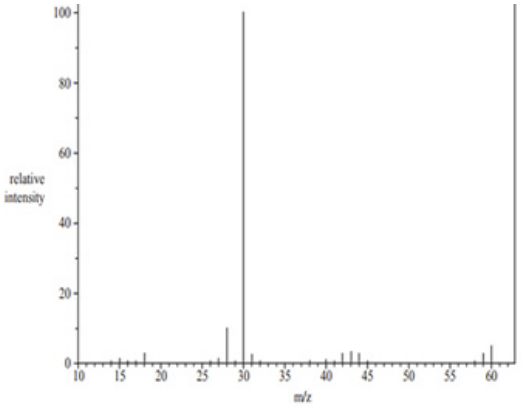
Spectroscopy (2016 VCE)

1) A bottle containing an unknown organic compound was examined in a university laboratory. There was an incomplete label on the bottle that gave only the empirical formula for the contents: CH_4N. A chemist hypothesised that the unknown compound was 1,2-ethanediamine, $NH_2CH_2CH_2NH_2$. Mass spectrometry produced the following spectral data.



Solution will appear here

i. On the diagram above, identify the base peak.

Solution

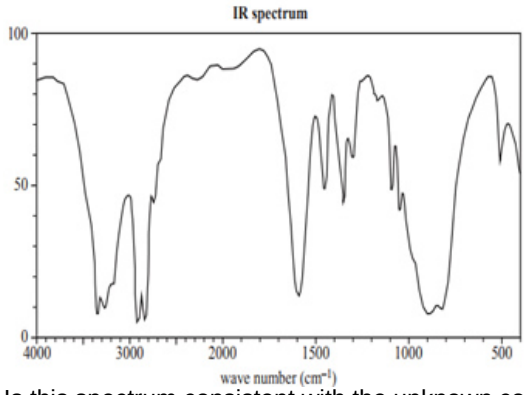
ii. At what m/z ratio is the principal peak that supports the chemist's hypothesis that the unknown compound has the formula $NH_2CH_2CH_2NH_2$? Justify your answer.

Solution

iii. Write the semi-structural formula of the species that produces the peak at 30 m/z

Solution

Infrared (IR) spectroscopy was also used to analyse the sample. The spectrum is shown below.

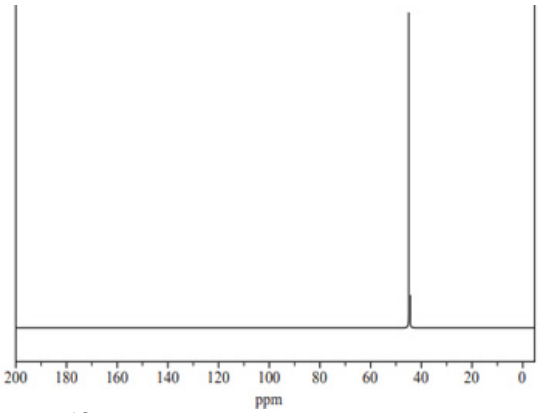


Solution will appear here

Is this spectrum consistent with the unknown compound being $NH_2CH_2CH_2NH_2$? Use evidence from the IR spectrum in your response.

Solution

The sample was also analysed using ^{13}C NMR. The spectrum is shown below.



Is the ^{13}C NMR spectrum consistent with the structure of $NH_2CH_2CH_2NH_2$? Justify your answer.

Solution

Solution will appear here