

Answers to Questions.

Question One:

Reaction 1.

The ions before mixing are $\text{Pb}^{2+}(\text{aq})$, $\text{NO}_3^-(\text{aq})$, $\text{Na}^+(\text{aq})$ and $\text{Cl}^-(\text{aq})$.

The precipitate formed when the solutions are mixed is lead chloride, $\text{PbCl}_2(\text{s})$.

The precipitate forms because $\text{Pb}^{2+}(\text{aq})$ react with $\text{Cl}^-(\text{aq})$ ions to form the insoluble (ionic) solid, lead chloride.

Question Two:

(a) (i) silver chloride $\text{AgCl}(\text{s})$ (ii) no precipitate (iii) calcium sulfate $\text{CaSO}_4(\text{s})$

(b) Either $\text{Ag}^+(\text{aq}) + \text{Cl}^-(\text{aq}) \rightarrow \text{AgCl}(\text{s})$ OR $\text{Ca}^{2+}(\text{aq}) + \text{SO}_4^{2-}(\text{aq}) \rightarrow \text{CaSO}_4(\text{s})$

Question Three:

Lead nitrate + potassium chloride \rightarrow lead chloride + potassium nitrate OR

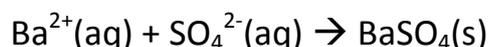
Lead nitrate + potassium chloride \rightarrow potassium nitrate + lead chloride (order of the products doesn't matter).

Question Four:

(a) A white precipitate would form (in a very pale green solution)

(b) It is a precipitation reaction.

(c) Barium nitrate will react with iron(II) sulfate to make barium sulfate and iron(II) nitrate. Barium sulfate is insoluble and will make a WHITE precipitate. A pale green solution of iron(II) nitrate will be formed. (Iron(II) compounds are usually a very pale green colour).



Question Five:

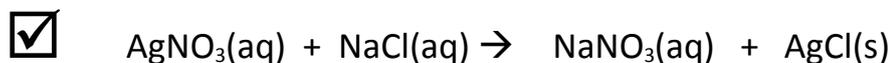
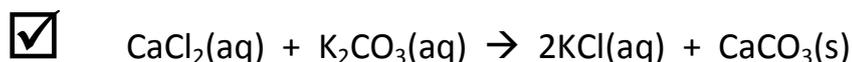
(a) (i) no precipitate (ii) lead chloride (iii) magnesium hydroxide

(b) Either $\text{Pb}^{2+}(\text{aq}) + 2\text{Cl}^-(\text{aq}) \rightarrow \text{PbCl}_2(\text{s})$ OR $\text{Mg}^{2+}(\text{aq}) + 2\text{OH}^-(\text{aq}) \rightarrow \text{Mg}(\text{OH})_2(\text{s})$

Question Six:

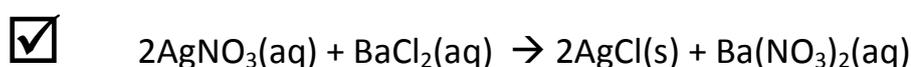
Barium chloride + magnesium sulfate \rightarrow barium sulfate + magnesium chloride

Question Seven:



(These two because 2 solutions (aq) react to make a solution (aq) and a solid (s) – the solid is the precipitate).

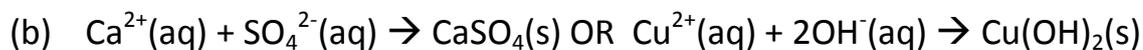
Question Eight:



(These one only because 2 solutions (aq) react to make a solution (aq) and a solid (s) – the solid is the precipitate).

