Name: _____ Class: _____ Date: _____

Ionic or Molecular?

Learner Outcomes:

- Distinguish between ionic and molecular compounds, and describe the properties of some common examples of each.

Key Terms:

Ionic	Non-metal	Molecule
Molecular	Anion	Conductivity
Metal	Cation	Solubility

Background Information: When non-metals combine with other non-metals, they form molecular compounds. When non-metals combine with metals, they form ionic compounds. Ionic and molecular compounds each have unique properties. In this activity, we will examine some of the properties that can be used to classify compounds as ionic or molecular.

Research Question: How do we determine if a substance is ionic or molecular?

Materials:

100 mL beakers	Sodium chloride	Paraffin wax
Distilled water	Ethanol	Copper(II)sulfate
Scoopula	Calcium chloride	Ammonium chloride
Watch glass	Vinegar	Distilled water
Stirring rod	Sulphur	
Conductivity tester	Sucrose	

Procedure:

1. Place a small amount of each substance on a watch glass and record the physical state at room conditions.

This investigation / activity has been adapted from:
Mah K, Martha J, McClelland L, et al. *Science in Action 9.* Toronto, ON: Addison Wesley.

2. Add about 25 mL of distilled water to a clean beaker and add a small sample of each substance to be tested. Stir the mixture and record whether or not it dissolves.
3. IF THE SUBSTANCE DOES DISSOLVE, use a conductivity tester to determine whether or not the solution conducts electricity. Record your observations. NOTE: Contamination of the beaker and probes can give false results. Be sure to rinse thoroughly before and after each test with distilled water.
4. Dispose of the beaker contents appropriately either down the sink or as directed.

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Observations:

Substance	Chemical Formula	Metal atoms	Non-metal atoms	State	Solubility	Conductivity	Type of Compound
Sodium chloride							
Ethanol							
Calcium chloride							
Vinegar							
Sulphur							
Sucrose							
Paraffin wax	$C_{25}H_{52(s)}$						
Copper(II)sulfate							
Ammonium chloride							
Pure water							

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Analysis: Answer the following questions using the evidence collected.

1. Which of the three properties, physical state, solubility and conductivity, can be used to differentiate between ionic and molecular substances? Explain.

2. Based on the evidence used in this investigation, what kinds of solid substances might be difficult to distinguish as being ionic or molecular? Why?

3. The substances tested did not include any gases due to the difficulty they would have presented in handling them during testing. If we had tested gases, we would have noted that some were soluble while others were not. For those that were soluble, the resulting solution would not have conducted electricity. Are gases ionic or molecular substances?

Conclusion:

Extension:

Use library or internet resources to find out how the unique properties of some common ionic substances are important in our day to day life. Find out how molecular substances are commonly used in daily life.