

Friday Worksheet
¹H NMR spectroscopy 1

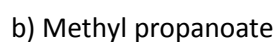
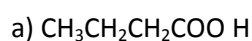
Name:

BACKGROUND ON NMR:

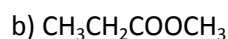
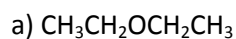
Below is a summary for interpreting NMR spectra.

- The number of signals depends on the number of equivalent hydrogen atoms in a molecule.
- The position of signals relative to the TMS is known as the chemical shift and deals with the relative environment of the hydrogen atoms responsible for the signal.
- The relative intensity of signals (generally referred to as the area under the peak) will give the ratio of equivalent types of hydrogen atoms.
- The signal splitting (spin-spin coupling) that creates the different set of peaks i.e. singlet, doublet, triplet etc. provides information of the neighbours of the hydrogen atoms causing the signal.

- 1) How many signals are expected in the ¹H NMR spectrum of the following molecules? Draw the structure of each molecule.



- 2) Draw the ¹H NMR spectrum of each of the compounds below. Clearly show the signal splitting and the relative intensity of each signal.

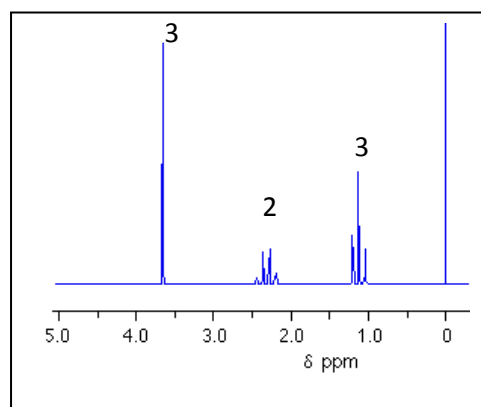


- 3) Consider the ¹H NMR spectrum on the right.

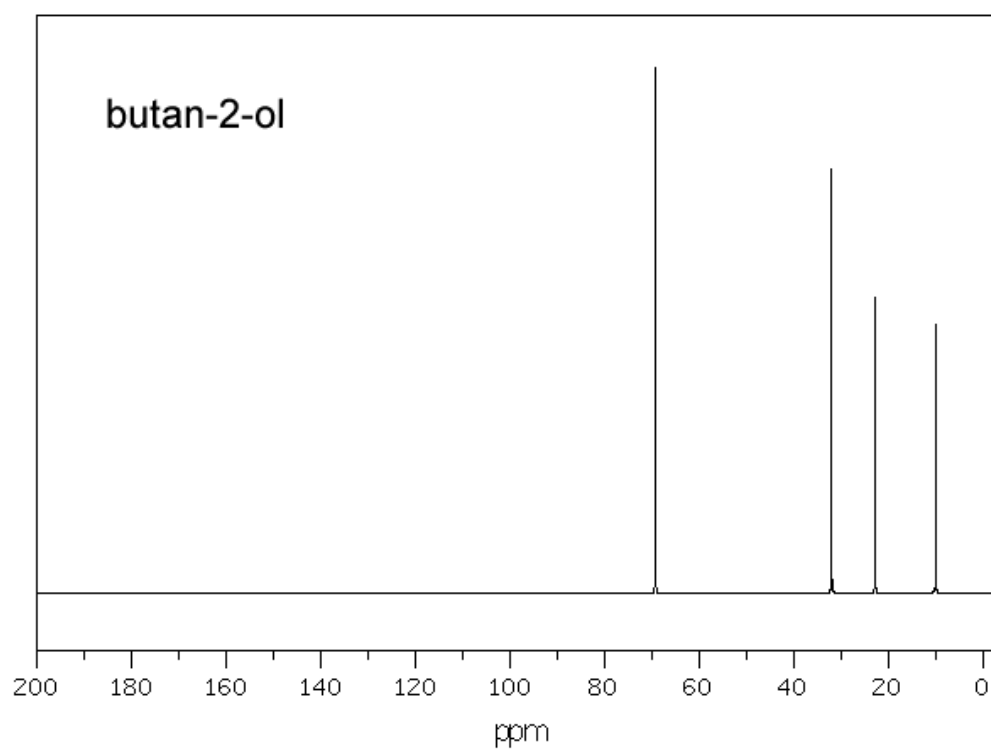
a) What is the signal at 0 ppm?

b) Which of the following molecules is likely to be represented by this spectrum? Explain.

- methyl propanoate
- butane
- butanoic acid.
- ethanol



4) Below is the ^{13}C NMR for butan-2-ol



- How many chemically different carbon environments exist?
- Why is there no signal splitting in ^{13}C NMR but there is in ^1H NMR?
- Why ^{13}C is used for analysis and not ^{12}C , which is the more abundant isotope of carbon