1. Which row shows the atomic structure of $^{55}Mn^{2+}$?

	Protons	Neutrons	Electrons
A	25	30	23
B	25	55	23
C	27	30	25
D	30	25	28

Your answer ☐

[1]

2. Which atom is **not** an isotope of iodine?

	Number of neutrons	Mass number
A	72	125
B	74	127
C	75	128
D	77	129

Your answer ☐ **[1]**

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3. A sample of boron contains the isotopes ^{10}B and ^{11}B.
The relative atomic mass of the boron sample is 10.8.

What is the percentage of ^{11}B atoms in the sample of boron?

A 8.0%

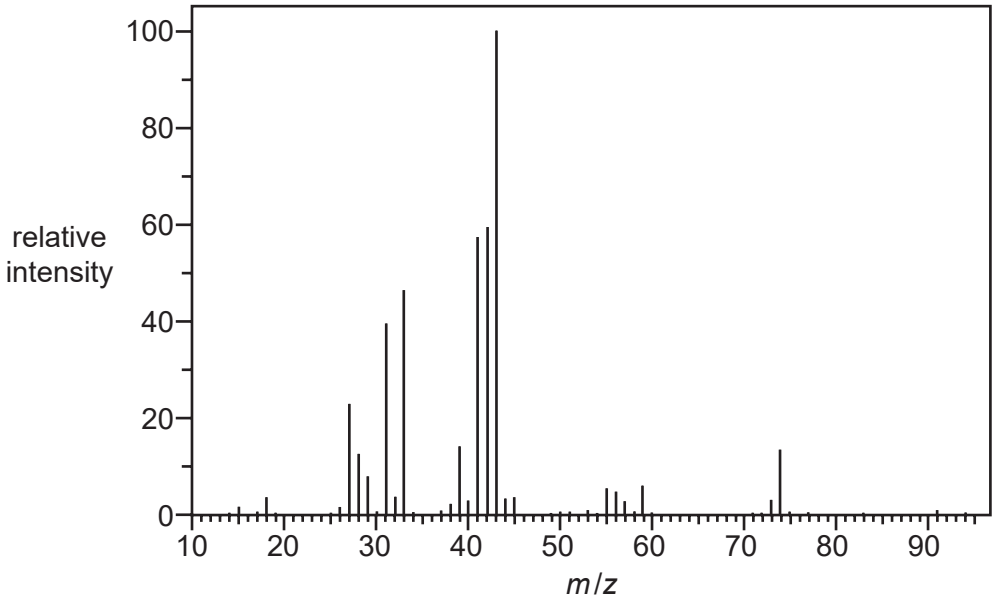
B 20%

C 80%

D 92%

Your answer ☐ **[1]**

4. The mass spectrum of $(CH_3)_2CHCH_2OH$ is shown below.



Which ion is responsible for the peak with the greatest relative intensity?

A $CHCH_2OH^+$

B $CH_3CH_2CH^+$

C $(CH_3)_2CH^+$

D CH_3CO^+

Your answer ☐

[1]

5. This question is about magnesium, bromine and magnesium bromide.

(a) Relative atomic mass is defined as 'the weighted mean mass compared with 1/12th mass of carbon-12'.

Explain what is meant by the term **weighted mean mass**.

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..... **[1]**

(b) **(i)** Draw a 'dot-and-cross' diagram for $MgBr_2$.

Show outer electron shells only.

[2]

(ii) Calculate the total number of **ions** in 1.74 g of magnesium bromide, $MgBr_2$.

Give your answer to **3** significant figures.

number of ions = ... **[3]**

(c)* **Table 16.1** shows some physical properties of magnesium, bromine and magnesium bromide.

Substance	Melting point / °C	Electrical conductivity	
		Solid	Liquid
Magnesium	711	Good	Good
Bromine	−7	Poor	Poor
Magnesium bromide	650	Poor	Good

Table 16.1

Explain the physical properties shown in **Table 16.1** using your knowledge of structure and bonding. **[6]**

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Additional answer space if required

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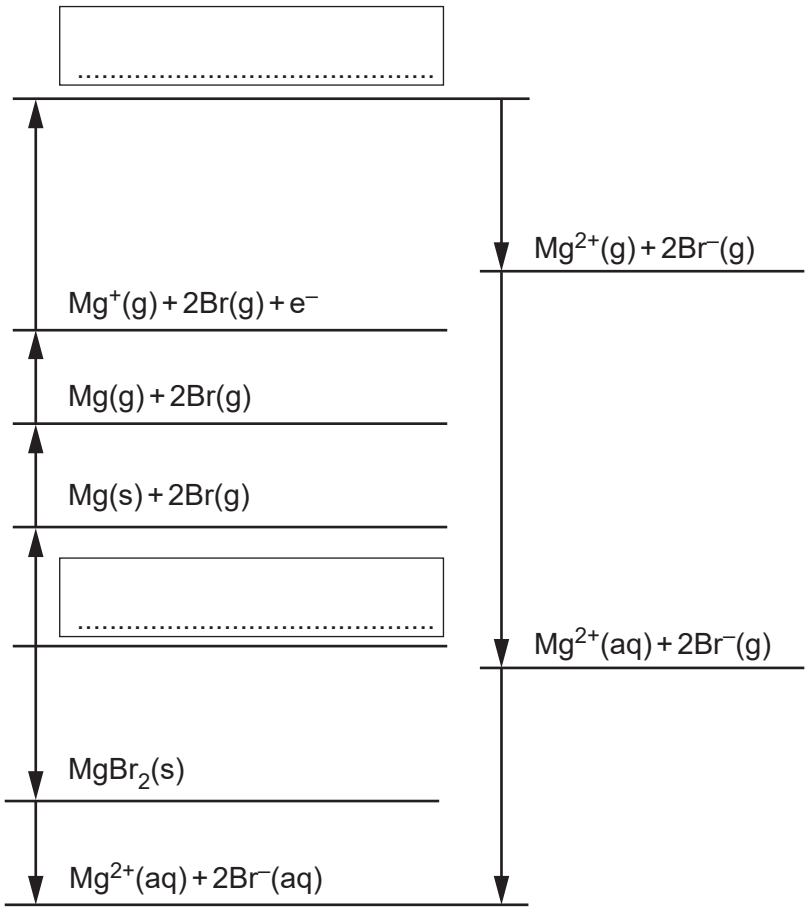
(d) The enthalpy change of hydration of bromide ions can be determined using the enthalpy changes in **Table 16.2**.

Enthalpy change	Energy / kJ mol^{-1}
1st ionisation energy of magnesium	+736
2nd ionisation energy of magnesium	+1450
atomisation of bromine	+112
atomisation of magnesium	+148
electron affinity of bromine	−325
formation of magnesium bromide	−525
hydration of bromide ion	to be calculated
hydration of magnesium ion	−1926
solution of magnesium bromide	−186

Table 16.2

(i) An incomplete energy cycle based on **Table 16.2** is shown below.

On the dotted lines, add the species present, including state symbols.



[2]

(ii) Using your completed energy cycle in **16(d)(i)**, calculate the enthalpy change of hydration of bromide ions.

enthalpy change of hydration = ... kJ mol^{-1} **[2]**

(iii) Write the equation for the lattice enthalpy of magnesium bromide and calculate the lattice enthalpy of magnesium bromide.

Equation .....

Calculation

lattice enthalpy = ... kJ mol^{-1} **[3]**