

## Determining Bonding Types Lab

### How the presences of certain substances can effect the human body

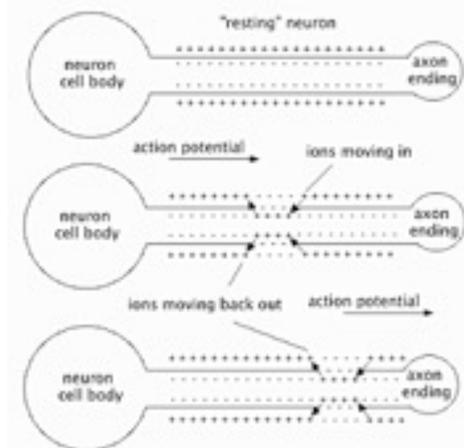
#### Background & Introduction

**Electrolytes are the key to communication.** How do you feel? No, really, how is it that when you touch something your brain immediately knows something about it? It knows the texture, the temperature, even the size, without looking at it.

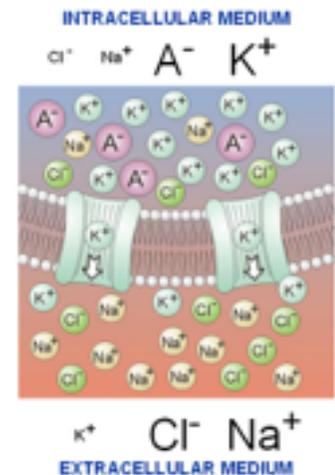
This is due to electrical impulses that pass through your body, known as an **action potential**. This works because your neurons are full of **electrolytes**. Electrolytes are any ion that **dissociates** in water, allowing the solution to conduct electricity. Sodium, chloride, potassium and calcium ions are all essential parts of this process. All along the **neuron**, specific electrolytes are pumped on to either side of the cell membrane, and to send a signal, electrolytes rush across the membrane, allowing the signal to move. The ion pumps then re-set these ions so that the next signal can be sent.

When you are low in electrolytes your body can't communicate with your brain as well and your muscles may cramp. You may feel more fatigue when you are low on electrolytes. You might even crave salty foods, because table salt contains sodium ions, which are a key component needed for nerve signals. Your sweat is full of electrolytes, which is why you need to drink fluids rich in potassium, calcium and sodium when you work out. Sports drinks also contain large amounts of sugar to help give you extra energy when you drink them.

When a patient has diarrhea, one of the key things they lose is electrolytes. For this reason, it is important to drink more than plain water when you have diarrhea, because you need to replace your electrolytes to keep you strong. You also need to have electrolytes to help you absorb water because your body absorbs water through osmosis, which means that water follows the electrolytes. Pediatricians recommend that kids drink Pedialyte when they are sick so that they get the right mix of electrolytes in their liquids, but this works for any age. If you don't have Pedialyte then you can use Gatorade or another sports drink, however the large amount of sugar is not always a good idea when you're sick, so drink sports drinks in moderation or pick up some Pedialyte liquid or freezer pops!



<http://webspaceship.edu/cgboer/theneuron.html>



<http://www.bem.fi/book/03/03.htm>



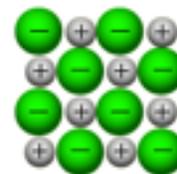
<http://canigivemybaby.com/pedialyte/>

## The Chemistry

**Ionic, Covalent** & Metallic compounds each have **physical properties** that relate to their structures, so there are some tests we can do to help identify the type of bonding in a substance.

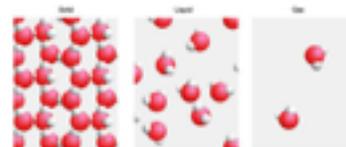
### Melting Points

An ionic bond is made when ions of opposite charges come together to create a crystal lattice structure. In order to melt an ionic compound the temperature has to rise until the ions move with enough force to break away from the oppositely charged ions around them. For table salt, this means you would need a temperature of 801°C to hit the melting point (that's over 1,000°F!).



[http://www.bbc.co.uk/schools/gcsebitesize/science/add\\_ocr\\_21c/](http://www.bbc.co.uk/schools/gcsebitesize/science/add_ocr_21c/)

Covalent compounds don't break apart when they melt, so they only have to reach a temperature strong enough to pull them away from the other molecules to melt them. This is why most small covalent molecules are liquid or gas at room temperature because they have such low melting points.



<http://zubebrinkster.net/SCH3U21/Reactions/Reading/stateparticles.jpg>

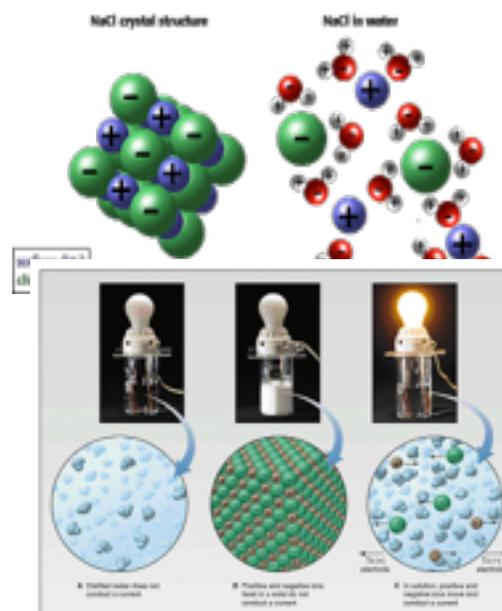
### Solubility & Conductivity

Ionic compounds **dissolve** very easily in water to create an aqueous solution. Since water is a **polar** molecule (meaning it has partial charges) it attracts the ions and surrounds each one as the compound dissociates in the water. Once water is full of charged particles it can conduct electricity very easily. Tap water conducts electricity because the chemicals used to treat the water are ions, so it makes the water into a conductor.

