09 Salts

Set A **Answer key**

A From the lesson

6 MARKS

1 **C** silver chloride [1]

Silver chloride is one of the two insoluble chlorides. All ammonium salts, all nitrates and all sodium salts are soluble.

2 **C** titration of aqueous potassium hydroxide with dilute sulfuric acid [1]

Potassium sulfate and all its starting materials are soluble, so titration is used. Potassium reacts violently with acids, an excess of soluble potassium carbonate cannot be filtered off, and precipitation is only for insoluble salts.

3 **(a)** Any two of barium sulfate, lead(II) sulfate and calcium sulfate. [1]

(b) So that all the acid is used up and the salt is not contaminated with acid. [1]

(c) Titration of dilute hydrochloric acid with aqueous sodium hydroxide. [1]

(d) $Ba^{2+}(aq) + SO_4{}^{2-}(aq) \rightarrow BaSO_4(s)$ [1]

B Practice

14 MARKS

4 **D** lead(II) nitrate and sodium sulfate [1]

Lead(II) sulfate is insoluble, so it is made by precipitation from two solutions. Lead(II) nitrate and sodium sulfate are both soluble.

With lead metal or lead(II) carbonate, a coating of insoluble lead(II) sulfate stops the reaction. Lead(II) chloride and barium sulfate are both insoluble, so they do not react.

5 **B** The indicator is an impurity and will lead to impure crystals. [1]

The indicator is a foreign substance in the reaction mixture, so it would contaminate the salt.

6

C magnesium chloride from magnesium nitrate and hydrochloric acid [1]

Magnesium nitrate and hydrochloric acid are both soluble and do not react to form a precipitate, so no magnesium chloride is separated. The other pairs are an acid with an insoluble carbonate, oxide or hydroxide.

7

C Add lead(II) carbonate to dilute nitric acid, then add dilute sulfuric acid, filter the mixture and wash the residue. [1]

First make soluble lead(II) nitrate, then precipitate insoluble lead(II) sulfate with sulfuric acid. The precipitate is the residue, so it is washed, not crystallised. Adding lead(II) carbonate straight to sulfuric acid forms a coating of lead(II) sulfate that stops the reaction.

8

D all soluble [1]

Titration is used when the acid, the base (an alkali) and the salt are all soluble.

9

D all soluble [1]

Titration needs every reactant and the salt to be soluble, so the carbonate must be a sodium, potassium or ammonium carbonate.

10

B potassium nitrate [1]

The filtrate contains excess Ba^{2+} and Cl^- ions, with Mg^{2+}. Sulfate gives barium sulfate, silver ions give silver chloride and carbonate gives insoluble carbonates. All nitrates and potassium salts are soluble.

11

Add excess zinc oxide to dilute nitric acid and stir until no more zinc oxide dissolves. Filter to remove the excess zinc oxide as the residue, and collect the filtrate (aqueous zinc nitrate).

Heat the filtrate to evaporate most of the water and obtain a saturated solution, then allow it to cool so that the salt crystallises. [1] [1]

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

12

Potassium chloride: reagent 2 is aqueous potassium hydroxide *or* potassium carbonate [1], and the method is titration. [1]

Lead(II) sulfate: reagent 2 is aqueous lead(II) nitrate [1], and the solid is obtained by filtration. [1]