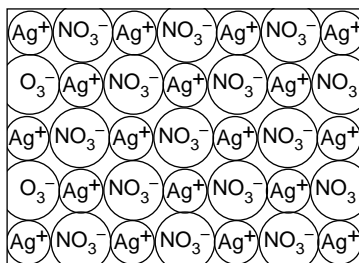


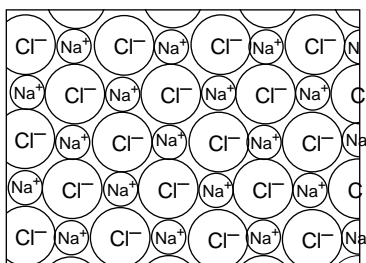
A reaction to form silver chloride

Silver chloride is an ionic solid. It can be prepared by reacting silver nitrate solution and sodium chloride solution. The diagrams represent the types of particles present in some of the substances involved in the reaction.



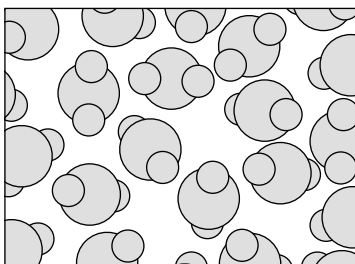
Silver nitrate (solid)

The diagram above shows the particles in solid silver nitrate. The particles in silver nitrate are silver ions (Ag^+) and nitrate ions (NO_3^-).



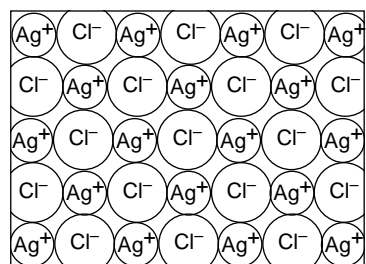
Sodium chloride (solid)

The diagram above shows the particles in solid sodium chloride. The particles in sodium chloride are sodium ions (Na^+) and chloride ions (Cl^-).



Water (liquid)

The diagram above shows the particles in water. Water is a liquid. The particles are water molecules.



Silver chloride (solid)

The diagram above shows the particles in solid silver chloride. The particles in silver chloride are silver ions (Ag^+) and chloride ions (Cl^-).

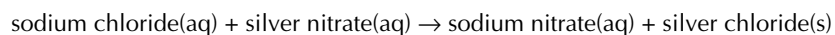
A reaction to form silver chloride

The diagrams (on the other sheet) may help you with these questions.

1. Sodium chloride dissolves in water to give sodium chloride solution. What particles (such as particular atoms, molecules, ions) do you think are present in sodium chloride solution?

2. Silver nitrate dissolves in water to give silver nitrate solution. What particles (such as particular atoms, molecules, ions) do you think are present in silver nitrate solution?

When sodium chloride solution is mixed with silver nitrate solution a white solid forms. The following reaction take place:



The solid that is formed is silver chloride. The solid can be separated from the liquid by filtration. The liquid that is left after filtration contains sodium nitrate.

3. What particles (such as particular atoms, molecules, ions) do you think are present in the liquid after it is filtered?

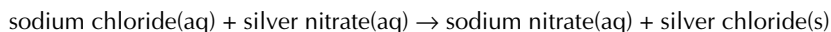
4. What do you think happens to the particles in the mixture when the ionic bonds form in the silver chloride in this reaction?

5. How many chloride ions do you think are bonded to each silver ion in silver chloride? (Give the reason for your answer, if you can.)



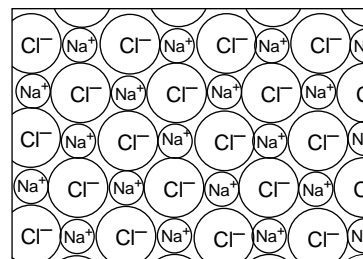
A precipitation reaction

This exercise is about what happens during a precipitation reaction. When solutions of sodium chloride and silver nitrate are mixed, then a white solid (silver chloride) forms:

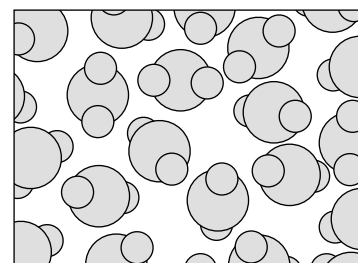


Fill in the gaps below. Use the diagrams to help you.

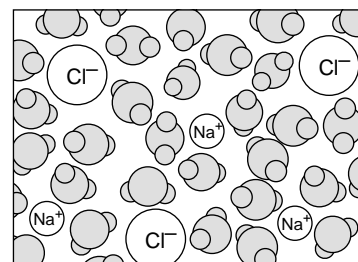
Sodium chloride is an ionic solid. Sodium ions (Na^+) and chloride ions (Cl^-) are bonded together by the electrical attraction between the positive and negative ions. Each ion is attracted to each of those counter ions surrounding it. This type of chemical bonding is called ionic bonding.



