

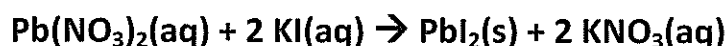
SOLUBILITY & PRECIPITATION REACTIONS

The same solubility table/rules apply when two ionic solutions are mixed together. For example if lead (II) nitrate and potassium iodide solutions are mixed, a yellow precipitate is produced. This is because when the solutions mix they make two new substances – lead (II) iodide and potassium nitrate, and one of these must be a **precipitate** (a product that is insoluble in water).

Using the solubility table, we can see that lead (II) iodide is in fact insoluble, while potassium nitrate is soluble. Thus the yellow precipitate must be the lead (II) iodide.

Let's look at this reaction:

Lead (II) Nitrate + Potassium Iodide → Lead (II) Iodide + Potassium Nitrate



The (s) subscript indicates it is insoluble and has formed a solid precipitate

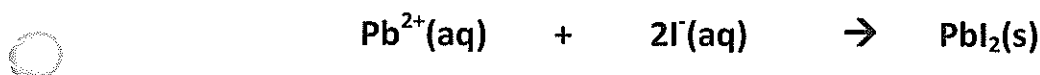
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Sometimes mixing two solutions together does not produce a precipitate – whereby both products are both soluble in water.

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* If the question asks to write the net ionic equation for the reaction that takes place, you can exclude the 'spectator ions' (which are any ions not involved in the production of the insoluble solid)

Therefore the equation above would be written as:



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Completely lost? Let's go back to writing reactions and knowing how to write the products.

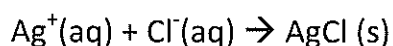
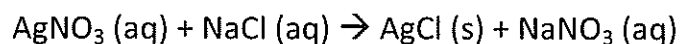
Chemical Reactions produce new substances. The reactants on the left hand side of the equation – must be different on the other side (the products)

REACTANTS → PRODUCTS

In ionic equations like the example above – the positive and negative charges of one solution will break apart and mix with the opposite charge of the other ionic solution – almost 'swapping' partners to make new solutions.



E.g. 2: Silver Nitrate + Sodium Chloride \rightarrow Silver Chloride + Sodium Nitrate



If given a word equation, it will take longer, as first you will need to write the chemical formula of the reactants – in order to work out the products produced.

TASK:

- Using the Solubility table determine which reactions below produce a precipitate.
- Write balanced equations for any that do produce a precipitate.
- If a precipitate does not form write 'no reaction'.

1. Calcium Chloride + Sodium Carbonate
2. Barium Hydroxide + Sulphuric Acid
3. Sodium Nitrate + Sodium Chloride
4. Potassium Nitrate + Lead (II) acetate (ethanoate)
5. Lead (II) Nitrate + lead (II) acetate
6. Sodium Hydroxide + Calcium Chloride
7. Ammonium Carbonate + Aluminium Nitrate
8. Magnesium Nitrate + Sodium Carbonate
9. Copper (II) Sulphate + Aluminium Chloride
10. Iron (II) Sulphate + Potassium Carbonate
11. Sodium Chloride + lead (II) nitrate
12. Barium Nitrate + potassium Sulphate
13. Lead (II) nitrate + Sodium Iodide
14. Copper (II) Chloride + Zinc Nitrate
15. Zinc Chloride + Potassium Carbonate
16. Ammonium Chloride + Potassium Nitrate

Read page 46.

Checkpoint 7.6 – 2 questions

Set 11 (page 48) – questions 1, 2, 3, 4, 5

Set 11 - Ionic solutions

1. For each ionic compound named, give the cations (positive ions) and anions (negative ions) it is composed of:

- a) $\text{Ca}(\text{OH})_2$ b) $\text{Fe}_2(\text{CO}_3)_3$ c) AlPO_4
 d) $\text{Cr}_2(\text{SO}_4)_3$ e) $\text{Ba}(\text{NO}_3)_2$ f) Rb_2CO_3

2. Give the cations and anions for each of the following compounds:

- a) Calcium phosphate b) Cobalt nitrate c) Nickel bromide

3. Complete the table below to indicate the formula of any precipitate formed when the solutions listed are mixed

	AgNO_3	$\text{Cu}(\text{NO}_3)_2$	$\text{Fe}(\text{NO}_3)_2$	$\text{Ba}(\text{NO}_3)_2$
K_2SO_4				
NaCl				
$(\text{NH}_4)_2\text{CO}_3$				
NaOH				

4. Write ionic equations for each of the following precipitate forming reactions. If no precipitate forms, write No Reaction.

- a) $\text{NaOH}(\text{aq}) + \text{Ni}(\text{NO}_3)_2(\text{aq})$ b) $\text{Pb}(\text{NO}_3)_2(\text{aq}) + \text{NH}_4^+(\text{aq})$
 c) $\text{CaSO}_4(\text{aq}) + \text{BaCl}_2(\text{aq})$ d) $\text{Hg}(\text{NO}_3)_2(\text{aq}) + \text{ZnI}_2(\text{aq})$

5. Write ionic equations for each of the following precipitate forming reactions. If no precipitate forms, write No Reaction.

- a) $\text{NiCl}_2(\text{aq}) + \text{Na}_2\text{S}(\text{aq})$ b) $\text{Al}_2(\text{SO}_4)_3(\text{aq}) + \text{Ba}(\text{OH})_2(\text{aq})$
 c) $\text{Ag}_2\text{SO}_4(\text{aq}) + \text{FeBr}_3(\text{aq})$ d) $\text{AlCl}_3(\text{aq}) + \text{Ba}(\text{OH})_2(\text{aq})$

For the experts