

Q1. (a) State the meaning of the term *first ionisation energy* of an atom.

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(2)

(b) Complete the electron arrangement for the Mg^{2+} ion.

$1s^2$

(1)

(c) Identify the block in the Periodic Table to which magnesium belongs.

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(1)

(d) Write an equation to illustrate the process occurring when the **second** ionisation energy of magnesium is measured.

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(1)

(e) The Ne atom and the Mg^{2+} ion have the same number of electrons. Give **two** reasons why the first ionisation energy of neon is lower than the third ionisation energy of magnesium.

Reason 1

Reason 2

(2)

(f) There is a general trend in the first ionisation energies of the Period 3 elements, Na – Ar

(i) State and explain this general trend.

Trend

Explanation

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(ii) Explain why the first ionisation energy of sulphur is lower than would be predicted from the general trend.

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(5)
(Total 12 marks)

Q2. Which one of the following statements is correct?

- A** The first ionisation energies of the elements in Period 3 show a general decrease from sodium to chlorine.
- B** The electronegativities of Group 2 elements decrease from magnesium to barium.
- C** The strength of the intermolecular forces increases from hydrogen fluoride to hydrogen chloride.
- D** The ability of a halide ion to act as a reducing agent decreases from fluoride to iodide.

(Total 1 mark)

Q3. (a) When aluminium is added to an aqueous solution of copper(II) chloride, CuCl_2 , copper metal and aluminium chloride, AlCl_3 , are formed. Write an equation to represent this reaction.

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(1)

- (b) (i) State the general trend in the first ionisation energy of the Period 3 elements from Na to Ar.

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- (ii) State how, and explain why, the first ionisation energy of aluminium does not follow this general trend.

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(4)

- (c) Give the equation, including state symbols, for the process which represents the second ionisation energy of aluminium.

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(1)

- (d) State and explain the trend in the melting points of the Period 3 metals Na, Mg and Al.

Trend

Explanation

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(3)

(Total 9 marks)

Q4. This question is about the elements in Period 3 from Na to P

(a) (i) Explain the meaning of the term *first ionisation energy*.

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(2)

(ii) State and explain the general trend in first ionisation energies for the elements Na to P

Trend

Explanation

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(3)

(iii) State which one of the elements from Na to P deviates from this general trend and explain why this occurs.

Trend

Explanation

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(3)

(b) State which one of the elements from Na to P has the highest melting point and explain your answer.

Element

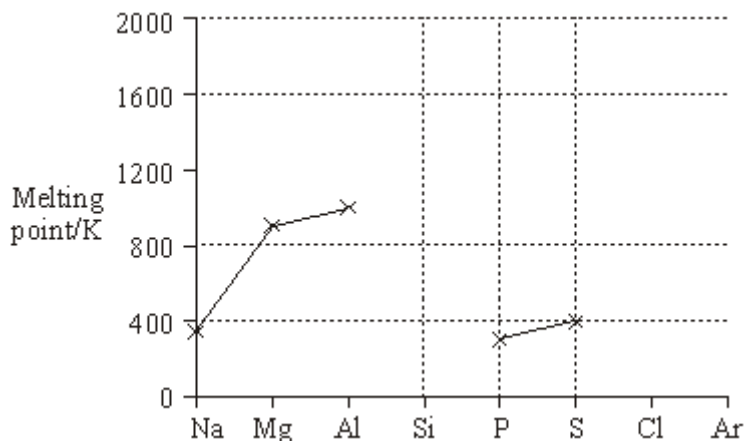
Explanation

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(3)

(Total 11 marks)

- Q5.** (a) The diagram below shows the melting points of some of the elements in Period 3.



- (i) On the diagram, use crosses to mark the approximate positions of the melting points for the elements silicon, chlorine and argon. Complete the diagram by joining the crosses.

- (ii) By referring to its structure and bonding, explain your choice of position for the melting point of silicon.

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- (iii) Explain why the melting point of sulphur, S₈, is higher than that of phosphorus, P₄.

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(8)

- (b) State and explain the trend in melting point of the Group II elements Ca–Ba.

Trend

Explanation

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(3)
(Total 11 marks)

Q6. The elements phosphorus, sulfur, chlorine and argon are in the p block of the Periodic Table.

(a) State why these elements are classified as p block elements.

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(1)

(b) State the trend in atomic radius from phosphorus to chlorine and explain the trend.

Trend

Explanation

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(3)

(c) In terms of structure and bonding, explain why sulfur has a higher melting point than phosphorus.

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(3)

- (d) In terms of atomic structure, explain why the van der Waals' forces in liquid argon are very weak.

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(2)
(Total 9 marks)