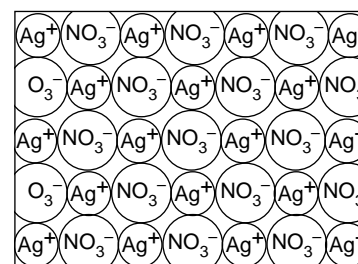
Sodium chloride dissolves in water. Water is a liquid containing water molecules. The molecules move around quickly, bumping into each other. In these collisions the water molecules bounce off one another. Many ionic solids will dissolve in water.



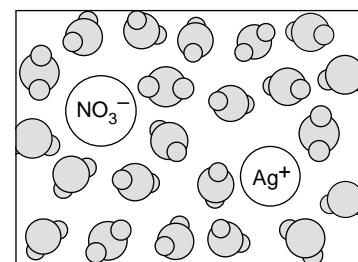
When the sodium chloride dissolves it forms a solution. The solution contains the water molecules, and the sodium ions and the chloride ions from the sodium chloride. The fast moving water molecules constantly collide with the ions, and crowd around ('solvate') them, so that the ions can not stick together.



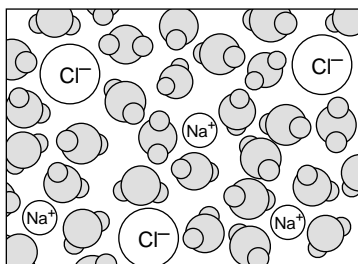
Silver nitrate is an ionic solid. Silver ions (Ag^+) and nitrate ions (NO_3^-) are bonded together by the electrical attraction between the positive and negative ions. Each ion is attracted to each of those surrounding it. This type of chemical bonding is called ionic bonding.



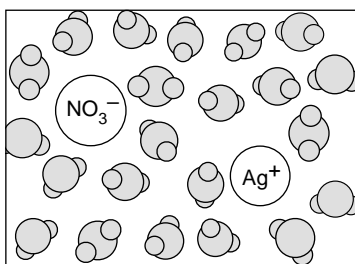
When the silver nitrate dissolves it forms a solution. The solution contains the water molecules, and the silver ions and the nitrate ions from the silver nitrate. The fast moving water molecules constantly collide with the ions, and crowd around ('solvate') them, so that the ions can not stick together.



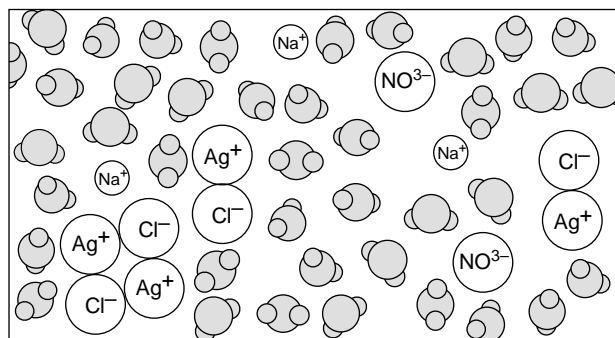
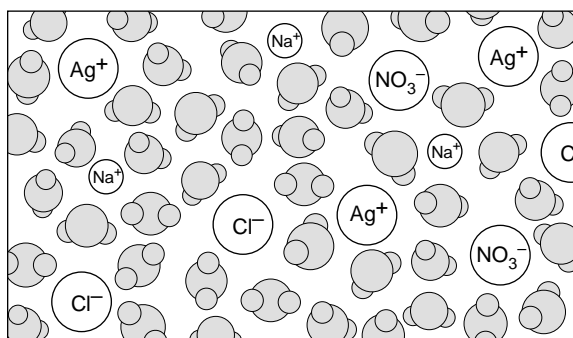
What do you think would be in the mixture if the two solutions below were to be poured into the same beaker?



+

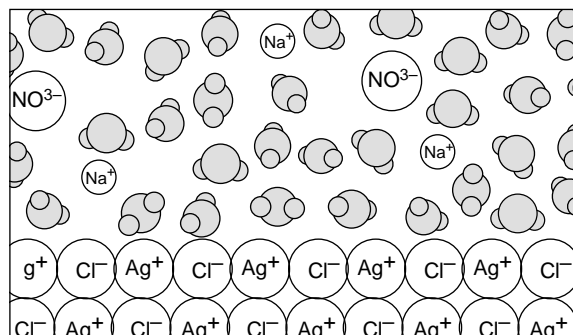


When the two solutions are m_____ together the new mixture contains water m_____, sodium ions, s_____ ions, chloride ions and nitrate i_____.

