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CHEMISTRY

INORGANIC CHEMISTRY

Level & Board	AQA (A-LEVEL)
TOPIC:	PROPERTIES OF PERIOD 3 ELEMENTS
PAPER TYPE:	QUESTION PAPER - 1
TOTAL QUESTIONS	10
TOTAL MARKS	43

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Properties of Period 3 Elements and their Oxides

1. Phosphorus(V) oxide has a lower melting point than sodium oxide.

(a) State the structure of and bonding in phosphorus(V) oxide.

(2)

(b) Explain why the melting point of phosphorus(V) oxide is low.

(1)

2. State and explain the trend in electronegativities across Period 3 from sodium to sulfur.

(4)

3. Explain why the oxides of the Period 3 elements sodium and phosphorus have different melting points.

In your answer you should discuss the structure of and bonding in these oxides, and the link between electronegativity and the type of bonding.

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(6)

4. Which is the formula of the main aluminium-containing species present when aluminium oxide is added to an excess of water?

- A. $[\text{Al}(\text{H}_2\text{O})_6]^{3+}(\text{aq})$
- B. $\text{Al}(\text{H}_2\text{O})_3(\text{OH})_3(\text{s})$
- C. $[\text{Al}(\text{H}_2\text{O})_2(\text{OH})_4]^{-}(\text{aq})$
- D. $\text{Al}_2\text{O}_3(\text{s})$

(1)

5. Explain, in terms of their type of structure and bonding, why P_4O_{10} can be vaporised by gentle heat but SiO_2 cannot.

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(4)

6. Write an equation for the reaction between.

(a) MgO and HNO_3

(1)

(b) SiO_2 and NaOH

(1)

(c) Na_2O and H_3PO_4

(1)

7. State how the melting point of phosphorus(V) oxide compares with that of silicon dioxide.

Explain your answer in terms of the structure of, and the bonding in, phosphorus(V) oxide.

(3)

8. By reference to the structure of, and the bonding in, silicon dioxide, suggest why it is insoluble in water.

(3)

9. State the type of bonding in magnesium oxide.

Outline a simple experiment to demonstrate that magnesium oxide has this type of bonding.

(3)

10. There is a link between the properties of the oxides of the Period 3 elements and their structure and bonding.

The table below shows the melting points of the oxides of some Period 3 elements.

	Na ₂ O	SiO ₂	P ₄ O ₁₀
T _m /K	1548	1883	573

(a) In terms of crystal structure and bonding, explain in each case why the melting points of sodium oxide and silicon dioxide are high.

(4)

(b) Predict whether the melting point of lithium oxide is higher than, the same as, or lower than the melting point of sodium oxide and explain your prediction.

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(3)

(c) Separate samples of phosphorus(V) oxide and sodium oxide were reacted with water.

In each case, predict the pH of the solution formed and write an equation for the reaction.

(4)

(d) Write an equation for the reaction between Na_2O and P_4O_{10}
State the general type of reaction illustrated by this example.

(2)

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