Is it Ionic or Covalent

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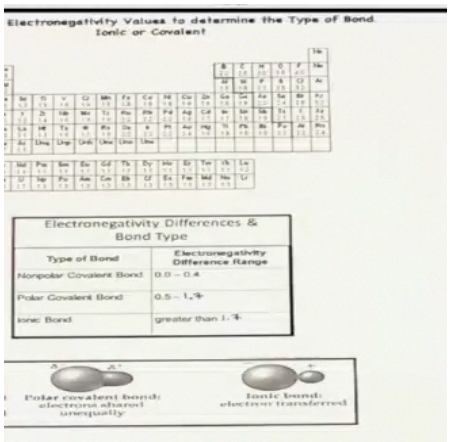
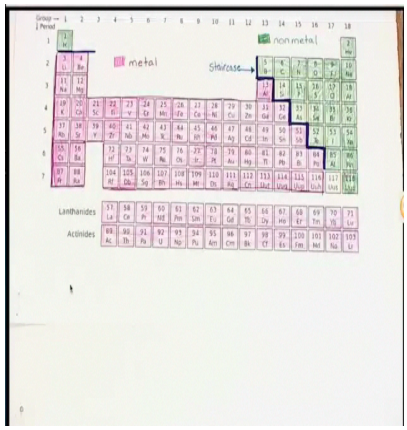
Ionic or Covalent Bond Videos





Ionic or Covalent Worksheet

Ionic or Covalent Bonds –Electronegativity

Directions: Using the electronegativity of each element determine the type of bond that will form.

Use your Electronegativity Chart to obtain the electronegativity value for each element.

	Atom 1	Atom 2	More electronegative element & value	Less electronegative element & value	Electronegativity Difference (ΔEN) (Show work)	Bond Type Nonpolar Covalent, Polar Covalent, or Ionic
Ex:	Arsenic	Sulfur	S-2.5	As- 2.0	2.5-2.0 =0.5	Polar Covalent Bond
1.	Copper	Bromine				
2.	Germanium	Selenium				
3.	Silicon	Fluorine				
4.	Potassium	Nitrogen				
5.	Lithium	Oxygen				
6.	Barium	Tin				
7.	Hydrogen	Oxygen				
8.	Calcium	Sulfur				
9.	Iron	Carbon				
10.	Carbon	Oxygen				
11.	Phosphorus	Fluorine				
12.	Sodium	Chloride				
13.	Magnesium	Nitrogen				
14.	Aluminum	Sulfur				

Ionic or Covalent Bonding –Using the Periodic Table

REMEMBER....

Types of Bonds	How to Identify the Bond
Ionic Bond	Formed between a Metal and Non-Metal
Covalent Bond	Formed between a Non-Metal and Non-Metal

Directions: Using the periodic table determine if the elements in the following compounds are metals or non-metals, then describe the bond as polar or nonpolar

Compound	Element 1 (metal or non-metal?)	Element 2 (metal or non-metal?)	Bond Type
Ex: NO_2	**N = non-metal**	**O = non-metal**	**covalent**
LiCl			
SO_2			
PO_4^{1-}			
$MgBr_2$			
$Co(CN)_3$			
H_2O			
K_2O			
AlF_3			
$Fe(ClO_4)_3$			
$CuCl_2$			
NO_2			
TiO_2			
HF			
Rb_2S			

Ionic or Covalent Bond Lab

Ionic or Covalent Bonding Lab

Introduction:

A compound is defined as a chemical combination of two or more elements. A chemical bond is the "glue" holding together atoms of different elements. Two types of bonds are ionic and covalent. Ionic bonds generally occur between a metallic atom and a nonmetallic atom. The bond results from the transfer of electrons and the attraction between the resulting ions. Covalent bonding generally occurs between two or more nonmetallic atoms. Covalent bonding involves the sharing of electrons.

Properties such as melting point, boiling point, solubility, electrical conductivity, color, and odor can help you distinguish ionic from covalent compounds. As in many areas of chemistry, the distinctions are not always clear, nor do the distinctions apply to all compounds.

