2007 Reaction Lesson Study

Goals:

Identify the five types of reactions.
Predict the products with correct subscripts.

What should they already know:

Balancing reactions
Writing chemical formulas (ionic and covalent)

Misconceptions:

Transition metals charges are hard for students to determine.
The students think that the subscripts of the elements remain the same on both sides of the arrow.
Polytomics that break down further than the ions (Carbonate and chlorate).
Students like to have cations forming a compound together and the ions.
Combustion is a change of state of matter- solid or liquid to gaseous.
Additive view of chemical reactions. ($3N_2$ Vs. NNNNNN)
Salt is NaCl not any soluble ionic.
Hydrogen can't act as a metal in a single or double replacement reaction.
Order of reactants or products can't change.

Day 1: Introduction of reactions

Pattern recognition activity. In groups students are given a list reactions, and asked to find a pattern. (see Patterns document)

Group probing questions:

-What type of chemistry things have you looked for in the sample list?
-Have you thought about ionic vs. covalent bonding?
-Have you thought about what states of matter you start and end with?
-Have you thought about metals vs. nonmetals?
-Have you looked elements vs. compounds combinations before and after?
-How many "pieces"/"species" do you have before and after?

Probing questions for presentation of patterns by groups:

-Does the pattern follow the entire list of sample equations?
-What type of ion is doing the replacement?
-With the single replacement/synthesis, did you notice a pattern that worked for some in the list but not all? What are the differences?
-In double replacement, why did the ions choose the partners that they did?

Evidence to collect:

-Video of class
-Pictures of whiteboards
-Photocopy of one groups work/notes from their list of reactions
-Interview of individual students

Day 2: Formal instructions/demos

We are going to perform demos while we formally introduce the reactions. Students should be asked to make suggestions for products of the demos.

Generic questions for all reactions:
How many reactants do you start with?
Do you have elements or compounds when you start?
Are the compounds ionic or covalent?
Are the elements metals or nonmetals?
How many products are formed?

Probing questions for synthesis reactions:
Where does the extra mass come from? (for burning metals)
Could we classify burning metals under a different category?

Probing questions for decomposition reactions:
For gummie bear demo, how do we know that oxygen is produced?
The gummie bear demo is unique, what is happening to the polyatomic?
For electrolysis demo, how do we know that oxygen and hydrogen are produced?

Probing questions for single replacement reactions:
Where did the blue color of the copper (II) sulfate go?
What evidence do we have the production of copper?
Where did the zinc go? Explain why the zinc disappeared.
Is the cation/anion doing the replacement?
Who did the cation/anion replace and why that choice?

Probing questions for double replacement reactions:
Which product is the solid? (This question might want to be used only with upper level classes.)
Would Ag ion and Na ion combine to form a compound? Why or why not?
Would NO_3 ion and Cl ion combine to form a compound? Why or why not?

Probing questions for combustion reactions:
How do we know that water and carbon dioxide are produced?
How do we know that the cotton ball/dollar bill is not burning?
How might we be able to test for the presence of carbon dioxide and water?

Evidence to collect
Video of class
Homework
Exit card
Log of new questions