Experiment worksheet answers

4.3 The solubility rules predict the formation of precipitates

Pages 94–95 and 204

Experiment 4.3: Precipitation reactions

The expected results of these reactions are:

	NaCl	NaOH	Na_2SO_4	Na_2CO_3
$Ca(NO_3)_2$	–	$Ca(OH)_2$	–	$CaCO_3$
$Cu(NO_3)_2$	–	$Cu(OH)_2$	–	$CuCO_3$
$Mg(NO_3)_2$	–	$Mg(OH)_2$	–	$MgCO_3$
$AgNO_3$	AgCl	Ag(OH)	–	Ag_2CO_3
$CuSO_4$	–	$Cu(OH)_2$	–	$CuCO_3$

Note: the solubility of some of these solutions (e.g. $Ca(OH)_2$ and $Mg(OH)_2$) is dependent on their concentration, because small amounts will dissolve in water.

Discussion

1 The sets of compounds tested included a range of anions: NO_3^-, OH^-, CO_3^{2-}, Cl^- and SO_4^{2-}. Of these, which:

a did not form any precipitates?

All nitrates and sulfates were soluble.

b only formed precipitates with one or two cations?

Chloride ions and bromide ions formed a precipitate with silver cations only.

2 The sets of compounds tested included a range of cations: Na^+, Ag^+, Cu^{2+}, Ca^{2+} and Mg^{2+}. Of these, which:

a did not form any precipitates?

Potassium did not form any precipitates. (Depending on their concentration, magnesium and calcium may not have formed any precipitates.)

b formed precipitates with only one or two anions?

Calcium, copper, magnesium and iron only formed some precipitates.

3 Did the precipitation reactions you observed match those predicted from Table 4.1? Discuss why or why not.

Students' results will vary.

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4 Write balanced chemical equations for the reactions between:

a silver nitrate and sodium chloride

$$AgNO_3(aq) + NaCl(aq) \rightarrow AgCl(s) + NaCO_3(aq)$$

b magnesium nitrate and sodium hydroxide.

$$Mg(NO_3)_2(aq) + 2NaOH(aq) \rightarrow Mg(OH)_2(s) + 2NaNO_3(aq)$$

5 Why is it important not to touch the tip of the dropper bottles on the top of the solution already on the plastic sleeve?

Touching the end of the droppers on the plastic sleeve may contaminate the solution in the dropper. A precipitate will form that may affect the dropper or the results of the experiment.

6 What other factors may affect the outcome of these precipitation reactions?

Some solutions may have a partial solubility. The concentrations of the solutions may affect the results. Many senior chemistry students need to memorise the rules of solubility when they go on to further study. This can be encouraged early on using a range of memory tools.

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