The salt and sugar on your kitchen table both dissolve easily in water, but the solutions they form have an important difference. One of those kinds of white crystals is an ionic compound, and when it dissolves, it dissociates, or breaks up into ions. The ions are free to move in the solution, and that solution, therefore, conducts electricity. The more ions in solution, the better it conducts electricity. If something produces a large amount of ions it is called a strong electrolyte. If something produces a small amount of ions it is called a weak electrolyte. The other kind of crystal, however, is a molecular compound, and its molecules remain whole when they dissolve. With no ions, that solution does not conduct electricity. If something produces no ions it is called a nonelectrolyte.

In this experiment, you will observe several properties of some ionic and some covalent compounds and attempt to recognize patterns among the properties. The patterns you may recognize are generalizations and may not necessarily apply to all ionic and covalent compounds.

Some properties may be useful to predict the type of bonding in a substance. These properties are phase at room temperature, melting point, solubility in water, and electrical conductivity. In this experiment you will find how these properties vary in ionic and covalently bonded substances.

Objectives:
(1) Classify compounds as either primarily ionic or covalent from the name, formula, and/or behavior of the compound. (2) Observe and record some properties of several ionic and covalent compounds, and (3) Recognize patterns among the properties and distinguish ionic compounds from covalent compounds.

Pre-Lab Assignment:
Read the introduction and procedures before answering the following questions.
1. What kind of elements generally form ionic compounds? _____
_____
2. What kinds of elements generally form covalent compounds? _____
_____
3. Based on their formulas, predict whether each of the following is primarily ionic or primarily covalent.
   a. Sodium iodide NaI _____
   b. Methane CH_4 _____
   c. Calcium chloride $CaCl_2$ _____
   d. Ammonia NH_3 _____
   e. Glucose $C_6H_{12}O_6$ _____

Materials: aluminum foil, well plate, conductivity tester, wood splints, Bunsen burner, beaker tongs, and droppers.
Chemicals: Distilled water, sodium chloride (NaCl), potassium chloride (KCl), sugar, mineral oil, ethanol, glycerine, calcium chloride ($CaCl_2$)
Procedure:
Part One
1. Place a tiny amount of each sample (<1g) of each substance in each well of the well plate provided. Put one sample in one well only. ***PREVENT CONTAMINATION:*** Clean the scoopula between each sample
2. **Record the phase** of each sample, at room temperature.
3. Test each substance for **electrical conductivity (without water)** using the conductivity tester provided. Record your results in the data table. ***PREVENT CONTAMINATION:*** Clean the probes between tests.
4. Place several drops of distilled water into the wells that contain a solid sample. **Do not put water into the liquid samples.**
5. Use the wooden splints and mix the samples so that each has a chance to dissolve in the water. Note:
6. **Solubility Test.** Record this in the data table under "solubility". The substance is soluble if the original substance is no longer visible.
7. Re-test the **electrical conductivity** (with water) of the **dissolved solid samples,** from step 4, using the conductivity tester. Record conductivity of each substance on the data table.
8. Follow teacher instructions for proper disposal when done.

Part Two:
Testing the **melting point** of the solid substances. **ONLY TEST NaCl, KCl, sugar, and $CaCl_2$.**
1. Make a small testing cup, for each solid sample, by wrapping a piece of aluminum foil around your thumb.
2. Use a scoopula and place a small amount (1 gram) of one solid into a small foil cup. ***PREVENT CONTAMINATION:*** Clean the scoopula between each sample.
3. Heat each cup over the Bunsen burners for about 30 seconds. Record in the data table which substance melts, carmelizes, decomposes or in which nothing happens at all.
4. Follow teacher instructions for proper disposal when done.

Ionic or Covalent Bond Lab (continued

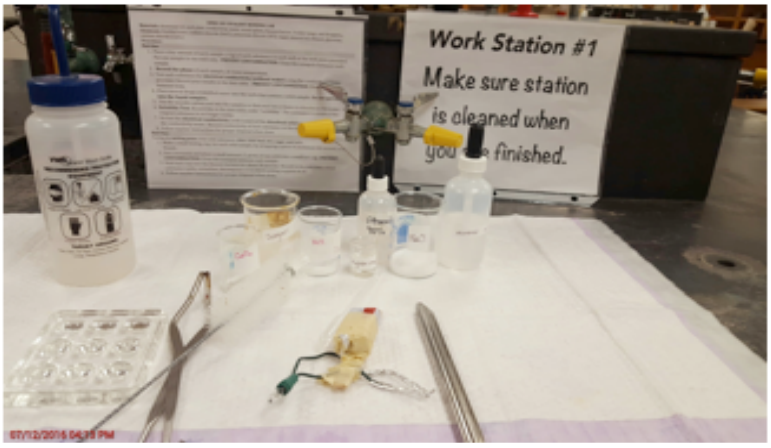
Substance	Phase at 20°C (solid or liquid)	Solubility Does it dissolve (yes or no)	Electrical Conductivity without water (Yes or no)	Electrical Conductivity with water (yes or no)	Melting Point	Type of Bond (Ionic or Covalent)
a.) Distilled water						
b.) NaCl						
c.) KCl						
d.) Sugar						
e.) Oil						
f.) Ethanol						
g.) Glycerine.						
h.) $CaCl_2$						

