09 Salts

Set B **Answer key**

A Multiple choice

3 MARKS

1 **D** silver nitrate and dilute hydrochloric acid [1]

Silver chloride is insoluble, so it is precipitated from two solutions. Potassium reacts violently with acid, copper does not react with dilute acids, and insoluble calcium sulfate coats the calcium oxide.

2 **C** copper(II) carbonate and dilute nitric acid [1]

Copper(II) nitrate is soluble, so an excess of insoluble copper(II) carbonate is added to the acid and filtered off. Copper does not react with dilute acid, and potassium nitrate is not an acid.

3 **B** copper(II) carbonate and hydrochloric acid [1]

Copper(II) chloride is soluble, so an excess of insoluble copper(II) carbonate is reacted with the acid and filtered off. Copper does not react with dilute acid, and the soluble salts in D give no precipitate to separate.

B Structured questions

23 MARKS

4 **(a)** The colourless sodium sulfate solution turns green. [1]

(b) The concentrations of H^+ and OH^- ions are equal. [1]

(c) Pipette 25.0 cm^3 of aqueous sodium hydroxide into a conical flask, add 1 to 2 drops of methyl orange, and fill a burette with dilute sulfuric acid. [1]

Add the acid slowly while swirling, until 1 drop turns the indicator from yellow to orange: the end-point. [1]

Record the volume of acid needed, $(V_2 - V_1)$ cm^3. [1]

Repeat with 25.0 cm^3 of sodium hydroxide and $(V_2 - V_1)$ cm^3 of acid, without the indicator.

Heat until saturated, cool to crystallise, filter, wash with a little cold distilled water and dry the crystals with filter paper. [1] [1]

5

With constant stirring, add excess magnesium to dilute nitric acid until no more effervescence is observed. [1]

Filter to remove the excess magnesium as the residue, and collect the filtrate, magnesium nitrate solution. [1]

Heat the filtrate until it is saturated, then allow it to cool and crystallise. [1]

Filter to collect the crystals, wash them with a little cold distilled water and dry them between sheets of filter paper. [1]

6

Lead(II) nitrate, $Pb(NO_3)_2$, and sodium iodide, NaI (any two soluble salts containing Pb^{2+} and I^- ions). [1]

Add excess aqueous lead(II) nitrate to aqueous sodium iodide and stir until no more precipitate forms. Filter the mixture to collect the lead(II) iodide precipitate. [1]

Wash the precipitate with distilled water to remove impurities, and dry it between a few sheets of filter paper. [1]

$Pb^{2+}(aq) + 2I^-(aq) \rightarrow PbI_2(s)$ [1]

7 **(a)**

Filter the mixture to remove the excess barium carbonate and obtain barium chloride solution as the filtrate. [1]

Heat the filtrate to form a saturated solution, then cool it to allow crystals to form. [1]

Filter to obtain the crystals, wash them with a little cold distilled water and dry them between sheets of filter paper. [1]

(b)

Barium carbonate reacts with the acid in the stomach to form (soluble) barium ions, which are toxic. [1]

(c)

M_r of $BaCl_2 = 137 + 2(35.5) = 208$ and M_r of $BaCl_2 \cdot 2H_2O = 208 + 2(18) = 244$ [1]

Mass of $BaCl_2 = \frac{208}{244} \times 4.88 = 4.16$ g [1]

(d)(i)

$Ba(OH)_2(aq) + H_2SO_4(aq) \rightarrow BaSO_4(s) + 2H_2O(l)$ [1]

(ii)

A white precipitate is observed. [1]