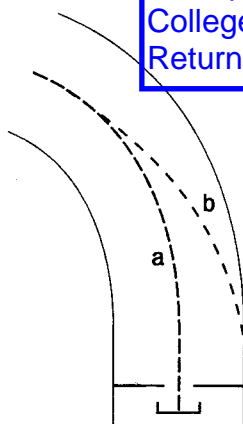


The mass spectrometer (1)

1 The five stages in a mass spectrometer are: vaporisation, ionisation, acceleration, deflection and detection. Use your textbook, a library or a CD-ROM to write short notes on each stage in order to deepen your understanding of how the process works.

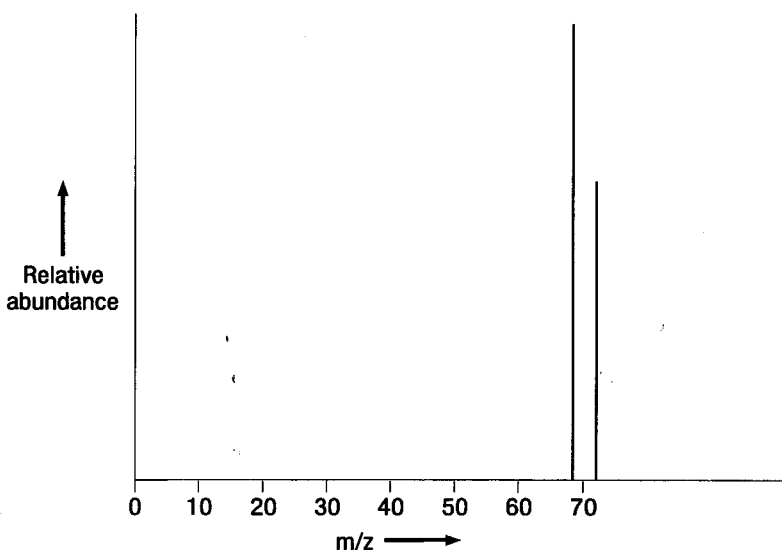
2 Gallium has two stable isotopes: $^{69}_{31}\text{Ga}$ and $^{71}_{31}\text{Ga}$. When a sample of gallium was analysed in a mass spectrometer, the following deflections occurred:

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- (a) Assuming that both isotopes form singly charged ions, which one will follow the path marked 'a' on the diagram?
- (b) Occasionally a 2+ ion may form on ionisation. Sketch the path that this ion would produce in relation to 'a' and 'b'.

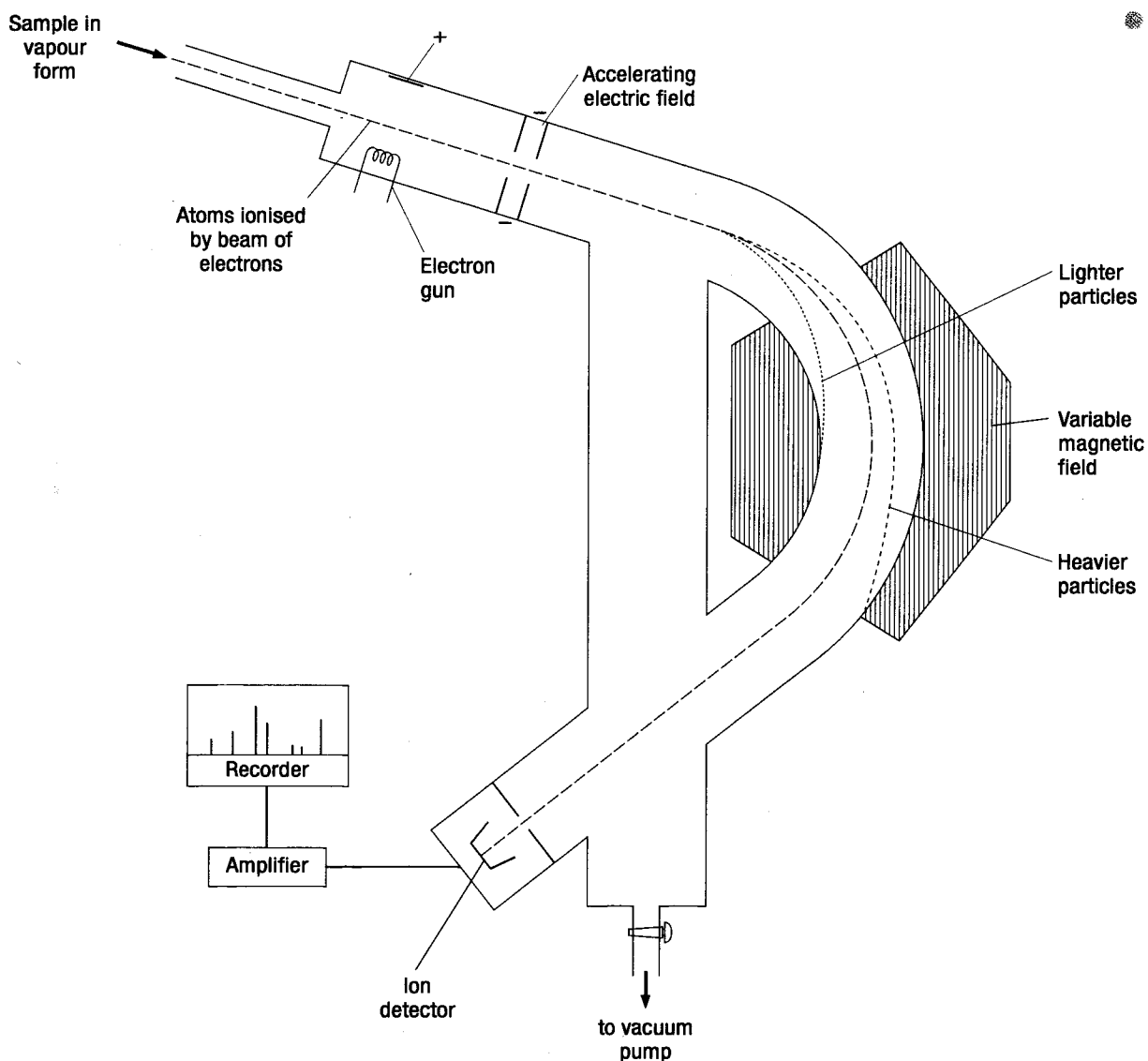
The following shows a read-out for the mass spectrum of a sample of gallium:



- (c) Explain why the horizontal axis is 'mass/charge ratio' and not just 'mass'.
- (d) Use the mass spectrum to calculate the relative atomic mass of gallium.

The mass spectrometer

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Stages in a mass spectrometer

1. Vaporisation. The sample must be in the vapour state.
2. Ionisation. Via an electron gun, $1+$ ions are formed and very occasionally $2+$ ions.
3. Acceleration. Via an electric field.
4. Deflection. Via a magnetic field.
5. Detection. The strength of the magnetic field is increased slowly to detect ions of increasing mass.