Conductivity of Solutions Lab

**A strong electrolyte** is a substance which is capable of splitting into ions when placed in a water solution. If the positive and negative ions are “mobile” as a result of the splitting, than an electric current will be conducted. Ionic substances are good conductors of electricity when melted or dissolved in a solution.

**A non-electrolyte** is a substance which remains molecular (doesn’t split into ions) when dissolved in solution, rather than forming ions. Since the net change on a molecule is zero, these molecules do not conduct electricity.

**Weak electrolytes** are only partially split up. This means that a small percent of the molecules will separate into positive and negative ions and the remaining molecules will not. The weak conductivity observed is due to the presence of these few ions.

The conductivity indicator will measure a strong conductivity by blinking or playing a loud solid tone when placed in a solution of strong electrolytes. Weak conductivity will be indicated by a dull red glow (no blinking). Non-conduction will be evident when the LED does not light up. It is important to work in dim light in order to observe the variation in intensity of glow.

In this experiment, students will study the principles of conductivity by differentiating between strong electrolytes, weak electrolytes and non-electrolytes. The student will also learn to differentiate between strong and weak acids and strong and weak bases.

**Precautions** **WEARING GOGGLES THE ENTIRE LAB IS REQUIRED**. Use special care handling the Hydrochloric acid, Glacial Acetic acid, and concentrated Ammonia. Sodium hydroxide pellets should be transferred with a spatula. Do not allow them to fall on the floor or stay on the surface of the desk. Immediately close the vial after removing any substance. Clean up spills immediately!

**Procedure**

1. Each student should have a worksheet, a Chemplate, spatula, and paper towels.

The following items will be available:

 Conductivity Indicator Sucrose Crystals Sodium Hydroxide Pellets
 Deionized water Sodium Chloride Crystals Glacial Acetic Acid
 Tap Water 1M Hydrochloric Acid Concentrated Ammonia
 Anhydrous Ethyl Alcohol 0.1 M Hydrochloric Acid

1. Clean and dry your chemplate. Fill the spaces in the Chemplate according to the directions in the Data table.
2. Using the Conductivity Indicator, test the conductivity of the substance in cavity #1. Before testing the next substance, rinse the probes by dipping them in deionized water in the large oval depression. Remove the extra water with a paper towel. Continue to cavity #2 and repeat these steps.
3. Record conductivity in the Data Table as follows:

Strong Conductivity should be shown with a +

Weak Conductivity should be shown with a +/-

Non-Conductivity should be shown with a –‘

1. Do not allow the liquid from one cavity to mix with the liquid from another cavity; this will contaminate your solutions.
2. When finished, immediately wipe down your desk, conductivity sensor, and chemplate.

|  |  |  |
| --- | --- | --- |
| Cavity | Substance | Conductivity |
| Large Oval | ½ full deionized water |  |
| 1 | ½ full tap water |  |
| 2 | 10 drops Ethyl Alcohol |  |
| 3 | 1. Sodium Chloride crystal
 |  |
|  | 1. Add 10 drops of Deionized water
 |  |
| 4 | Sodium Chloride crystal + 10 drops of Ethyl Alcohol |  |
| 5 | 1. Sucrose Crystal
 |  |
|  | 1. Add 10 drops of Deionized water
 |  |
| 6 | Sucrose crystal + 10 drops of Ethyl Alcohol |  |
| 7 | 10 drops of 0.1 M Hydrochloric acid |  |
| 8 | 10 drops of 1M Hydrochloric Acid |  |
| 9 | 1. Sodium hydroxide pellet
 |  |
|  | 1. Allow pellet to stand for 10 minutes, retest
 |  |
|  | 1. Add 10 drops of Deionized water
 |  |
| 10 | 1. 5 drops concentrated ammonia
 |  |
|  | 1. Add 5 drops Deionized water
 |  |
|  | 1. Add 5 more drops Deionized water
 |  |
|  | 1. Add 5 more drops Deionized water
 |  |
| 11 | 1. Add 5 drops Glacial acetic acid
 |  |
|  | 1. Add 5 drops Deionized water
 |  |
|  | 1. Add 5 more drops Deionized water
 |  |
|  | 1. Add 5 more drops Deionized water
 |  |
| 12 | 10 drops concentrated ammonia+ 10 drops Glacial Acetic Acid |  |

Observations and Conclusions
1. Compare the conductivity of Sodium Chloride Crystals, Sodium Chloride in water, and Sodium Chloride in Ethyl Alcohol.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
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Which is a strong Electrolyte? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

2. Compare the conductivity of Sucrose Crystals, Sucrose crystals in water, and sucrose crystals in Ethyl Alcohol.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
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Explain why you think there is difference in your observations\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
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3. Compare the conductivity of sucrose in a solution to sodium chloride in a solution:\_\_\_\_\_\_\_\_\_\_\_\_\_\_
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4. A sodium hydroxide pellet (solid) should not conduct electricity. Describe the change in appearance of the sodium hydroxide pellet as it was exposed to the room atmosphere. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
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What happened to the conductivity of the Sodium Hydroxide pellet as you added water? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

What happens to the conductivity of Acetic Acid as you add increasing amounts of water? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Is Acetic acid classified as a strong acid or weak acid?

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5. In your own words, what does this lab show us about conductivity and different materials? More specifically, why can some things change how conductive they are when mixed with something else? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Do you think anything can become a conductor if mixed well enough?
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Make sure to answer in full sentences!