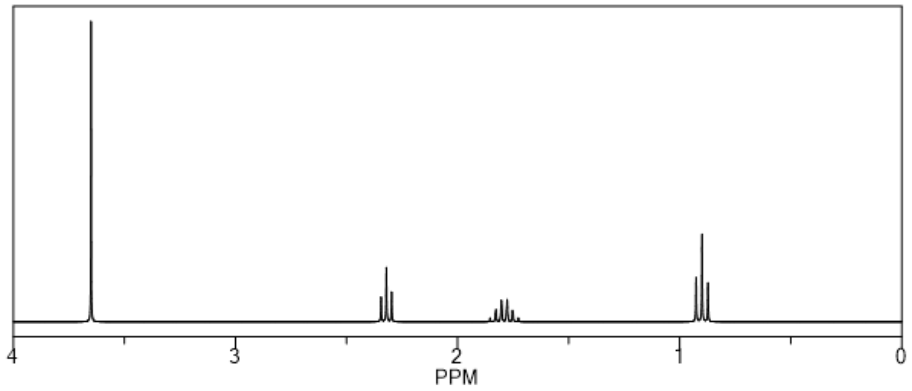
Question 5 **(7 marks)**

The structure of an organic molecule B, with empirical formula $C_5H_{10}O_2$, is determined using spectroscopic techniques. The mass spectrum, of B, showed the molecular ion peak at m/z= 102. The infrared spectrum of B showed a strong absorption at 1740 cm^{-1}. A chemical test showed that compound B could **not** react with bases. The ^1H NMR spectrum of B is shown below.



a. What is the molecular formula of compound B? (1 mark)

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b. Which atoms and the bonds between them are associated with the absorption at 1740 cm^{-1} in the infrared spectrum? (1 mark)

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c. How many different H environments are present in compound B? (1 mark)

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d. The signal at 1.79 ppm is split into 6 peaks. What is the number of equivalent protons bonded to the adjacent carbon atom/s? (1 mark)

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e. Draw the structure of Compound B. (2 marks)

f. How many peaks would you expect to observe in the ^{13}C spectrum of B? (1 mark)

SAMPLE

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