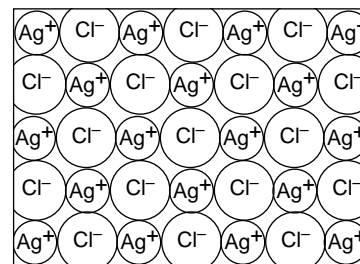


When silver ions collide with c_____ ions they sometimes stick together. The a_____ between these ions is so strong that collisions with the fast moving w_____ molecules do not stop them bonding together.

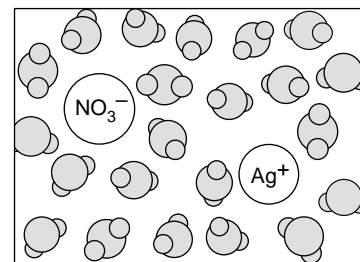
The silver ions and c_____ ions soon form into large enough crystals to p_____ out from the solution. The solid precipitate of silver chloride sinks to the b_____ of the mixture.



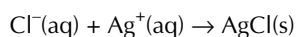
In the p_____ silver ions (Ag^+) and chloride ions (Cl^-) are b_____ together by the electrical attraction between the positive and negative i_____. Each ion is attracted to e_____ of those surrounding it. Silver chloride is an example of a compound with ionic bonding which does not dissolve in water (it is insoluble in w_____).



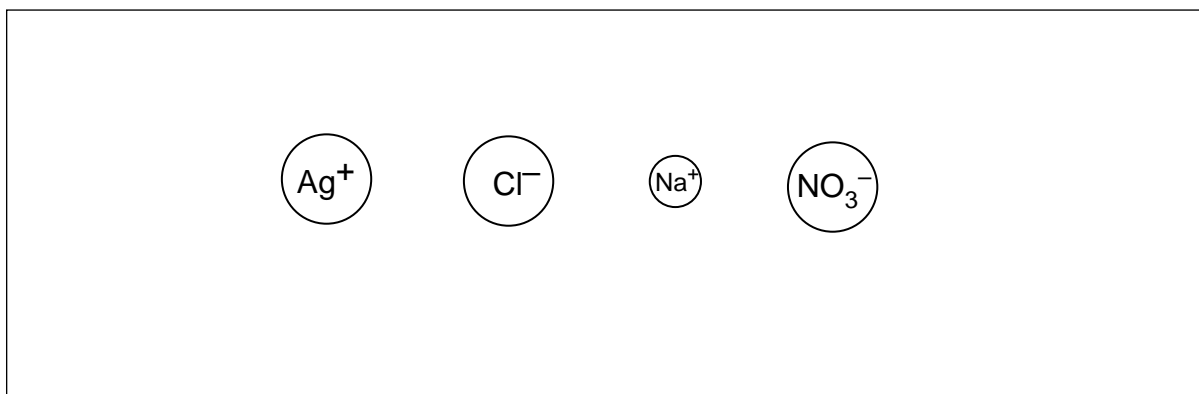
The liquid above the precipitate contains the water m_____, sodium ions and nitrate ions. This is a solution of sodium n_____. The fast moving water molecules constantly collide with the ions, and crowd around ('solvate') them, so that the ions can not s_____ together.



