Title: Chemical Formulas

Problem to be studied: How to name simple chemical formulas and write their formulas.

Background: Students, especially the non-science motivated, generally struggle with the basics of understanding why chemical formulas are written the way they are. For many, simple inorganic compounds, the writing of correct chemical formulas is, in fact, simple provided a few basic rules are followed.

Suggested Grade Level:
9-10

Materials:
Ion flash cards
Scissors
Rulers
Paper, lined

Content Standards:

3.1.10B. Describe concepts of models as a way to predict and understand science and technology.

3.1.10C. Apply patterns as repeated processes or recurring elements in science and technology.

Content Objective (s):

1. **Students will use a set of flash cards to model writing names of chemical compounds and writing correct formulas using just three basic rules.**

Process Standards:

3.4.10A. Explain concepts about the structure and properties of matter.
- ***Recognize formulas for simple inorganic compounds.***

Process Objective(s):

1. **Students will demonstrate how to name simple inorganic chemicals by there formulas.**

2. **Students will successfully write correct formulas for simple inorganic chemicals.**

Assessment Strategies: (Evaluation)

Formative Evaluation:

1. **Review previous vocabulary: *atom, electron, molecule, compound, symbols* and *chemical formula*. Students will orally define these terms (If necessary, review the concepts); and be asked if they know what is a *subscript, superscript* and *radical*, and can give an example of each.**

Summative Evaluation:

1. **A written assessment will be given after lesson, ie. "Name this compound" after showing formula; "Write the formula for this compound" after giving its name; and "Is this formula correct? And Why?" after showing its formula.**

2. **An extended project will require each student to find five (5) household products that contain a simple inorganic compound, hand in their labels (or a reasonable facsimile), name the compound and write its chemical formula.**

Procedures:

Engage:

1. **Show an example of a chemical formula. Ask the following: "What is the name of this compound?"; "Can you tell if this formula is correct?"; and, "How can you tell if the formula is correct?".**

Engage--continued

2. **Tell students that we will come back to these examples at the end of the lesson to see if they answered/ guessed correctly.**

3. **Introduce new vocabulary: *subscript, superscript,* and *radical, and* explain how they "work".**

Explore:

1. **Distribute ion flash card sheets and review and explain the symbols used. Be sure students notice and understand the charge symbol in the upper right hand corner of each ion. Ask which numbers are the superscripts and/or subscripts.**

2. **Distribute scissors, rulers and envelopes. Have the students cut out the cards; and identify the envelope with their name and class information.**

3. **Have the students arrange the cards in vertical rows, by charge, starting with hydrogen. Ask, "What does the arrangement resemble?".**

4. **Naming chemical compounds**

Ask students to name several compounds by showing their formulas. This is easily done by the students finding the appropriate flash cards and reading the names of the ions directly from the cards.

5. **Writing chemical formulas**

Rule #1—Place the cards side by side for the compound in question. Example: Al^{3+} O^{2-}

Rule #2—Drop the sign and decide what to do with the numbers.

If both are the same, simply drop the numbers. The remaining symbols make the correct chemical formula.

If the numbers are different, criss-cross them so they become subscripts to the other symbol. If a "new" subscript(s) is a 1, drop it. The remaining symbols make the correct chemical formula.

Rule #3—If the negatively charged ion is made of more than one element.

Follow Rule #2, but if the "new" subscript for the negatively charged ion is greater than 1, write parentheses (radical) around the ion with the subscript outside and on the right side. $Al_2(CO_3)_3$

Explain:

1. **Use the appropriate vocabulary about chemical formulas to explain what we did and why we did it.**

Elaborate:

1. **Show how a correctly written formula is electrically balanced.**
2. **Remind students that what we did applies only too simple compounds and there are more complex inorganic compounds and formulas that have some other rules to follow. Show a few examples.**

Related Web Sites:

1. **www.rubristar.4teachers.org**

Sources consulted in developing this lesson:

1. ***Concepts and Challenges In Physical Science***
2. **Several years of experimentation.**