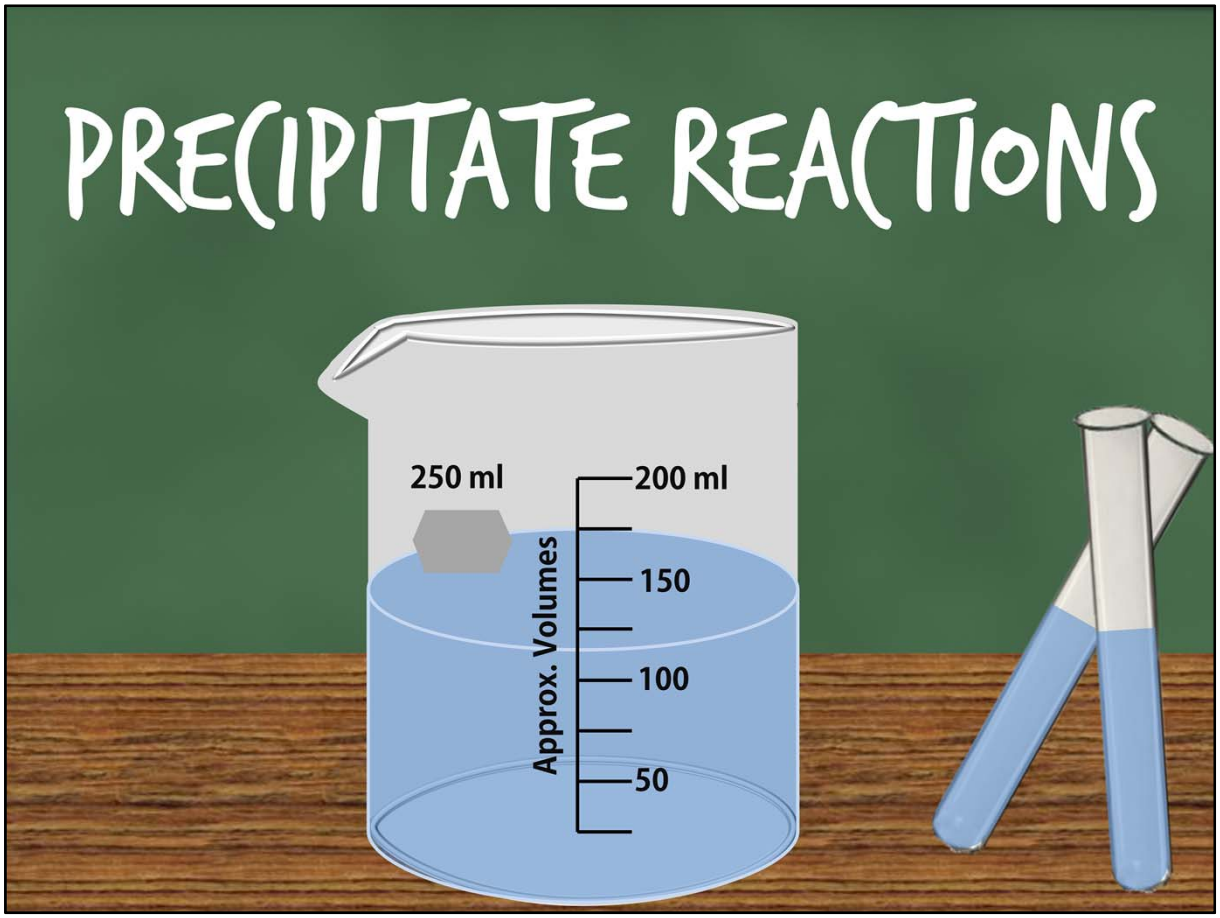
Module 6: Chemical Reactions
Topic 4 Content: Precipitate Reactions Presentation Notes



Precipitate Reactions

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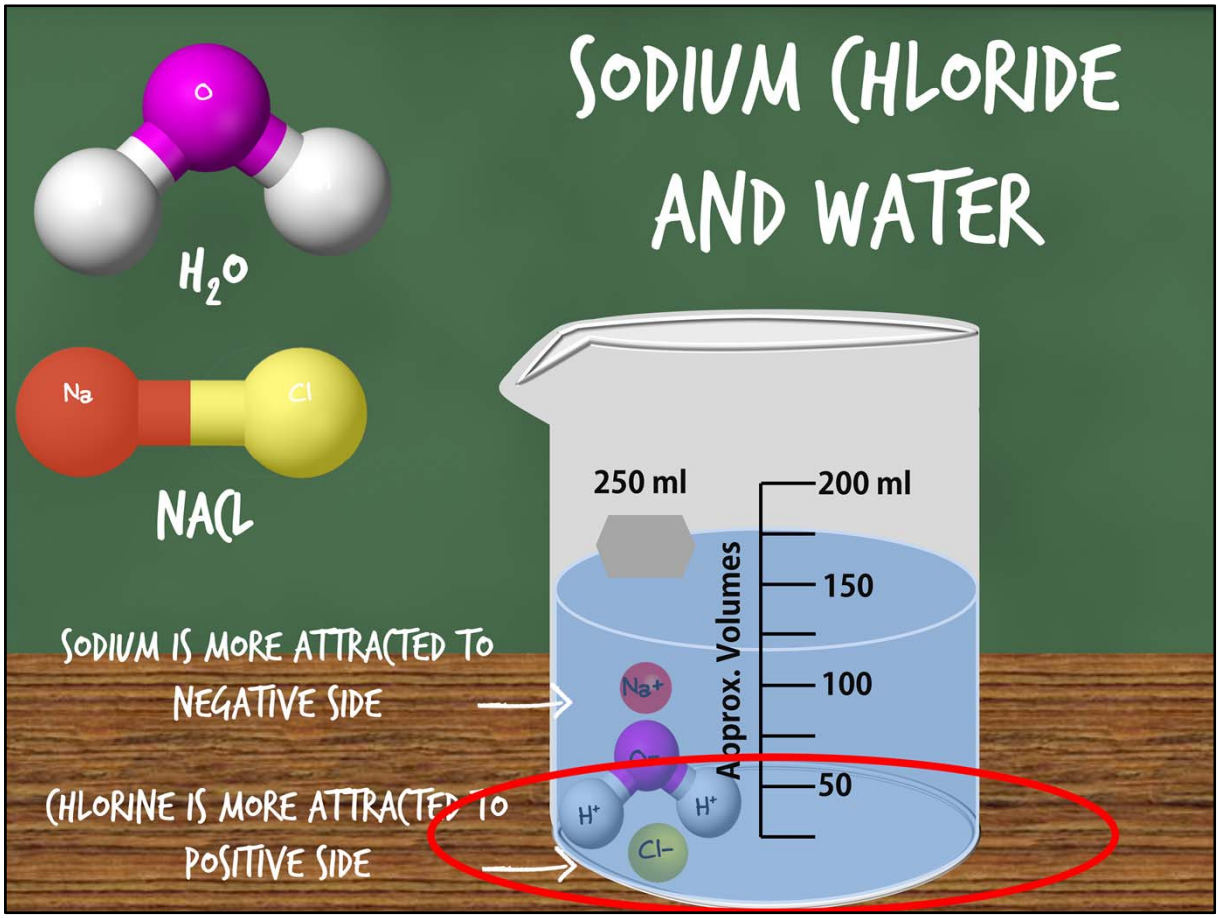

If a reaction takes place in an aqueous solution, and produces an insoluble product, that product will precipitate and form a solid product at the bottom of the beaker. Often, precipitation happens with double replacement reactions. In order to determine which reactions will occur in an aqueous solution, you need to look at what happens to an ionic compound in water. When an ionic compound dissolves in water, the ions separate and begin to move around independently. In some cases, certain ions are attracted to one another. This attraction forms bonds, and eventually, a chemical precipitate forms. This image shows sodium chloride dissolved in a beaker of water. In this example, the sodium ions are more attracted to the negative sides of the water molecules. The chlorine atoms are more attracted to the positive sides of the water molecules. This breaks the bonds of sodium chloride. Since both ions are more attracted to the water molecules, they are dissolved or aqueous.

