

2007 Reaction Lesson Study

Goals:

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

Do: See the goals

Understand: Reactions in nature occur in a predictable way (patterns).

Know: they five types of reactions and the difference between them.

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) **This is hard to do because you need a very sensitive scale or a very large piece of magnesium.**
- 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 NO₃ 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 – Give students from one group a different type of reaction for an exit card.

This is checking to see if the groups are actually learning from the other group's presentations.

Log of new questions

Did we meet our goals and what evidence do we have?

Yes, we met the goal of having our students identify the types of reactions. In this lesson, we feel that the goal of predicting the product with the correct subscripts was covered after this lesson study. Evidence for this are:

1. Student work that shows that the student were able to ID the reactions.
2. Notes from the demo day, which includes their predictions of the types of reaction for the demos.
3. Video of the students making the predictions of the demos.
4. Students presentations of the patterns that they were given to figure out.

What changes are going to be made? What evidence do we have to make these decisions? How do these changes tie into the original instructional goals?

1. Modifications to patterns list based on students finding patterns that lead them astray. This eliminates misconceptions. An example of this is that our students noticed diatomics every single replacement reaction.
2. The structure of the pattern finding day. After a group has finished their patterns list and presentation aide, the group should be given another set to work on until all the rest of the groups are finished. This is more of a classroom management issue and allows the group a chance to contribute their observations during the other group's presentations.
3. A Tri-Mind assessment after the student presentations on the types of reactions, but before the demo day. This allows for differentiated assessment and give the students a tool for the demo day to help them predict products of the demos. This also gives us an individual assessment rather than just a group assessment.
4. Better individual group video so that we can actually hear the students talking. The video from this year was difficult to hear the students discuss the patterns activity.
5. Focus on using our probing questions that we made with video. We want to find out if the questions were effective? We spent the summer 2007 meeting writing the questions, but then we didn't use them.
6. Exit card at the end of the patterns activity day. We had this on the lesson plans, but no one used it.