



- (c) Draw a diagram to show how the particles are arranged in aluminium and explain why aluminium is malleable.  
(You should show a minimum of six aluminium particles arranged in two dimensions.)

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(3 marks)

- (d) Explain why the melting point of aluminium is higher than the melting point of sodium.

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(3 marks)

2 Trends in physical properties occur across all Periods in the Periodic Table.  
This question is about trends in the Period 2 elements from lithium to nitrogen.

- (a) Identify, from the Period 2 elements lithium to nitrogen, the element that has the largest atomic radius.

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(1 mark)

- (b) (i) State the general trend in first ionisation energies for the Period 2 elements lithium to nitrogen.

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(1 mark)

- (ii) Identify the element that deviates from this general trend, from lithium to nitrogen, and explain your answer.

Element .....

Explanation .....

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(3 marks)

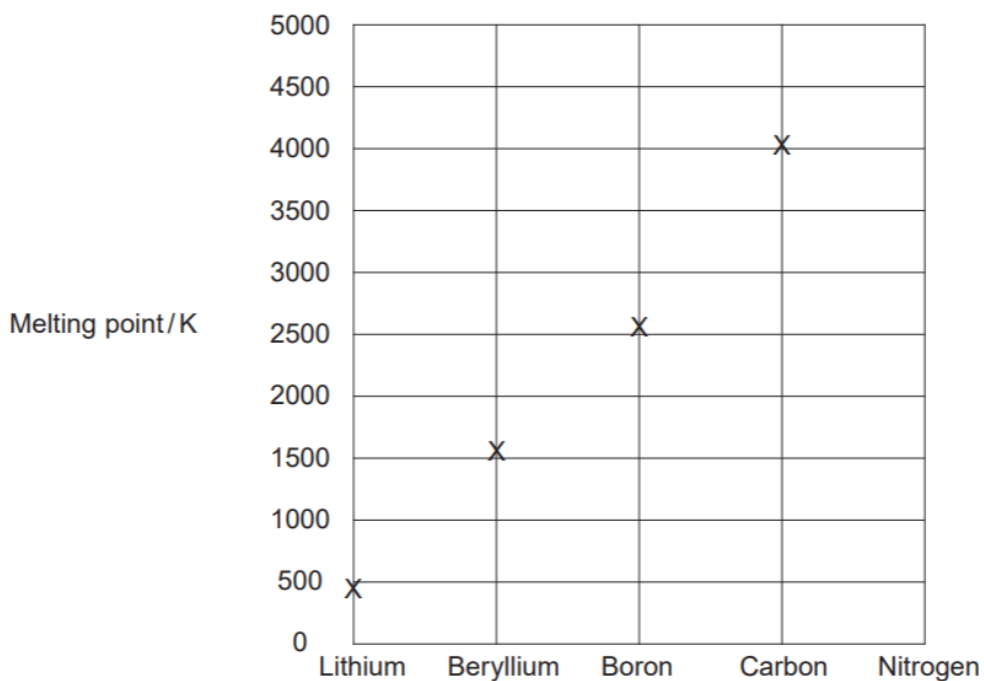
- (c) Identify the Period 2 element that has the following successive ionisation energies.

	First	Second	Third	Fourth	Fifth	Sixth
Ionisation energy /kJ mol <sup>-1</sup>	1090	2350	4610	6220	37 800	47 000

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(1 mark)

- (d) Draw a cross on the diagram to show the melting point of nitrogen.



(1 mark)

- (e) Explain, in terms of structure and bonding, why the melting point of carbon is high.

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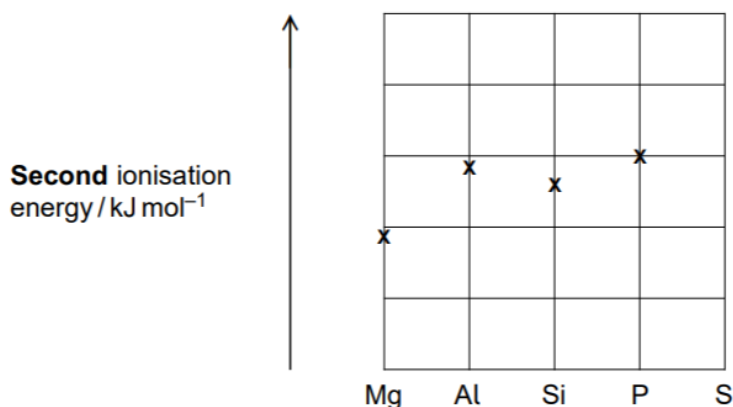
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(3 marks)

- 3 (a) Use your knowledge of electron configuration and ionisation energies to answer this question.  
The following diagram shows the **second** ionisation energies of some Period 3 elements.



- (i) Draw an 'X' on the diagram to show the **second** ionisation energy of sulfur. (1 mark)

- (ii) Write the full electron configuration of the  $\text{Al}^{2+}$  ion.

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(1 mark)

- (iii) Write an equation to show the process that occurs when the **second** ionisation energy of aluminium is measured.

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(1 mark)

- (iv) Give **one** reason why the **second** ionisation energy of silicon is lower than the **second** ionisation energy of aluminium.

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(1 mark)

- (b) Predict the element in Period 3 that has the highest **second** ionisation energy. Give a reason for your answer.

Element .....

Reason .....

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(2 marks)

- (c) The following table gives the successive ionisation energies of an element in Period 3.

	First	Second	Third	Fourth	Fifth	Sixth
Ionisation energy /kJ mol <sup>-1</sup>	786	1580	3230	4360	16 100	19 800

Identify this element.

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(1 mark)

- (d) Explain why the ionisation energy of every element is endothermic.

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(1 mark)

4 The elements in Period 2 show periodic trends.

- (a) Identify the Period 2 element, from carbon to fluorine, that has the largest atomic radius. Explain your answer.

Element .....

Explanation .....

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(3 marks)

- (b)** State the general trend in first ionisation energies from carbon to neon.  
Deduce the element that deviates from this trend and explain why this element deviates from the trend.

Trend .....

Element that deviates .....

Explanation .....

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*(4 marks)*

- (c)** Write an equation, including state symbols, for the reaction that occurs when the first ionisation energy of carbon is measured.

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*(1 mark)*

- (d)** Explain why the second ionisation energy of carbon is higher than the first ionisation energy of carbon.

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*(1 mark)*

- (e)** Deduce the element in Period 2, from lithium to neon, that has the highest second ionisation energy.

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*(1 mark)*