Chemistry

Standard level

Paper 2

Practice paper

Topic: Periodicity (Topic 3)

1. The table below lists atomic radii for the elements of Period 3.

Na	Mg	Al	Si	P	S	Cl	Ar
186	160	143	118	110	102	99	97

Atomic Radius / pm

(a) Explain the decrease in atomic radius across Period 3 from Sodium to Chlorine. **[3]**

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(b) Explain why Argon is not typically included when discussing trends in electronegativity. **[1]**

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2. Consider the species: O^{2-}, F^{-}, Na^{+}, and Mg^{2+}.

(a) Compare the electron configurations of these four ions. **[1]**

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(b) Explain why Mg^{2+} is the smallest species among those listed. **[2]**

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3. Aluminum oxide, Al_2O_3, is an amphoteric oxide.

(a) Write balanced chemical equations to demonstrate its reactions with hydrochloric acid (HCl) and sodium hydroxide (NaOH). **[2]**

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4. Potassium is more reactive than Sodium.

(a) State the balanced equation for the reaction of Potassium with water. **[1]**

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(b) Using the trend in ionization energy, explain why Potassium reacts more vigorously than Sodium. **[2]**

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5. An unknown Period 3 element has the following successive ionization energies (kJ $mol^{-}1$): 496, 4562, 6912, 9543...

(a) Identify the element and deduce its group number. **[2]**

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(b) Explain the large jump in energy between the first and second ionization energies. **[2]**

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6. Periodic trends are also observed in physical properties such as melting point.

(a) Explain why Silicon has a significantly higher melting point than Phosphorus. **[2]**

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(b) Explain why Argon has the lowest melting point in Period 3. **[2]**

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7. Halogens react with alkali metals to form salts.

(a) Write a balanced chemical equation for the reaction between Sodium and Chlorine. **[1]**

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(b) Describe the bonding in the product formed. **[1]**

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8. Sodium and Aluminum are both metals in Period 3.

(a) Compare the metallic bonding in Sodium and Aluminum. **[2]**

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(b) Deduce which metal has the higher electrical conductivity and explain your choice. **[2]**

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