Worksheet 8.4

# Gravimetric analysis problems

**NAME:** **CLASS:**

## INTRODUCTION

Analysis by precipitation sounds very simple, but, in practice, obtaining accurate results by this method requires planning and careful experimentation. The method involves considering such variables as the degree of solubility, the size of the precipitate particles formed and the possibility that other ions present might interfere.

Gravimetric analysis involves precipitating one of the ions of interest and weighing the precipitate. The amount of precipitate tells us the amount of the ion of interest that must have been present in the original solution. Sometimes the positive ion is precipitated, sometimes the negative ion.

| No. | Question | Answer |
|---|---|---|
| **1** | Gravimetric analysis cannot be used for solutions of sodium nitrate. Why is this? | |
| **2** | Silver nitrate solution is added to a solution containing a mixture of sodium chloride and potassium chloride.<br>**a** Write an ionic equation for the reaction that occurs between:<br>**i** silver nitrate and sodium chloride<br>**ii** silver nitrate and potassium chloride.<br>**b** Explain why this procedure can be used for an analysis of the chloride ion concentration, but not the potassium ion concentration. | |
| **3** | Most precipitates are not 100% insoluble. What is the main precaution taken during a gravimetric procedure to ensure that this does not affect the accuracy too much? | |

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| No. | Question | Answer |
|---|---|---|
| **4** | Use a solubility table to suggest a compound that could be added to each of the following solutions to produce a precipitate.<br>**a** $Na_2CO_3$<br>**b** $MgI_2$<br>**c** NaOH | |
| **5** | The sulfate content of fertiliser can be found by adding barium nitrate, $Ba(NO_3)_2$, to precipitate the sulfate as barium sulfate, $BaSO_4$.<br>**a** Write an ionic equation for the reaction between barium nitrate and sulfate ions.<br>**b** A student suggests that the sulfate content could also be found by boiling the water from a solution of the fertiliser and weighing the solid left behind. Why does this procedure not work? | |
| **6** | When barium sulfate is collected as a precipitate, care must be taken to use a filter paper that has very fine pores. Explain why this is needed. | |
| **7** | **a** Write an ionic equation for the reaction between silver nitrate and lithium chloride solutions.<br>**b** A solution contains 0.02 mole of lithium chloride. A student wishing to precipitate this lithium chloride adds 25 mL of 2 mol $L^{-1}$ silver nitrate solution. Has the student added an excess of silver nitrate? | |

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|---|---|---|
| **8** | An organic compound has a formula $C_8H_{15}Cl_3$. The purity of a sample of this compound is to be checked by the addition of silver nitrate to precipitate the chlorine atoms as silver chloride. It is difficult to write a complete, balanced equation for this reaction but fortunately only a partial equation is required.<br>**a** Write a partial equation for this process.<br>**b** A 2.0 g sample leads to 0.478 g of precipitate. Calculate the % purity by mass of the organic compound in the sample. | |
| **9** | A precipitate of $Fe_2O_3$ is obtained from an iron(III) chloride, $FeCl_3$, solution. The mass of precipitate obtained is 0.644 g.<br>**a** Write a partial equation for this reaction.<br>**b** If the mass of sample used was 2.0 g, determine the percentage by mass of iron(III) chloride in the sample. | |
| **10** | As households use more grey water on their gardens, the phosphorus content of the water becomes more relevant. Phosphorus can be precipitated as $Mg_2P_2O_7$. During an analysis of a water sample, the $Mg_2P_2O_7$ precipitate is found to weigh 0.744 g. What will be the effect on the calculated phosphorus content if:<br>**a** the precipitate is not completely dry?<br>**b** some of the precipitate passed through the filter paper? | |