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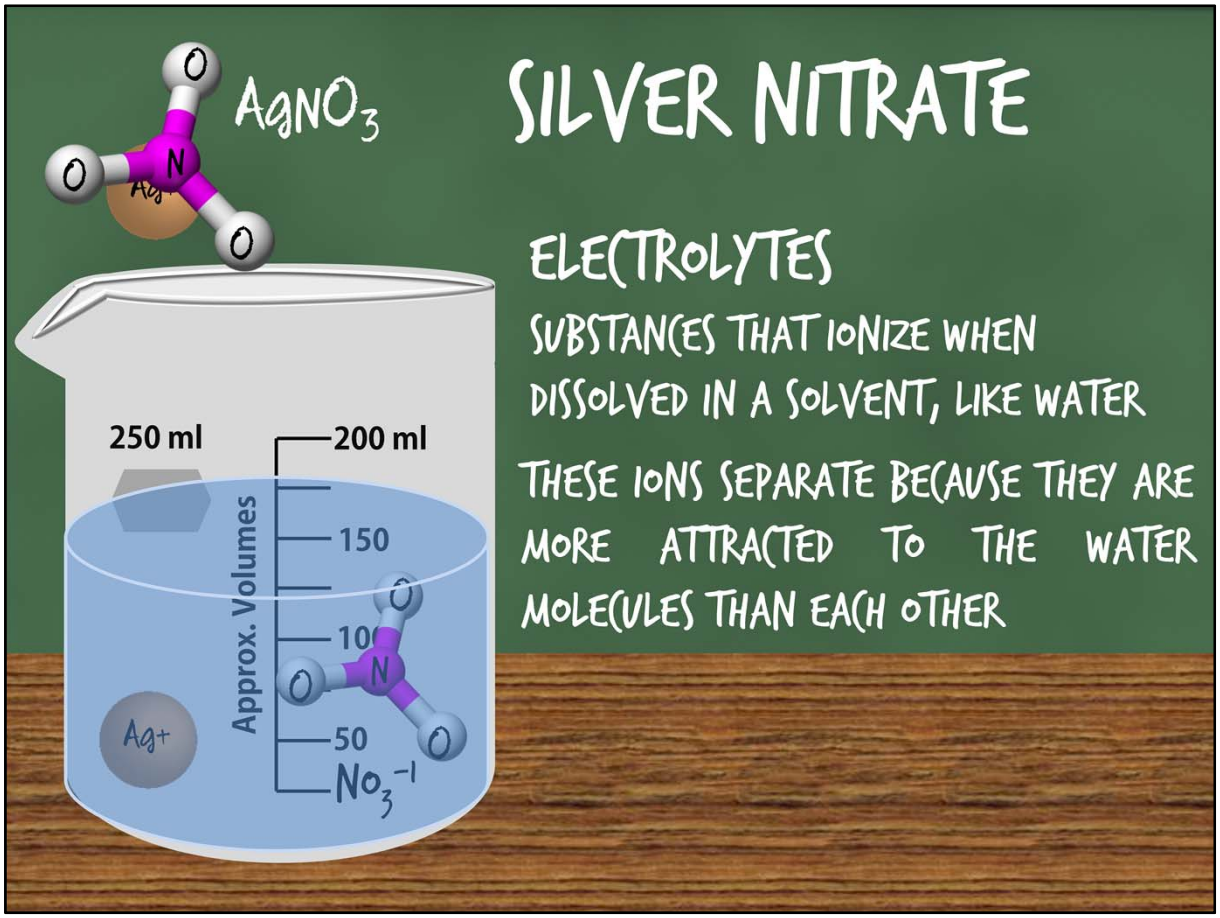
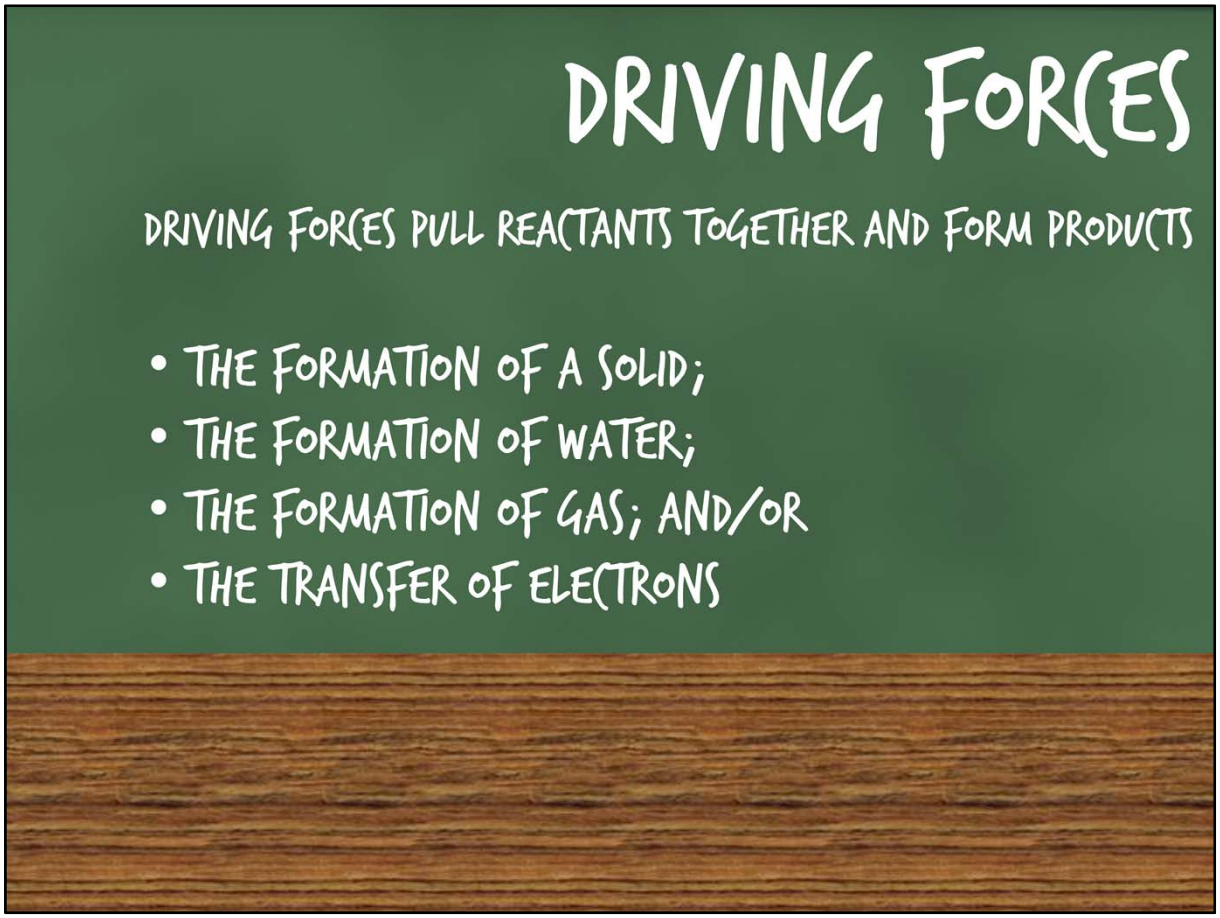
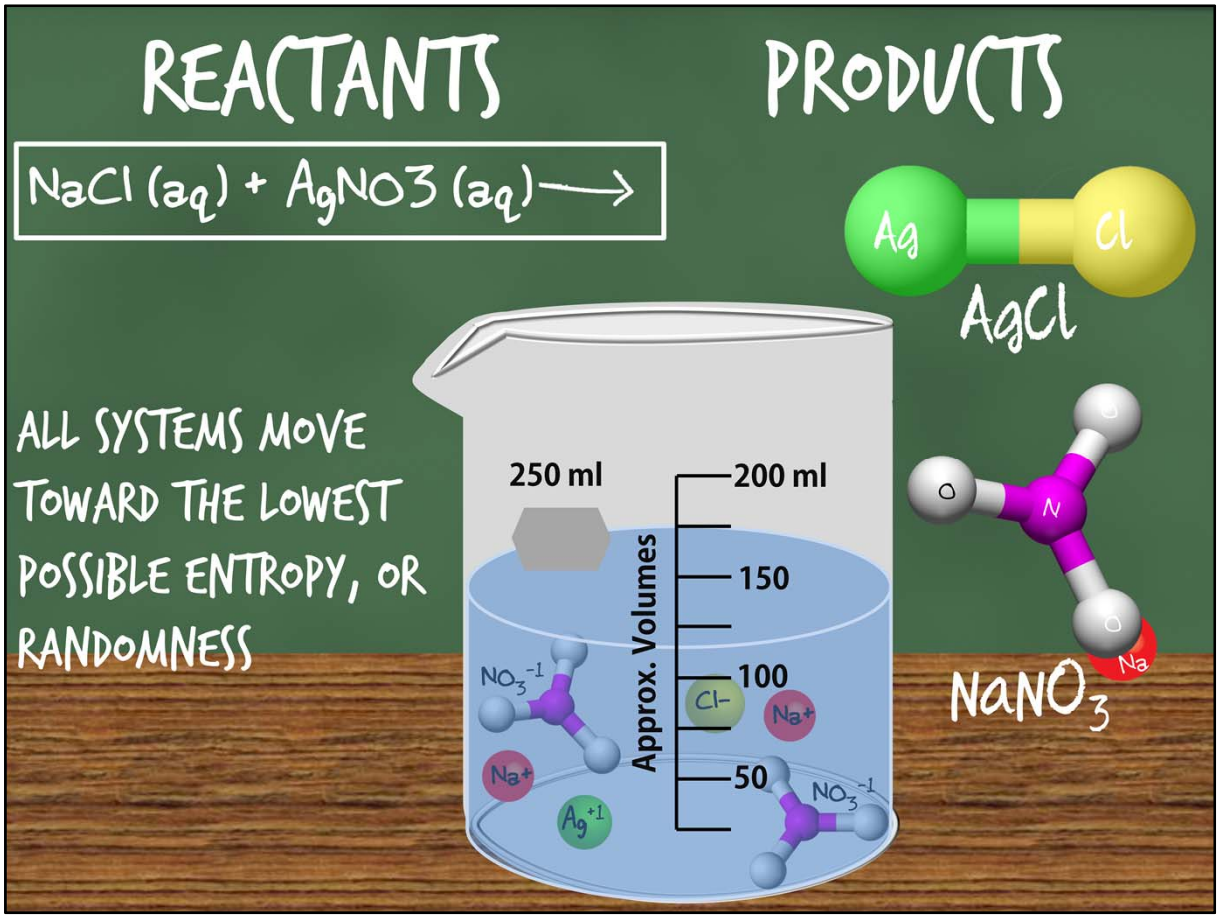


When a substance dissolves in water and produces ions, the substance is called an electrolyte. Electricity is based on the flow of electrons. If electrolytes are present in the water, they will conduct electricity. You may have heard that electrolytes are used in sports drinks. Electrolytes, like sodium, potassium, chloride, and bicarbonate ions, help human cells and organs function correctly. In this example, silver nitrate breaks into silver ions and nitrate ions. This occurs because each ion is more attracted to water molecules than each other. Silver nitrate is a strong electrolyte. Why is it such a strong electrolyte? This compound completely ionizes in water, meaning that it breaks into the silver ion (Ag^+) and nitrate ions (NO_3^{-1}).

