NAME:_____
PERIOD:_____

Introduction to Conductivity(PART ONE)

INTRODUCTION:

A **CONDUCTOR** is any substance that allows an electric current to easily flow through it. Since an **ELECTRIC CURRENT** consists of moving charged particles, the presence of mobile electrons or ions is necessary. Solids that conduct electricity have mobile electrons that are only loosely held by their atoms. Therefore, an electric current in a solid conductor is made up of a flow of these mobile electrons.

Solids that obstruct the flow of electricity through it are called **INSULATORS.** These solids have electrons that are more closely bound to their nuclei and are generally not free to move.

In this experiment, a **CONDUCTIVITY INDICATOR** will be used to test a variety of materials in order to determine whether they are conductors or insulators.

The Conductivity Indicator is a simple electronic devise with an open electrical circuit between two probes. The circuit can be completed when the two probes come in contact with a conductor. This is indicated by the blinking glow of the red and green light emitting diodes(LED). When the two probes come in contact with an insulator, the electric circuit is not complete and therefore the LED will not glow or blink.

Purpose: To test observe and understand differences between electrical conductors and insulators.

Materials: The following items will be available for use during this activity:

Conductivity Indicator	wooden toothpicks
Chemplate	paper clips
Scoopula	tin
String	carbon
Rubber bands	silicon
Plastic beads	coin(supplied by student)
Copper wire	sodium chloride crystals

Procedure:

1. Using the Conductivity Indicator, test the materials listed in the DATA TABLE below by making sure that the substance being tested touches both probes at the same time.

2. Record your results as follows:
   Conductors should be indicated by a **C**
   Insulators should be indicated by an **I**

SUBSTANCE	RESULT
string	
Copper wire	
Wooden toothpick	
Rubber bands	
Plastic beads	
carbon	
tin	
silicon	
Paper clips	
coin	
Sodium chloride crystal	

Observations and Conclusions:

1. Do all solids conduct electricity?_____
2. Are there any specific classes of conductors? _____Did all of the conductors share similar physical properties?_____Explain_____
   _____
3. Can you classify those materials that you observed to be insulators?_____
   Did any of the insulators surprise you?_____
   Explain_____
   _____
   Did your observations raise any questions you would like to research?_____Explain_____
   _____
   _____
4. Explain why some substances in their solid state do not conduct an electric current:_____
   _____
   _____
   _____
   _____

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PART TWO

INTRODUCTION:

An electric current can also pass through solutions(liquids) known as **ELECTROLYTES.** Electrolytes are substances that when dissolved in water break up into both positive and negative **IONS.** These ions are charged particles that are generally free to move. The flow of these ions constitute an electric current. Acids, bases, and salts are common electrolytes.

Electrolytes may also vary in strength depending on the amount of ions formed when dissolved in water. Strong electrolytes form many ions in a solution and will produce a bright LED response on the Conductivity Indicator. A weak electrolyte will form fewer ions in a solution and will produce only a glow response of the LED. Alcohols and hydrocarbons are common non-electrolytes.

Non-electrolytes are substances that when dissolved in water do not form positive and negative ions. These solutions do not conduct electricity and will therefore produce no response on the LED.

Purpose: To observe and test some electrical properties of solutions.

Materials:

The following items will be available for use during the activity:

Conductivity Indicator	denatured alcohol
Chemplate	sucrose crystals
Deionized water	6 M hydrochloric acid
Calcium hydroxide	sodium chloride crystals

PROCEDURE:

1. Clean and dry your Chemplate. Note the numbers that identify each cavity. Do not allow the liquid from one cavity to mix with the liquid from another cavity- this would contaminate your solutions.

2. Fill the large oval cavity in the Chemplate halfway with deionized water. Test the substance with the Conductivity Indicator by dipping the probes into the cavity. What response did you observe on the Conductivity Indicator?_____

3. Place 12 drops of deionized water in cavities # 1, 3, 5, 7, and 9. One member of your team should place the probes of the indicator in the solution in cavity #1 and

a second person should carefully add 1 drop of 6 M hydrochloric acid to cavity #1. What is observed?_____

4. Before testing the next substance, rinse the probes by dipping them IN THE LARGE OVAL CAVITY. Blot the excess water dry.

5. Carefully add a "tip of the scoopula"-ful of calcium hydroxide to cavity # 3 and stir. Test with the Conductivity Indicator. What is observed?_____

REPEAT STEP 4

6. Carefully add 1 crystal of sodium chloride to cavity # 5 and stir. Test with the Conductivity Indicator. What is observed?_____

REPEAT STEP 4

7. Carefully add 5 drops of denatured alcohol to cavity # 7. Test with the Conductivity Indicator. What is observed?_____ Add 5 more drops of denatured alcohol. What is observed?_____

REPEAT STEP 4

8. Carefully add a small portion of a crushed sugar cube to cavity # 9 and stir. Test with the Conductivity Indicator. What is observed?_____

REPEAT STEP 4

9. Retest the liquid in the large OVAL CAVITY. What is observed?_____

Immediately clean the probes on the Conductivity Indicator. Dry. Empty your Chemplate CAREFULLY in the sink and rinse with running water. Dry. Return all materials to their proper location.

OBSERVATIONS AND CONCLUSIONS:

1. Of the materials tested in Part 2 of this activity, which solutions conducted electricity?_____
   _____
2. How would you classify these solutions?_____
3. What are these solutions called?_____
4. Which solutions tested can be considered to be non-conductors?_____
   _____
5. How would you classify these non-conductors?_____
6. Why do only some substances conduct electricity when dissolved in water?_____
7. Why do some substances that do not conduct electricity in their solid state conduct electricity when dissolved in water?_____
   _____
   _____
8. Was the retest of the liquid in the large oval cavity different from the original test?_____

   How do you explain this?_____
   _____
   _____
   _____