Non-polar covalent compounds do not dissolve well in water. They have no charges on their outsides, so they are not attracted to the polar water. Some polar-covalent compounds do dissolve well in water, however they do not conduct electricity in the water because they do not have charges.

By testing a substance's **melting point**, **solubility** and **conductivity**, you can discover the bond type.

\*Add **chemical property** to your bolded words.



<https://chemistry11mrstanding.wikispaces.com/The+Conductivity+of+Aqueous+solutions>

## **Purpose**

During this lab, you and your lab group will work as a team to test the substances provided. You are looking to determine the differences between ionic and covalent compounds based on some of their relative properties. In the pre-lab, you will research these chemicals so you will know which ones are ionic and which ones are covalent.

As you complete each part of the lab, record your findings in your lab notebook. Towards the end of the lab you will be asked to look at your compiled data and determine whether the unknown substances provided are ionic or covalent. I have provided you with suggested data table structures throughout the lab instructions to help you organize your data.

Please remember, as a group member, it is your responsibility to make a genuine effort to contribute and share the responsibility in achieving the goal of the lab or activity. When working in a chemistry lab it is very important that you always conduct yourself in professional manner otherwise you may cause harm to yourself or others. Grades will reflect your *involvement*, the *manner in which you conduct yourself* as well as the product to turn in for grading.

## References

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Adapted from the HASPI Medical Chemistry Lab 3a Determining bonding Types

## Lab

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Prior to engaging in this Lab activity you must complete your PreLab in your class notebook.

*\*Please note, if you are not able to complete the prelab for any reason, you will work on it while others are working in the lab and you will be given a zero on the assignment until it is completed during the scheduled seminar or as make-up assignment . It is your responsibility to arrange to come to the lab makeup seminar or obtain make up lab.*

**You are to structure your notebook as shown below. Lab title, section titles should be included. Answer the following questions/prompts on the in your class notebook. Though you do not have to copy the questions, you are to phrase your answers so that you know what they are referring to in FULL sentence. You are allowed to use you notebooks on most assessments and they will only be useful to you if your notebooks are organized, legible and detailed enough to provide insight.**

## INQUIRY PRE-LAB

1. **Terms:** The **bolded** words in the above reading are to be defined (in your own words) in your lab notebook prior to entering the lab.
2. List 3 examples of electrolytes.
3. What are 2 causes of low electrolytes?
4. List the expected physical qualities of an ionic substance.
5. List the expected qualities of a covalent substance.
6. Using your class notes, or the internet for the last column, to research the items in the table below and fill in the missing data (create your own data table in your lab notebook of course!)

	Ionic or Covalent	Chemical Formula	Molar Mass	Medical Use
<b>Sodium Chloride</b>			Fill in for them	
<b>Phenyl Salicylate</b>		$C_{10}H_{10}O_3$		
<b>Dextrose</b>		$C_6H_{10}O_6$		
<b>Sodium Iodide</b>				
<b>Sucrose</b>		$C_{12}H_{22}O_{11}$		
<b>Potassium Iodide</b>				

## LAB

**To be done while conducting the lab using your IN LAB INSTRUCTIONS as a guide**

**Purpose/Hypothesis:** What are you attempting to achieve, prove, or test? **State your hypothesis:** *If I do this, then I think this will happen.*

**Materials:** List all that you used.

**Procedure:** List SIMPLE step by step instructions to that someone could repeat the experiment exactly as you did it. Always stat amounts of any substance used.

**Data Tables and Diagrams:** Title ALL data tables and diagrams from the in lab experience very clearly so you can look back at your data/drawings and draw conclusions.

## POST LAB

**Results:**

1. Was you first unknown ionic or covalent? What was your evidence and reasoning for this identification?

2. Was your second substance ionic or covalent? What was your evidence and reasoning for this identification?

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3. Predict the missing data based on the patterns seen throughout this experiment. (create your own data table in your lab notebook of course!)

	<b>Soluble in Water (Y/N)</b>	<b>Melting Point (High/Low)</b>	<b>Conductive in Water (Y/N)</b>
<b>Potassium Chloride, KCl</b>			
<b>Magnesium Bromide, MgBr<sub>2</sub></b>			
<b>Urea, CH<sub>4</sub>N<sub>2</sub>O</b>			
<b>Cornstarch, C<sub>6</sub>H<sub>12</sub>O<sub>6</sub></b>			

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4. Explain the data table above. Literally explain your rational for each box in a paragraph. For example: “Potassium bromide *is or is not* soluble in water because ..., this directly relates to it’s conductivity in water because... Its melting point therefore is... This *is or is not* similar to Magnesium bromide as...” Make it a paragraph description of your understanding! Make what you *know* clear to me. Practice by explaining your understanding of the data table to a lab partner before writing your paragraph description.

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