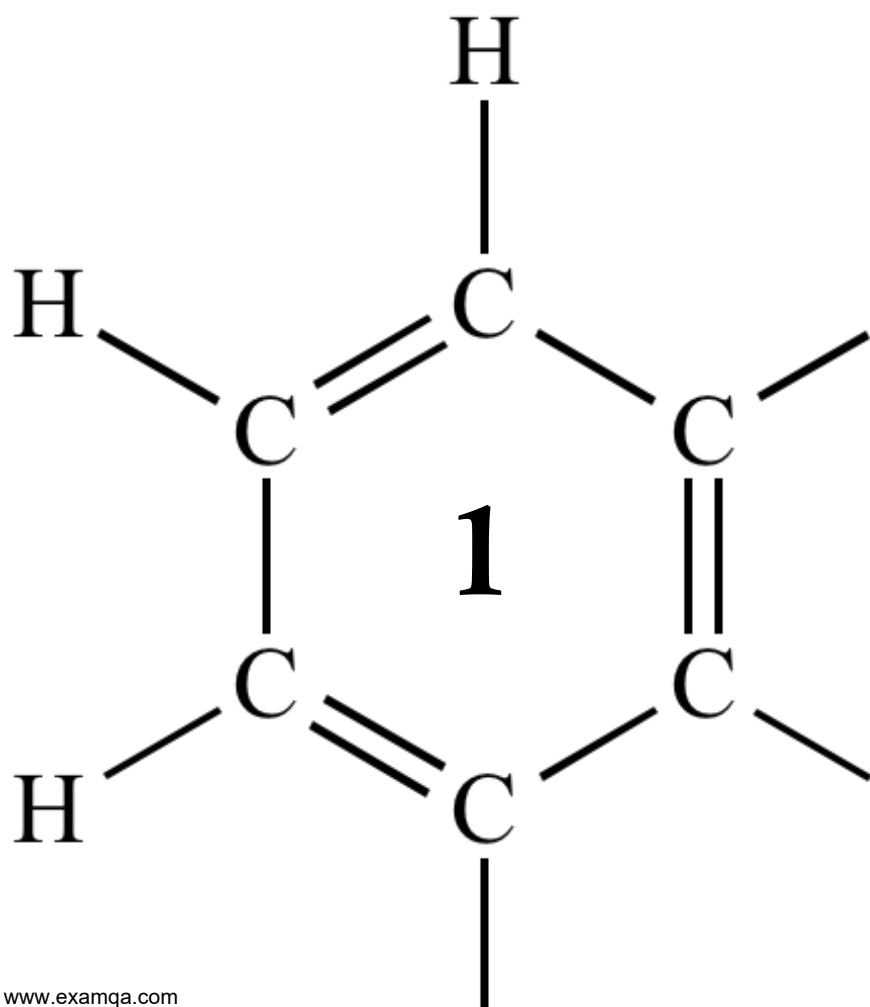


AQA A2 CHEMISTRY
PERIOD 3 OXIDES



1

This question is about the elements in Period 3 from sodium to phosphorus (Na to P) and their oxides.

(a) Element **X** forms an oxide that has a low melting point. This oxide dissolves in water to form an acidic solution.

(i) Deduce the type of bonding in this oxide of **X**.

.....

(1)

(ii) Identify element **X**.

.....

(1)

(iii) Write an equation for the reaction between this oxide of **X** and water.

.....

(1)

(b) Element **Y** reacts vigorously with water. An oxide of **Y** dissolves in water to form a solution with a pH of 14.

(i) Deduce the type of bonding in this oxide of **Y**.

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(1)

(ii) Identify element **Y**.

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(1)

(iii) Write an equation for the reaction of element **Y** with water.

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(1)

(iv) Write an equation for the reaction of this oxide of **Y** with hydrochloric acid.

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(1)

(c) Element **Z** forms an amphoteric oxide that has a very high melting point.

(i) Deduce the type of bonding in this oxide of **Z**.

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(1)

(ii) Write the formula of this amphoteric oxide.

.....

(1)

(iii) State the meaning of the term amphoteric.

.....

(1)

(iv) Write two equations to show the amphoteric nature of the oxide of **Z**.

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(2)

(Total 12 marks)

2

(a) Explain why the atomic radii of the elements decrease across Period 3 from sodium to chlorine.

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(2)

(b) Explain why the melting point of sulfur (S_8) is greater than that of phosphorus (P_4).

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(2)

(c) Explain why sodium oxide forms an alkaline solution when it reacts with water.

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(2)

(d) Write an ionic equation for the reaction of phosphorus(V) oxide with an excess of sodium hydroxide solution.

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(1)

(Total 7 marks)

3

(a) Write an equation for the reaction that occurs when magnesium is heated in steam. Describe what you would observe when this reaction occurs.

Equation

Observations

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.....

(3)

- (b) Write an equation for the reaction that occurs when sodium is heated in oxygen. Describe what you would observe when this reaction occurs.

Equation

Observations

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.....

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(3)
(Total 6 marks)

4

- (a) The table below contains data that show a trend in the melting points of some oxides of the Period 3 elements.

Oxide	Sodium oxide	Magnesium oxide	Aluminium oxide	Silicon(IV) oxide	Phosphorus(V) oxide	Sulfur(IV) oxide
Melting point / K		3125	2345	1883	573	

- (i) Use data from the table above to predict an approximate melting point for sodium oxide.

Tick (✓) **one** box.

250 K

500 K

1500 K

3500 K

(1)

(ii) Explain, in terms of structure and bonding, why sodium oxide has a high melting point.

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(2)

(iii) Use data from the table above to predict a value for the melting point of sulfur(IV) oxide.

Suggest, in terms of structure and bonding, why the melting point of sulfur(IV) oxide is different from that of phosphorus(V) oxide.

Predicted melting point of sulfur(IV) oxide

Why the melting point is different from phosphorus(V) oxide

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(3)

(b) Write an equation for the reaction of sulfur(IV) oxide with water.

Suggest the pH value of the resulting solution.

Equation

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pH value

(2)

(c) Silicon(IV) oxide is insoluble in water.

Explain, using an equation, why silicon(IV) oxide is classified as an acidic oxide.

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(2)
(Total 10 marks)

5

This question is about some Period 3 elements and their oxides.

(a) Describe what you would observe when, in the absence of air, magnesium is heated strongly with water vapour at temperatures above 373 K.
Write an equation for the reaction that occurs.

Observations

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Equation

(3)

(b) Explain why magnesium has a higher melting point than sodium.

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(Extra space)

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(2)

- (c) State the structure of, and bonding in, silicon dioxide.
Other than a high melting point, give **two** physical properties of silicon dioxide that are characteristic of its structure and bonding.

Structure

Bonding.....

Physical property 1.....

Physical property 2.....

(4)

- (d) Give the formula of the species in a sample of solid phosphorus(V) oxide.
State the structure of, and describe fully the bonding in, this oxide.

Formula

Structure

Bonding.....

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(4)

- (e) Sulfur(IV) oxide reacts with water to form a solution containing ions.

Write an equation for this reaction.

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(1)

- (f) Write an equation for the reaction between the acidic oxide, phosphorus(V) oxide, and the basic oxide, magnesium oxide.

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(1)

(Total 15 marks)