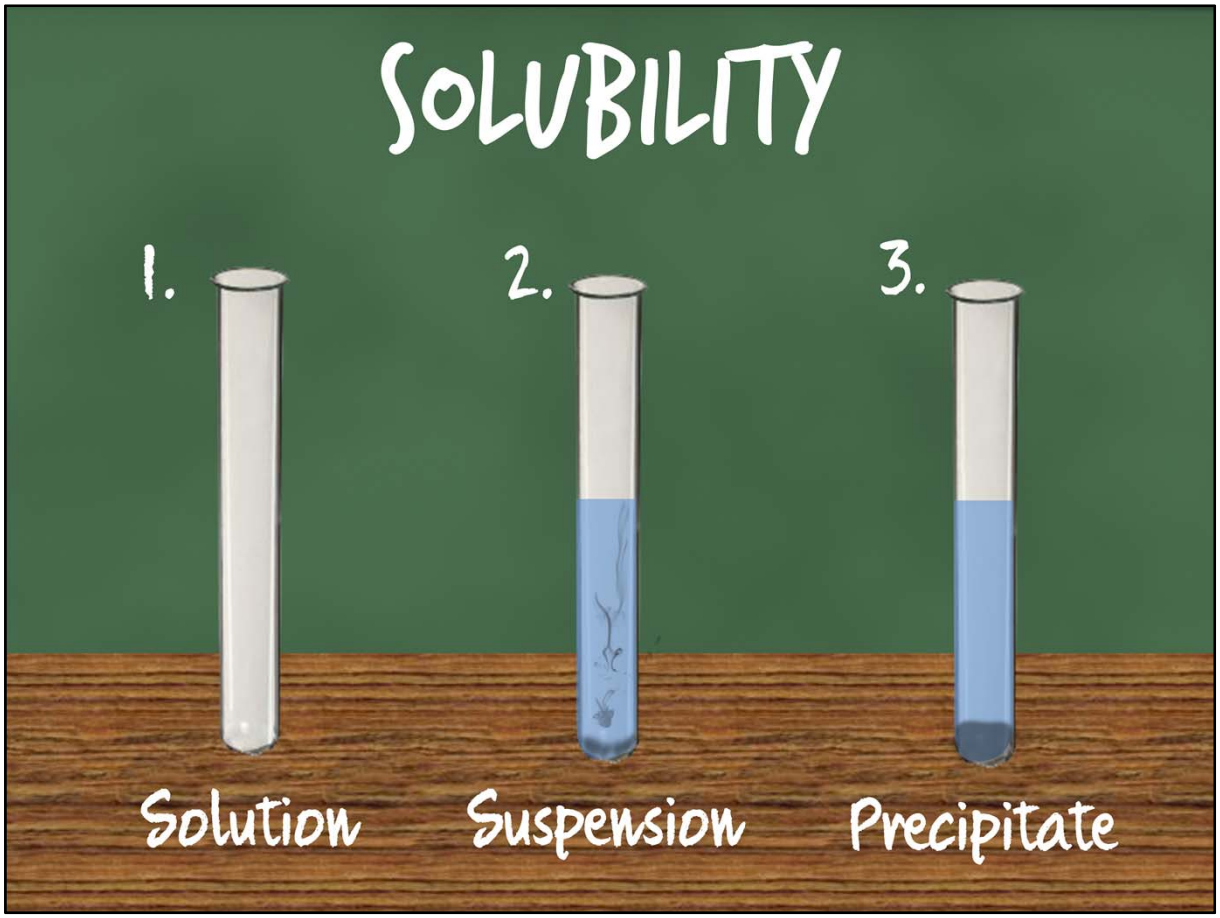


When a chemists mix two solutions to find out if there will be a chemical reaction, driving forces pull reactants together and form products. These driving forces include the following:

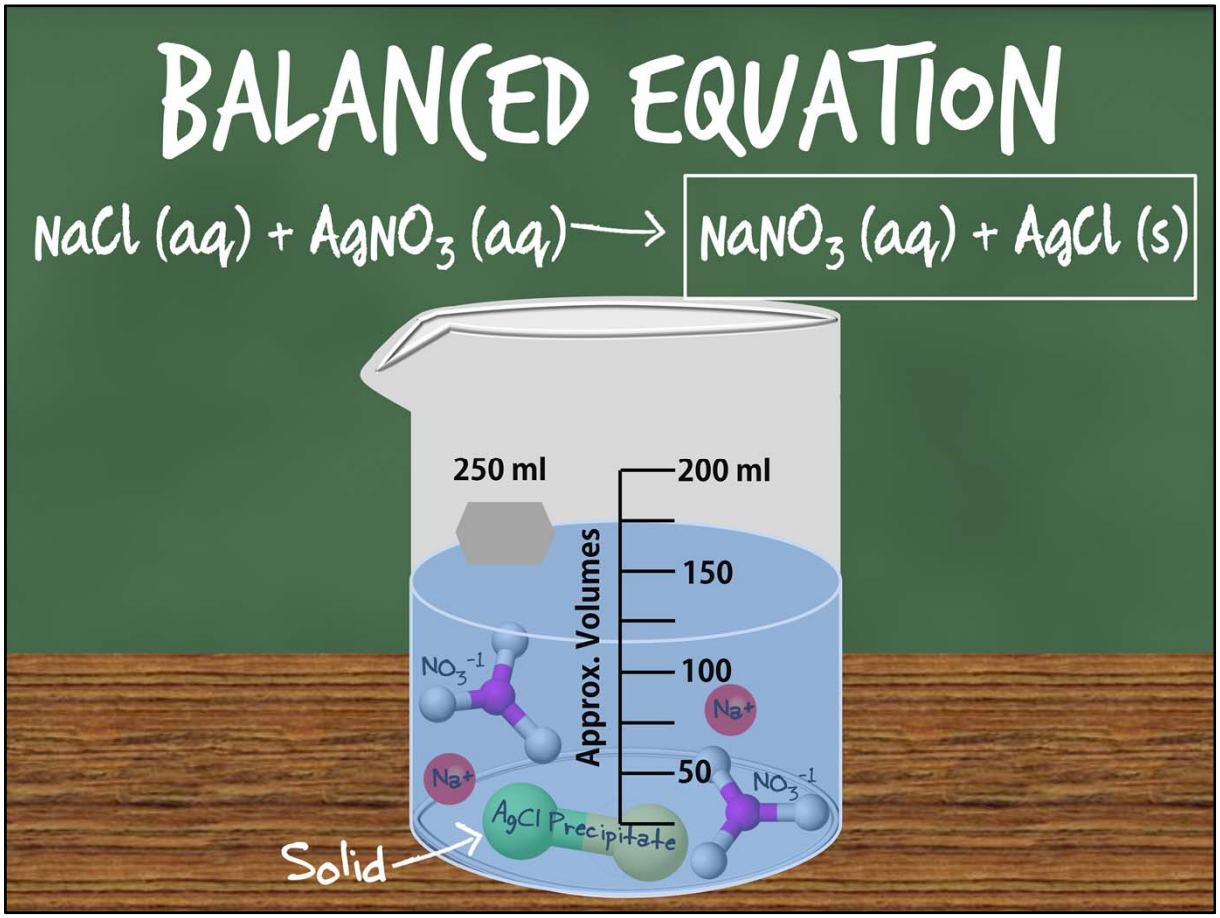
- The formation of a solid;
- The formation of water;
- The formation of gas; and/or
- The transfer of electrons.



The reason that driving forces exist is because all systems move toward the lowest possible entropy, or randomness. In this example, sodium chloride and silver nitrate are mixed in the solution. Can you predict the products of this reaction? The products are sodium nitrate and silver chloride.



If you were going to complete a precipitate reaction in the laboratory, you could observe whether a solid or gas is produced. You start with a solution. If a solid precipitate is going to form, you would first observe a suspension. Lastly, the precipitate forms toward the bottom of the solution. You can also determine this information from the chemical equation. To predict whether a given pair of ions forms a solid, you need to learn the General Rules for the Solubility of Salts.



In the reaction of sodium chloride and silver nitrate, the possible products are sodium nitrate and silver chloride. After you refer to the rules for solubility, sodium chloride is soluble and silver nitrate is not soluble. You can now write the balanced equation for the reaction, including the products. This reaction does actually occur and a solid is produced. The silver and chloride ions come together as a solid because they are more attracted to each other than they are to the water molecules. If they were more attracted to water, they would stay dissolved or aqueous.