InkChemistry

QUESTION WORKBOOK

# The Period 3 elements: reactions with oxygen and water

Periodicity and Period 3 · Unit C12

AQA 3.2.4

19 questions · 65 marks

PRINT EDITION

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## SECTION B · Standard, 3 to 5 marks

**B1** PER-Q1

Describe what is seen when a small piece of sodium is added to water containing universal indicator. Give an equation with state symbols for the reaction, and the pH of the solution left. [5]

**B2** PER-Q6

Describe what is seen when sulfur is burned in oxygen and when white phosphorus is exposed to air at about 30 °C, naming the product each time. [4]

**B3** PER-Q12

Deduce the oxidation state of the Period 3 element in $Na_2O$, $P_4O_{10}$, $SO_2$ and $SO_3$. Explain why $SO_2$ can be oxidised further but $P_4O_{10}$ cannot. [4]

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**B4** PER-Q18 Outline how magnesium can be reacted with steam in a school laboratory, including one safety precaution. [4]

**B5** PER-Q3 Explain why the solution formed when magnesium reacts with cold water has a pH of about 10, whereas the solution formed from sodium has a pH of 13 to 14. [3]

**B6** PER-Q4 Explain why magnesium reacts much faster with steam than with cold water, and why the magnesium-containing product is different. [3]

**B7** PER-Q5 Describe what is seen when steam is passed over heated magnesium, and give an equation, with state symbols, for the reaction. [3]

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**B8** PER-Q7 Give equations, with state symbols, for the reactions of aluminium, silicon and phosphorus with excess oxygen. [3]

**B9** PER-Q9 Calculate the volume of hydrogen, at room temperature and pressure, produced when 0.345 g of sodium reacts completely with water. Molar gas volume is 24.0 $dm^3$ $mol^{-1}$. [3]

**B10** PER-Q10 Calculate the mass of phosphorus(V) oxide, $P_4O_{10}$, formed when 1.24 g of white phosphorus burns in excess oxygen. [3]

**B11** PER-Q11 Deduce the empirical formula of the oxide formed when 0.540 g of aluminium powder burns in excess oxygen to give 1.020 g of oxide. [3]

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**B12** PER-Q14 Suggest why a sheet of aluminium does not burn when held in a Bunsen flame, but aluminium powder sprinkled into the flame burns brightly. Give the equation, with state symbols, for the reaction of the powder. [3]

**B13** PER-Q15 Suggest why sodium is stored under oil but white phosphorus is stored under water. [3]

**B14** PER-Q16 Compare the reactions of sodium and magnesium with cold water. [3]

**B15** PER-Q17 Explain why white phosphorus catches fire in air at about 30 °C, while red phosphorus can be kept in air on the side of a matchbox. [3]

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**B16** PER-Q19 Explain the change in the oxidation state of the Period 3 element across the chlorides NaCl, $MgCl_2$, $AlCl_3$, $SiCl_4$ and $PCl_5$, formed when sodium to phosphorus react with excess chlorine. [3]

**B17** PER-Q20 Calculate the volume of chlorine, at room temperature and pressure, that reacts with 0.496 g of white phosphorus to form $PCl_5$. The equation is $P_4(s) + 10Cl_2(g) \rightarrow 4PCl_5(s)$. Molar gas volume is 24.0 $dm^3\ mol^{-1}$. [3]

**B18** PER-Q21 Suggest why, when aluminium chloride is made by passing dry chlorine over heated aluminium, the product collects in the cooler part of the tube, away from the metal, and why the chlorine must be dry. Give the formula of the species present in the vapour. [3]

## SECTION C · Long, 6 marks or more

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**C1**
PER-Q22

Describe the reactions of sodium, magnesium, aluminium, silicon, phosphorus and sulfur with oxygen. Explain why they differ in how readily they start, and how the formula of each oxide follows from the element's outer electrons. [6]

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