

Q1. (a) (i) Complete the electronic configuration of aluminium.

1s²

(ii) State the block in the Periodic Table to which aluminium belongs.

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(2)

(b) Describe the bonding in metals.

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(2)

(c) Explain why the melting point of magnesium is higher than that of sodium.

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(3)

(d) Explain how metals conduct electricity.

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(2)
(Total 9 marks)

Q2. (a) Explain why certain elements in the Periodic Table are classified as p-block elements. Illustrate your answer with an example of a p-block element and give its electronic configuration.

(3)

(b) Explain the meaning of the term *periodicity* as applied to the properties of rows of elements in the Periodic Table. Describe and explain the trends in atomic radius, in electronegativity and in conductivity for the elements sodium to argon.

(13)

(Total 16 marks)

Q3. (a) State the meaning of the term *electronegativity*.

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(2)

(b) State and explain the trend in electronegativity values across Period 3 from sodium to chlorine.

Trend

Explanation

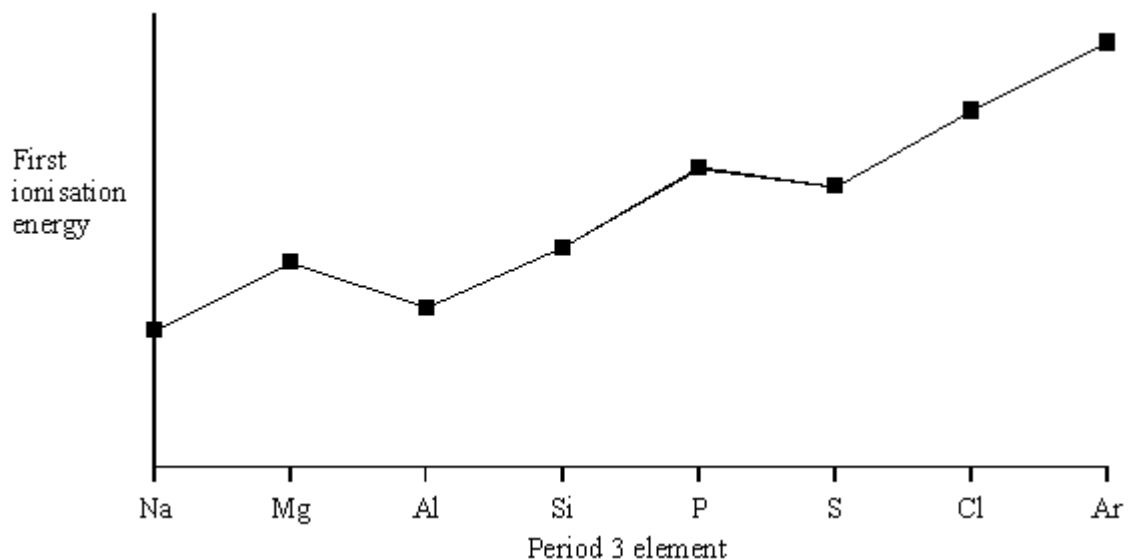
(3)

(c) What is meant by the term *first ionisation energy*?

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(2)

(d) The diagram below shows the variation in first ionisation energy across Period 3.



(i) What is the maximum number of electrons that can be accommodated in an s sub-level?

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(ii) What evidence from the diagram supports your answer to part (d)(i)?

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(iii) What evidence from the diagram supports the fact that the 3p sub-level is higher in energy than the 3s?

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(iv) What evidence from the diagram supports the fact that no more than three unpaired electrons can be accommodated in the 3p sub-level?

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(5)
(Total 12 marks)

Q4. (a) **P** and **Q** are oxides of Period 3 elements.

Oxide **P** is a solid with a high melting point. It does not conduct electricity when solid but does conduct when molten or when dissolved in water. Oxide **P** reacts with water forming a solution with a high pH.

Oxide **Q** is a colourless gas at room temperature. It dissolves in water to give a solution with a low pH.

(i) Identify **P**. State the type of bonding present in **P** and explain its electrical conductivity. Write an equation for the reaction of **P** with water.

(ii) Identify **Q**. State the type of bonding present in **Q** and explain why it is a gas at room temperature. Write an equation for the reaction of **Q** with water.

(9)

(b) **R** is a hydroxide of a Period 3 element. It is insoluble in water but dissolves in both aqueous sodium hydroxide and aqueous sulphuric acid.

(i) Give the name used to describe this behaviour of the hydroxide.

(ii) Write equations for the reactions occurring.

(iii) Suggest why **R** is insoluble in water.

(6)
(Total 15 marks)

