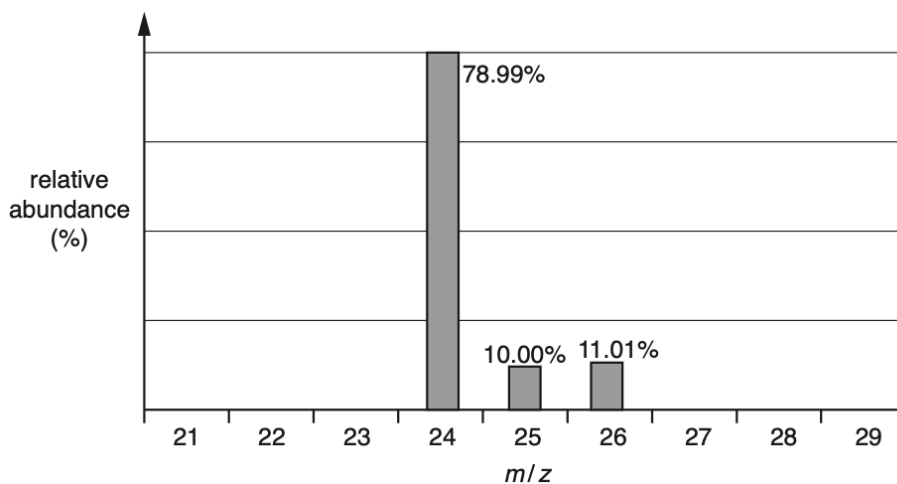


**AS Level Chemistry A**  
**H032/01** Breadth in chemistry

**Question Set 9**

1. This question is about elements from the s-block and p-block of the periodic table.

(a) A sample of magnesium is analysed by mass spectrometry. The mass spectrum is shown below.



(i) The species causing the peaks in the mass spectrum are 1+ ions of magnesium.

Complete the table to show the number of protons, neutrons and electrons in each **1+ ion** of magnesium.

<i>m/z</i>	protons	neutrons	electrons
24			
25			
26			

[2]

(ii) Calculate the relative atomic mass of the magnesium in the sample.

Give your answer to **two** decimal places.

[2]

- (b) **B** and **C** are ionic compounds of two different Group 1 elements. The molar masses of **B** and **C** are both approximately  $140 \text{ g mol}^{-1}$ .

A student dissolves **B** and **C** in water in separate test tubes and analyses the solutions.

The observations are shown below.

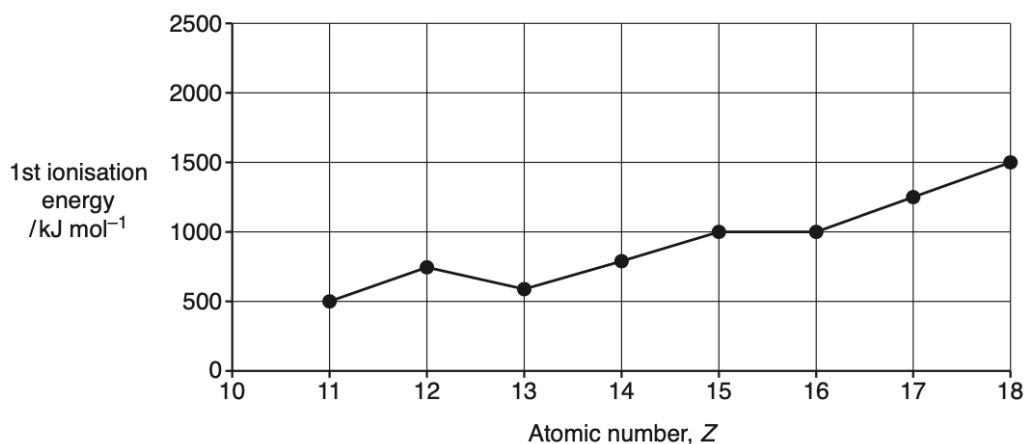
Test	Observation	
	B(aq)	C(aq)
Addition of $\text{HNO}_3(\text{aq})$ followed by $\text{BaCl}_2(\text{aq})$	bubbles no change	no change white precipitate

Use this information and the observations to identify the formulae of **B** and **C**.

Explain your reasoning.

[5]

- (c) **Fig. 22.1** shows first ionisation energies for elements across Period 3.



- (i) Add a point to **Fig. 22.1** for the first ionisation energy of the element with  $Z = 10$ . [1]
- (ii) Estimate the energy required to form **one**  $\text{Na}^+(\text{g})$  ion from one  $\text{Na}(\text{g})$  atom. [1]  
Give your answer in kJ, in standard form, and to **two** significant figures.
- (iii) Explain why the first ionisation energies in **Fig. 22.1** show a general increase across Period 3 (Na–Ar). [3]
- (iv) Explain why the general increase in first ionisation energies across Period 3 is **not** followed for Mg ( $Z = 12$ ) to Al ( $Z = 13$ ). [2]

**Total Marks for Question Set 9: 11**

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