

AS Level Chemistry B
H033/02 Chemistry in depth

Question Set 5

5 Chemists have arranged the elements into a Periodic Table which allows them to make predictions about the behaviour of the elements and their compounds.

(a) Many properties, such as first ionisation enthalpy, show a gradual change across a **period**.

(i) Write an equation representing the first ionisation enthalpy of sodium.

Show state symbols.

[2]

(ii) Explain the **general** increase in first ionisation enthalpy across Period 3 (sodium to argon).

[2]

(b) Elements in a **group** often show similar properties.

The Group 2 element calcium reacts with water to produce a solution of calcium hydroxide and bubbles of hydrogen gas.

Predict a chemical equation for the reaction of radium, Ra, with water.

Include state symbols.

[1]

(c) Mendeleev first proposed his Periodic Table in 1869. He left gaps for elements which he predicted would be discovered later.

One such element was in a gap immediately below silicon and he called it 'eka-silicon'.

Predict the formula of the oxide of eka-silicon, giving a reason.

Use **X** as the symbol for eka-silicon.

Formula

Reason [2]

(d)* A student is asked to identify a solid Group 2 compound, **A**.

The student carries out the following tests.

1. A very small amount of the solid is added to 2 cm depth of water in a test tube. Compound **A** partly dissolves. A couple of drops of universal indicator are added which show a pH of 11.
2. The student carries out a titration to calculate the M_r of the compound and hence identify the Group 2 element present.

0.092 g of compound **A** is dissolved in water and made up to 250 cm³. 25.0 cm³ samples of this solution are titrated with 0.0100 mol dm⁻³ hydrochloric acid giving a mean titre of 24.80 cm³.

Identify compound **A**, giving reasons in full for your choice and including a chemical equation for the reaction in the titration.

[6]

- (e) Calculate the volume of gas (in cm³ at RTP) produced when 0.493 g of barium carbonate, BaCO₃, is reacted with an excess of hydrochloric acid. (*M_r* of BaCO₃ = 197.2)



volume of gas =cm³ [1]

Total Marks for Question Set 5: 14



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