Worksheet 8.4: Solutions

Gravimetric analysis problems

No.	Answer
1	Neither sodium nor nitrate ions form any insoluble compounds.
2	**a** **i** $Ag^{+}(aq) + Cl^{-}(aq) \rightarrow AgCl(s)$ **ii** $Ag^{+}(aq) + Cl^{+}(aq) \rightarrow AgCl(s)$ **b** Because chloride ions are in both compounds, the chloride concentration is measured correctly. The amount of chlorine is not equal to the amount of sodium or to the amount of potassium; therefore neither of these two metals can be analysed using this procedure.
3	Water for rinsing should be used sparingly. The more water used, the more precipitate that will dissolve and be lost.
4	There are many possible answers. For example: $Mg(NO_3)_2 \rightarrow MgCO_3(s)$ $AgNO_3 \rightarrow AgI(s)$ $CuSO_4 \rightarrow Cu(OH)_2(s)$
5	**a** $Ba^{2+}(aq) + SO_4^{2-}(aq) \rightarrow BaSO_4(s)$ **b** By simply removing the water, the positive ion is caught up in the remaining solid as well as the sulfate ion, and any other ionic substances that are in the fertiliser.
6	Barium sulfate can form very fine particles. These particles will pass through normal filter paper.
7	**a** $Ag^{+}(aq) + Cl^{-}(aq) \rightarrow AgCl(s)$ **b** $n(AgNO_3) = c \times V = 2.0 \times 0.025 = 0.050 \text{ mol} = n(Ag^{+})$ 0.02 mol of Ag^{+} reacts with 0.02 mol of Cl^{-}; hence $AgNO_3$ is in excess. There is no problem with adding excess silver nitrate. In fact, it is important to add an excess amount to ensure all the chloride is precipitated.
8	**a** $C_8H_{15}Cl_3 + 3Ag^{+}(aq) \rightarrow 3AgCl(s) + \ldots$ **b** $n(AgCl) = \frac{m}{M} = \frac{0.478}{143.35} = 0.003\,33 \text{ mol} = n(Ag^{+})$ $n(C_8H_{15}Cl_3) = \frac{1}{3} \times 0.003\,33 = 0.001\,11 \text{ mol}$ $m(C_8H_{15}Cl_3) = n \times M = 0.001\,11 \times 217.55 = 0.241 \text{ g}$ $\% \text{ purity} = \frac{0.241}{2.0} \times 100 = 12\%$
9	**a** $2FeCl_3(aq) + \ldots \rightarrow Fe_2O_3 + \ldots$ **b** $n(Fe_2O_3) = \frac{m}{M} = \frac{0.644}{159.7} = 0.004\,03 \text{ mol}$ $n(FeCl_3) = 2 \times n(Fe_2O_3) = 0.008\,06 \text{ mol}$ $m(FeCl_3) = n \times M = 0.008\,06 \times 162.3 = 1.31 \text{ g}$ $\% \text{ purity } FeCl_3 = \frac{1.31}{2.0} \times 100 = 66\%$

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10	**a** Mass will be too high; therefore the % P will be overestimated. **b** Precipitate will be lost; therefore the % P will be underestimated.