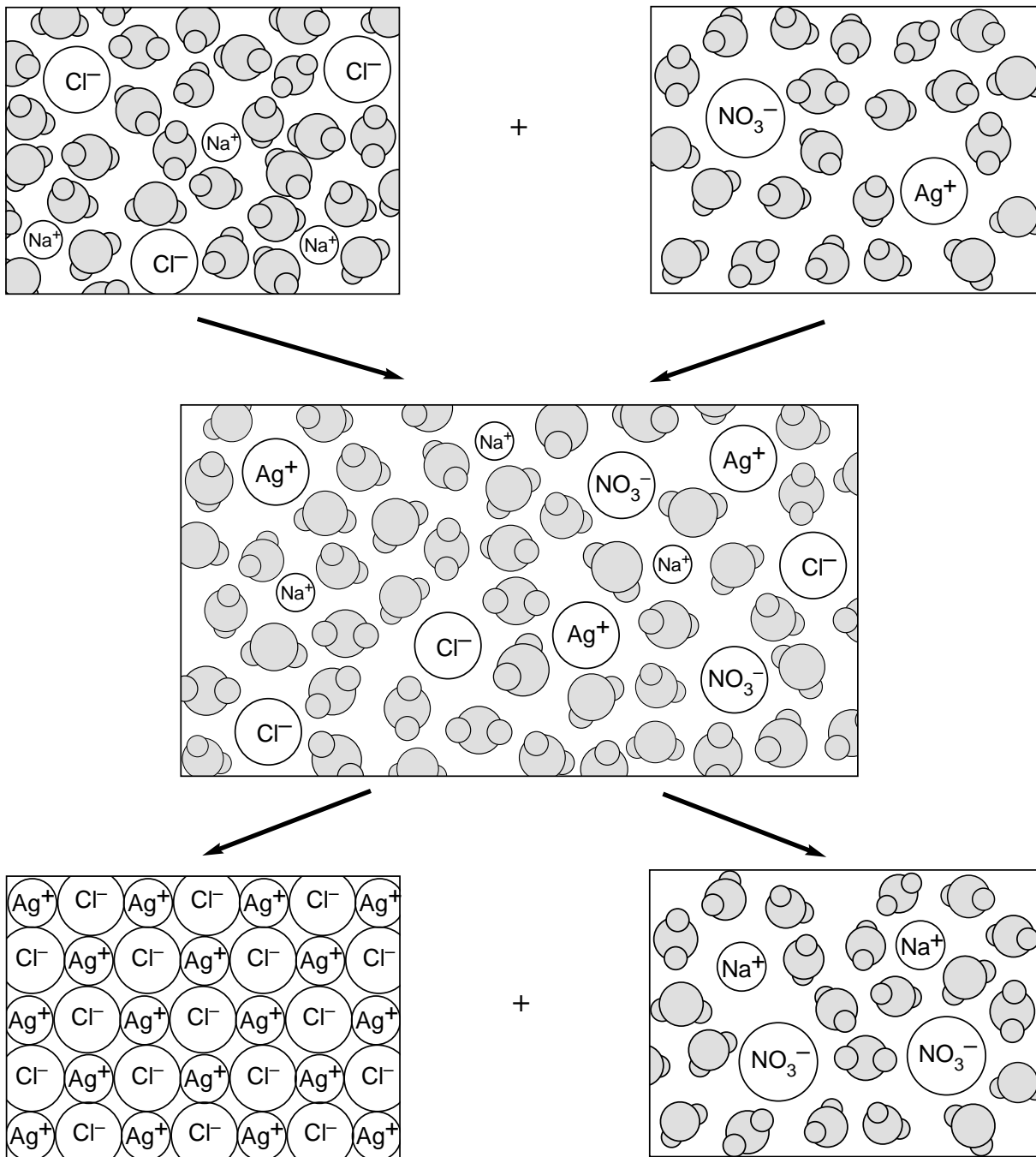
The real change during the reaction is that s_____ silver ions and solvated c_____ ions form solid s_____ chloride:



The sodium ions and nitrate ions are sometimes called 'spectator' ions because they are not directly involved in forming the product. Label the spectator ions in the box below:

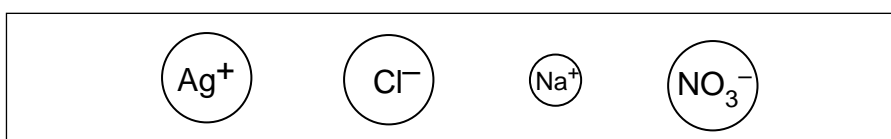


Summary sheet



The change that has taken place in this reaction is more obvious if you use a colour key for the ions.

Select four different colours (eg blue, green, red and yellow), and colour each different type of ion in a different colour. Use the box below as a key.



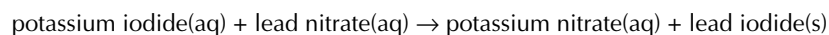
A reaction to form lead iodide

Lead iodide is an ionic solid. It can be prepared by reacting lead nitrate solution and potassium iodide solution.

1. Potassium iodide dissolves in water to give potassium iodide solution. What particles (such as particular atoms, molecules, ions) do you think are present in potassium iodide solution?

2. Lead nitrate dissolves in water to give lead nitrate solution. What particles (such as particular atoms, molecules, ions) do you think are present in lead nitrate solution?

When potassium iodide solution is mixed with lead nitrate solution a yellow solid forms. The following reaction take place:



The solid that is formed is lead iodide. The solid can be separated from the liquid by filtration. The liquid that is left after filtration contains potassium nitrate.

3. What particles (such as particular atoms, molecules, ions) do you think are present in the liquid after it is filtered?

4. What do you think happens to the particles in the mixture, when the ionic bond forms in the lead iodide in this reaction?

5. How many iodide ions do you think might be bonded to each lead ion in lead iodide? (Give the reason for your answer, if you can.)
