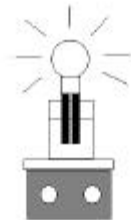


Conductivity of Solutions Demostration by: William C. Deese



Description: The electrical properties of aqueous solutions are demonstrated using a light bulb conductivity tester.

Materials: 0.1M NaOH, 0.1M HCl, vinegar, ammonia solution, table salt, sugar. Several small beakers, spatula, stirring rod, light bulb conductivity tester.

Procedure:

1. Cover the bottom of one beaker with table salt (NaCl), cover the bottom of a second beaker with sugar (C₁₁H₂₂O₁₁).
2. Test the conductivity of each by dipping the electrodes of the tester into the solids. (The bulb should not light.)
3. Fill a third beaker about 3/4 full with distilled water and test the conductivity. (The bulb should not light.)
4. Make a solution of table sugar by adding a scoop of sugar from the first beaker into the water. Test this solution. (The bulb should not light.)
5. Make a similar solution of table salt and test it. (The bulb should light brightly!)
6. Test the solutions of NaOH and HCl. (Both should light the bulb brightly.)
7. Test the solutions of vinegar (HC₂H₃O₂(aq)) and ammonia (NH₃(aq)). (Both should light the bulb, but it will be dim.)

Be sure to rinse the electrodes with distilled water after each test.

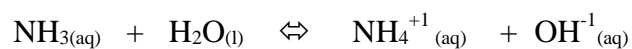
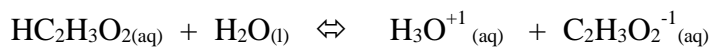
Hazards: Both hydrochloric acid and sodium hydroxide solutions are corrosive and can cause chemical burns to the skin and eyes. Wear eye protection at all times. Ammonia is toxic by ingestion and inhalation. Be sure the electrodes of the conductivity tester are covered for the prevention of electric shock. Never come in contact with a solution in which the electrodes are immersed.

Clean up:

1. The table salt, sugar, vinegar, and ammonia solutions can be flushed down the drain. (You may choose to recycle the ammonia and vinegar solutions.)
2. The HCl and NaOH solutions should be mixed and the mixture flushed down the drain. (Equal volumes should form a neutral solution.)
3. Rinse the electrodes of the conductivity tester.

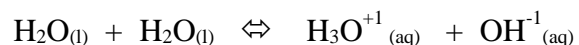
Discussion: Solutions that contain many ions are good conductors of electricity. In all cases, when the bulb lights brightly, there are many ions in solution. All soluble salts separate into ions when they dissolve. All strong acids and bases dissociate completely into ions in solution. Soluble salts, strong acids and strong bases are said to be strong electrolytes.

In the cases of the dimly lit bulb, there are some ions in solution, but most of the solute molecules remain neutral. This indicates only partial dissociation into ions. Acetic acid and ammonia are said to be weak electrolytes; therefore acetic acid is a weak acid and ammonia is a weak base.



Sugar is a nonelectrolyte that doesn't ionize at all in solution. Alcohols are also nonelectrolytes.

Distilled water does conduct electricity, but not well enough to cause the light bulb to light. Water is a very weak electrolyte. Water molecules dissociate to a small extent to form hydronium ions and hydroxide ions.



Reference: Most all chemistry textbooks.