

1 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]

- 2 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]

- 3** Which statement best explains why nitrogen has a larger first ionisation energy than oxygen?
- A** N atoms have less repulsion between p-orbital electrons than O atoms.
- B** N atoms have a smaller nuclear charge than O atoms.
- C** N atoms lose an electron from the 2s subshell, while O atoms lose an electron from the 2p subshell.
- D** N atoms have an odd number of electrons, while O atoms have an even number.

Your answer

[1]

- 4 In the diagrams below, each box represents an orbital and each electron is shown as an arrow.

Which diagram shows the correct arrangement of electrons in an atom of carbon?

A	
B	
C	
D	

Your answer

[1]

- 5 Sir Humphry Davy discovered several elements including sodium, potassium, magnesium, calcium and strontium.

(a) Explain which block in the Periodic Table sodium and magnesium belong to.

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..... [1]

- (b) A sample of magnesium, $A_r = 24.305$, is found to consist of three isotopes. The accurate relative isotopic masses and % abundances of two of the isotopes are shown in the table.

Isotope	Relative isotopic mass	% abundance
^{24}Mg	23.985	78.99%
^{25}Mg	24.986	10.00%

Determine the relative isotopic mass of the third isotope of magnesium in the sample.

Give your answer to **5** significant figures.

relative isotopic mass = ... [2]

- 6(a)** The first ionisation energy of sodium is more endothermic than that of potassium.
Explain why.

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..... **[2]**

7 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]

8 Which row shows elements in order of increasing first ionisation energy?

A Ca < Si < P < N

B N < P < Si < Ca

C Ca < N < P < Si

D C < Si < P < Ca

Your answer

[1]

9(a) The 12 successive ionisation energies of magnesium are shown in **Table 9.1** .

Ionisation number	Ionisation energy / kJ mol^{-1}
1	738
2	1451
3	7733
4	10 541
5	13 629
6	17 995
7	21 704
8	25 657
9	31 644
10	35 463
11	169 996
12	189 371

Table 9.1

- (i) Write an equation to represent the **fourth** ionisation energy of magnesium.

Include state symbols.

..... [1]

- (ii) Explain how the successive ionisation energies provide evidence that magnesium is in Group 2 of the periodic table.

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..... [1]

- (iii) Electrons occupy orbitals.

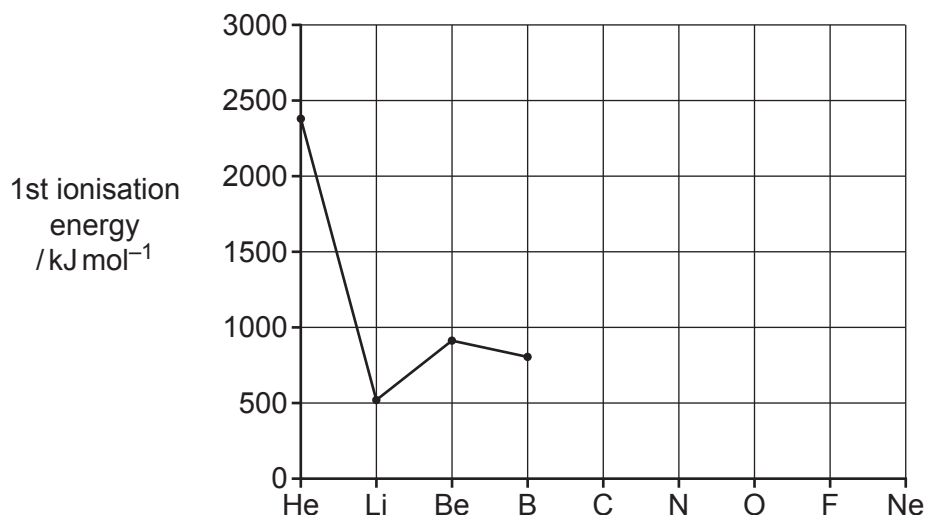
In **Table 9.2** below, add a tick (✓) below the ionisation numbers that are responsible for removing an electron from a full orbital in a magnesium atom.

Ionisation number	1	2	3	4	5	6	7	8	9	10	11	12

Table 9.2

[1]

- 10 The graph shows the first ionisation energies for elements from helium, He, to boron, B, in the periodic table.



- (a) Complete the graph for C, N, O, F and Ne.

[2]

- (b) Estimate the energy required to form **one** $\text{Li}^+(\text{g})$ ion from one $\text{Li}(\text{g})$ atom.

Give your answer in kJ, in standard form, and to **two** significant figures.

energy = ... kJ [1]

- (c) Explain why the first ionisation energies of He and Be are both higher than the first ionisation energy of Li.

Explanation for He:

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Explanation for Be:

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[4]

(d) Explain why the first ionisation energy of Be is higher than the first ionisation energy of B.

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..... **[2]**

11 Which element has the largest third ionisation energy?

- A** Li
- B** F
- C** Ne
- D** Na

Your answer

[1]

12(a) The first and second ionisation energies of magnesium, Mg, and strontium, Sr, in Group 2 are given in the table below.

Element	First ionisation energy /kJ mol ⁻¹	Second ionisation energy /kJ mol ⁻¹
Mg	+738	+1451
Sr	+550	+1064

- Explain why the first ionisation energy of Mg is greater than the **first** ionisation energy of Sr.
- Explain why the second ionisation energy of Sr is greater than the **first** ionisation energy of Sr.

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..... [4]

- 13 Oxygen has the electron configuration $1s^2 2s^2 2p^4$.

How are the electrons in an atom of oxygen arranged in the p-orbitals?

A



B



C



D



Your answer

[1]

- 14 The table shows the number of protons and neutrons in four different atoms.

Atom	Number of protons	Number of neutrons
W	17	18
X	18	18
Y	19	18
Z	18	19

Which two atoms are isotopes of the same element?

- A W and X
- B X and Y
- C X and Z
- D Y and Z

Your answer

[1]

15(a) The table shows the first ionisation energies for the elements in Period 3.

Element	Na	Mg	Al	Si	P	S	Cl	Ar
First ionisation energy / kJ mol^{-1}	496	738	578	789	1012	1000	1251	1521

- (i) Write an equation to represent the first ionisation energy of sulfur. Include state symbols.

..... [1]

- (ii) The table shows that there is a general increase in first ionisation energies across Period 3, but that this trend is **not** followed by phosphorus to sulfur.

Explain why the first ionisation energy of sulfur is **lower** than the first ionisation energy of phosphorus.

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..... [2]