Sharing vs. Stealing Draft 1.1 December 2002
The differences between ionic and molecular compounds
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Objective: To identify compounds as either primarily ionic or primarily covalent by recognizing patterns among the properties of various chemicals.

Target student audience: YR. I GENERAL CHEMISRTY

ChemSense user level: Intermediate

ChemSense tools used: DRAWING

Specialized tools needed: Test tubes, glazed paper, test-tube rack, stoppers, hot plate, beaker, graduated cylinder, safety goggles. Choose from the following reagents: benzoic acid, magnesium chloride, paradichlorobenzene, potassium iodide, copper sulfate, sucrose, and methanol.

Classroom implementation

Time: 2 (45-55 minute) classes or long period of similar length.
Student grouping: PAIRS
ChemSense Activity Type: DRAWING, Laboratory Experiment

Chemistry concepts in activity (linked to CA standards & ChemSense 5 themes):

Standard 2a- Students know atoms combine to form molecules by sharing electrons to form covalent or metallic bonds or by exchanging electrons to form ionic bonds.

Standard 2b-Students know chemical bonds between atoms in molecules such as H_2, CH_4, NH_3, H_2CCH_2, N_2, Cl_2 are covalent.

Standard 2c- Students know salt crystals, such as NaCl, are repeating patterns of positive and negative ions held together by electrostatic attraction.

Standard 2e- Students know how to draw Lewis dot structures.

Prerequisite chemistry concepts: Covalent and ionic bonding; Characteristics of molecular compounds; naming ionic and molecular compounds; Lewis structures; Chemical properties (melting point, boiling point, conductivity, solubility, color, and odor)

Inquiry skills (linked to NSES):

Design and conduct scientific investigations (NSES)
Formulate and revise scientific explanations and models using logic and evidence (NSES)
Communicate and defend a scientific argument (NSES)

ACTIVITY Summary:

1. PreLab- answer questions on report sheet (see experiment instructions)
2. Laboratory experience- follow procedure
3. Post Lab- answer discussion questions
4. ChemRxn- use beaker full of water molecules to show submicroscopic interaction between water and various compounds. (Part I and Part II)
5. ChemSynthesis- create molecules and use them to answer questions about the properties of the particular compounds.

Sources: Laboratory Experiment handbook Heath and Co.

Application:

Activity: (this lesson may be split in two separate days)

Students will:

1. PreLab- Answer questions from laboratory experiment report sheet. Review concepts include: ionic compound composition, molecular compound composition, melting time, and electrical conductivity. Make predictions about the identity of various compounds based on their names.

2. Laboratory experiment- Gather the selected reagents. Test them each separately for solubility and then do conductivity tests on them. Teacher demonstrates melting times for the substances while students observe and record observations. (follow all directions under the procedure section of lab manuel)

3. PostLab- After making observations and recording results, answer the questions on the experiment report sheet. Make conclusions about the compounds and observe any trends among them.

4. ChemRxn- Upon finishing the synthesis questions, use ChemSense to expand visual understanding of laboratory experience. Use the beaker of water molecules and show how sodium iodide would disassociate water. The Lewis dot structures of sodium and iodine are given and may be copied and pasted to represent the interaction. Try another compound, this time will use methane (carbon and hydrogen atoms.

5. ChemSythesis- To review and practice with more complex compounds, put the following compounds together: methanol (CH_3OH) and paradichlorobenzene ($C_6H_4Cl_2$).

6. Evaluation- answer questions about how creating the structures changes/modifies visual representation of the interactions between compounds and water. Evaluate each other's models and make modifications accordingly.

Rubric/s for scoring:

ChemRxn Activity-

Level:	**Defining characteristics:**
Insufficient mastery	Does not properly represent the interactions between the compounds and water. Covalent bonds may show to be broken. Ionic bonds may be represented incorrectly.
Basic mastery	Shows both types of compounds interacting, although does not properly differentiate the differences clearly.
Exemplary mastery	Correctly represents ionic compounds as breaking the electrostatic interactions (ionic bonds) and interacting with the water. Molecules are shown interacting with the water molecules, but not breaking their intramolecular bonds (covalent bonds).

ChemSynthesis Activity-

Level:	**Defining characteristics:**
Insufficient mastery	Bonding is not properly represented. Number of atoms may have caused the bonding to be misrepresented.
Basic mastery	Number of atoms and bonds are shown, but unrealistic representation of the molecule may be displayed.
Exemplary mastery	Shows both molecules with the proper number of atoms, the correct bonds between all atoms and realistic placement of all atoms.