Questions:

1. What properties in general do covalent-bonded substances have? List at least four properties based on information from your experiment. See your data table.
   A. _____
   B. _____
   C. _____
   D. _____

2. What general properties do ionic-bonded substances have? List at least four properties based on information from your experiment. See your data table.
   A. _____
   B. _____
   C. _____
   D. _____

Ionic or Covalent Lab Setup



How to make a Conductivity Tester

Exploratorium Teacher Institute: Eric Muller © 2006

Do Science: Eric Muller © 1990

Simple Portable Conductivity meter

Make a qualitative conductivity meter with a battery, bulb and foil.

Materials:

- Christmas lights
- Aluminum foil
- 9V battery
- Popsicle/ craft stick or plastic knife
- Wire strippers or scissors
- Tape
- Cups

- Water
- Salt or other ionic solution to test
- Optional: Stainless steel wire instead of Aluminum foil

Steps 1 & 2

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Exploratorium Teacher Institute: Eric Muller © 2006

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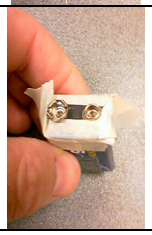
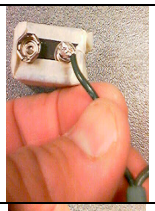
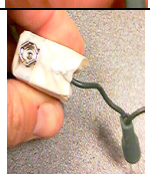
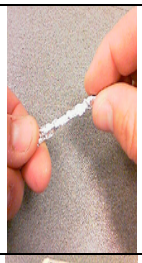
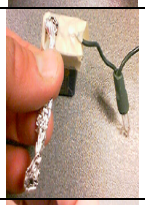
Assembly:

1. Cut off individual lights and expose the interior wire. Wires should trail at least 2 inches or 5 centimeters from base of bulb.	
2. Place tape around the top edge of the 9-volt battery. This will help reduce the chances of short-circuiting the battery by insulating the metal outer battery casing. Also, if you cover the terminal polarities, make a note of which is + or - .	

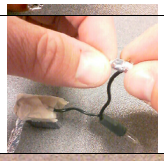
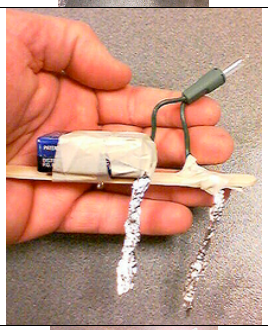
Steps 3 - 5

3. Make a small wad of foil around one of the exposed wires from the light bulb.	
4. Place the wad and wire into the positive terminal of the 9-volt battery.	
5. Secure and cover over the wad and wire with tape.	

Steps 6 - 7

6. Roll aluminum foil into two tubes. These will be your leads to test the conductivity of a solution. Stainless steel wire can be use instead of Aluminum foil to prevent corrosion and reactions with tested solutions.	
7. Place one of the aluminum leads into the negative battery terminal and place tape over it.	

Steps 8 & 9

8. Wrap the other aluminum lead around the exposed wire from the bulb.	
9. Tape the whole thing down to the popsicle/craft stick as shown. A. Secure the battery to the stick. B. Tape the aluminum leads so that they will not detach from the battery or the end of the light bulb. C. Allow the leads to dangle from the stick. D. Leave some stick exposed at both end of the device. This will enable the device to "sit" on top of the solution containers (see intro picture above).	

Steps 10

10. Test your device to ensure that it works properly. Do this by touching the aluminum leads together. The bulb should light. Separate the leads....your device is ready! Note: Don't let the bulb burn too long with direct current from the 9-volt battery. It will burn out the bulb.