Question Nine:

(a) (i) calcium sulfate (ii) copper hydroxide (iii) no precipitate



Question Ten:

Magnesium chloride + sodium hydroxide \rightarrow magnesium hydroxide + sodium chloride

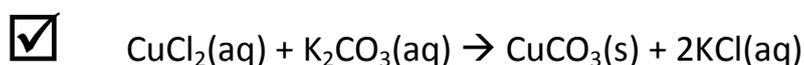
Question Eleven:

(i) When pale green iron(II) nitrate solution is added to colourless sodium hydroxide solution, a green precipitate of iron(II) hydroxide forms and a colourless solution of sodium nitrate.

(ii) Iron(II) hydroxide is an insoluble (ionic) solid



Question Twelve:



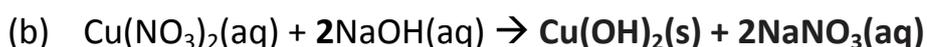
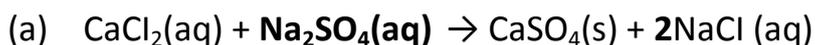
Question Thirteen:

(i) Calcium sulfate (ii) lead chloride (iii) zinc carbonate

Question Fourteen:

Sodium hydroxide + magnesium sulfate → sodium sulfate + magnesium hydroxide

Question Fifteen:



Question Sixteen: NOTE iron(III) hydroxide not examined from 2012 onwards

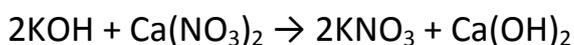
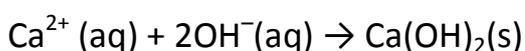
(a) When the colourless solution of sodium hydroxide is added to the orange solution of iron(III) chloride a brown precipitate of iron(III) hydroxide forms and a colourless solution of sodium chloride.



Question Seventeen:

This is a precipitation reaction. Calcium ions, Ca^{2+} , will react with hydroxide ions, OH^{-} , to form insoluble calcium hydroxide, $\text{Ca}(\text{OH})_2$. This is a white precipitate. The other ions in the reaction, potassium, K^{+} , and nitrate, NO_3^{-} , do not react with each other, so stay in solution. Since neither They are not written in the

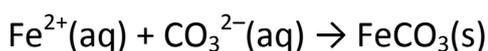
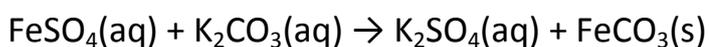
The potassium nitrate is soluble in water and since neither ion (K^{+} and NO_3^{-}) is coloured, the solution will be colourless.



Question Eighteen:

When a green solution of iron(II) sulfate is added to a colourless solution of potassium carbonate solution, a green precipitate forms.

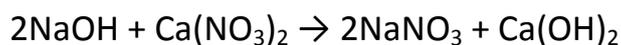
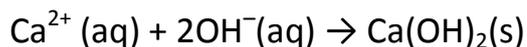
This precipitate is iron(II) carbonate. Iron(II) carbonate is insoluble in water so forms a solid that will settle in the container. The potassium sulfate is soluble in water and since neither ion (K^{+} and SO_4^{2-}) is coloured, the solution will be colourless.



Question Nineteen:

This is a precipitation reaction. Calcium ions, Ca^{2+} , will react with hydroxide ions, OH^- , to form insoluble calcium hydroxide, $\text{Ca}(\text{OH})_2$. This is a white precipitate. The other ions in the reaction, sodium, Na^+ , and nitrate, NO_3^- , do not react with each other, so stay in solution.

The sodium nitrate is soluble in water and since neither ion (Na^+ and NO_3^-) is coloured, the solution will be colourless.

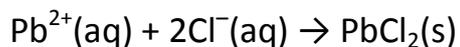


Question Twenty:

A precipitate would form in beaker A. The ions in this mixture are Pb^{2+} , NO_3^- , Na^+ and Cl^- .

The lead ion and chloride ion do react to form the insoluble solid lead chloride. The sodium and nitrate ions are spectator ions and do not react.

A (white) precipitate of lead chloride will form in the bottom of the beaker.



(There would be no precipitate in Beaker B as iron(II) nitrate and magnesium sulfate are both soluble substances).