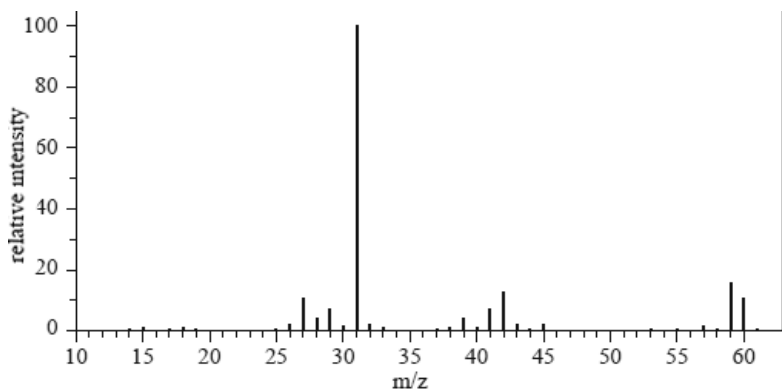


Spectroscopy (2014 VCE)

1) The mass spectrum of alkanol T is provided below.



Solution will appear here

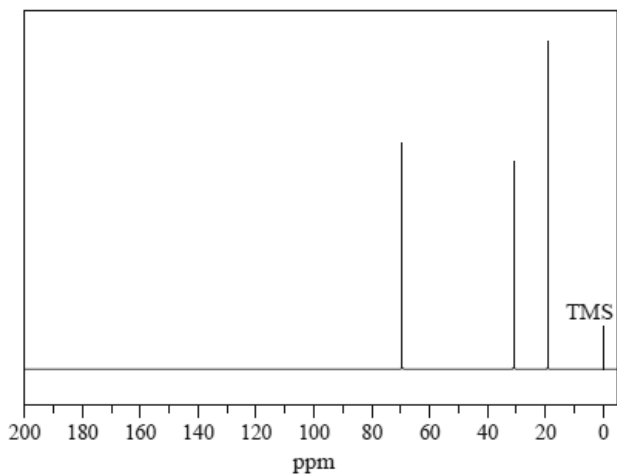
What is alkanol T?

- A. butan-1-ol
- B. ethanol
- C. methanol
- D. propan-1-ol

[Solution](#)

2) The ^{13}C NMR spectrum below corresponds to which one of the following compounds?

- A. propane
- B. 2-methylpropane
- C. 2-methylpropan-1-ol
- D. 2-methylpropan-2-ol



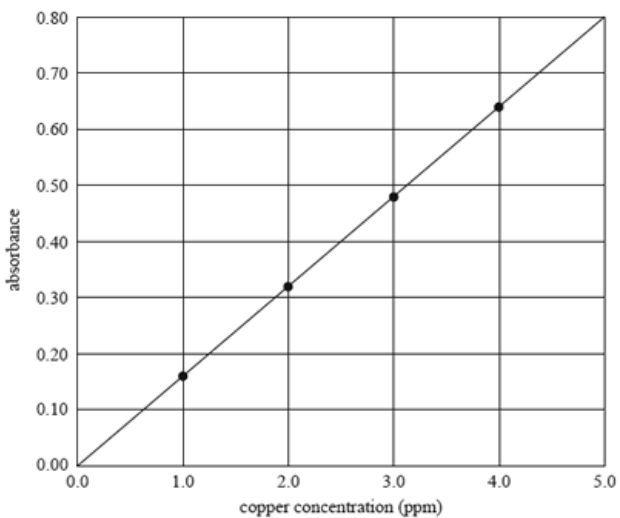
[Solution](#)

3) An atomic absorption spectrometer can be used to determine the level of copper in soils. The calibration curve below plots the absorbance of four standard copper solutions against the concentration of copper ions in ppm.

The concentrations of copper ions in the standard solutions were 1.0, 2.0, 3.0 and 4.0 mg L^{-1} . ($1 \text{ mg L}^{-1} = 1 \text{ ppm}$)

Solution will appear here

Copper calibration curve



The concentration of copper in a test solution can be determined most accurately from the calibration curve if it is between

- A. 0.0 ppm and 5.0 ppm.
- B. 0.0 ppm and 4.0 ppm.
- C. 1.0 ppm and 4.0 ppm.
- D. 1.0 ppm and 5.0 ppm.

Solution

b) If the test solution gave an absorbance reading of 0.40, what would be the concentration of copper ions in the solution

in mol L⁻¹?

- A. 2.5
- B. 3.9×10^{-2}
- C. 3.9×10^{-5}
- D. 2.5×10^{-6}

Solution will appear here

Solution

4) To determine the amount of phosphate in a sample of polluted water, a coloured solution is produced by adding excess molybdovanadate reagent to the water sample.

Which technique would be used to determine the concentration of phosphate in the water?

- A. atomic absorption spectroscopy
- B. gas chromatography
- C. high-performance liquid chromatography
- D. ultraviolet – visible spectroscopy

Solution will appear here

Solution

5) A small organic molecule has the molecular formula of the form $C_xH_yO_2Cl$.

A pH probe was inserted into a dilute aqueous solution of this compound and the pH was 4.5.

The mass spectrum, infrared spectrum, 1H NMR spectrum and ^{13}C NMR spectrum of this compound are provided

Solution will appear here

a) On the infrared spectrum, identify the wavelength that corresponds to the presence of two functional groups in this compound. Identify the functional groups. Note: The peak due to the C-Cl stretch has been labelled.

Solution

b) Use the data provided to determine the values of x and y in $C_xH_yO_2Cl$.

Solution will appear here

Solution

c) What specific information about the structure of the compound is provided by the splitting pattern in the 1H NMR spectrum?

Solution will appear here

Solution

d) Draw the complete molecular structure for this molecule.

Solution will appear here

Solution

e) Give a reason why the mass spectrum shows two molecular ion peaks at $m/z = 108$ and 110 , rather than just one.

Solution

Solution will appear here