SI Showcase:
Learning Organic Reactions

Supplemental Instruction
Iowa State University

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Course: Chem 231
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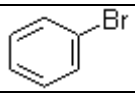
Primary Goal(s) of Activity:

- To organize information about several related reactions
- To review information about reactions presented in lecture
- To create useful tools for personal exam review

Reaction Matrix/Organization:

This works especially well when there are several reactions that proceed by the same mechanism (for example, electrophilic aromatic substitution or nucleophilic acyl substitution)

1. Create an empty grid on the board for students to fill in. The top row can be the names of the reactions and the leftmost column can give different aspects of the reactions which are important. You might fill in one column so that students understand each category.
2. Example: Electrophilic Aromatic Substitution

Reaction Name:	**Bromination**	**Chlorination**	**Sulfonation**	**Nitration**
Reagent	Br_2			
Acid Catalyst	$FeBr_3$			
Electrophile (E^+)	Br^+			
Product				

3. You might also want to write (or have a student write) the general reaction, using R, R', E, Nu, L etc. as a reference point.
4. Students can fill in the chart by referring to their notes, the textbook, and helping each other. When most students seem to be done, ask each small group to fill in one column of the table.
5. Have students identify trends (e.g., Which reactions proceed the fastest?) and answer additional questions about the reactions (e.g., What is the intermediate of this reaction?). Also, give them a chance to do at least one or two examples using the table.
6. Completed examples that were used in Fall 2008 Chem 231 SI are available online:
   - http://www.dso.iastate.edu/asc/si/documentdb/fall_2008/CHEM_231_Zhao_chelsea_electrophilic_aromatic_substitution_summary.jpg
   - http://www.dso.iastate.edu/asc/si/documentdb/fall_2008/CHEM_231_Zhao_chelsea_102908_nucleophilic_acyl_substitution.doc

Creating Flashcards of Reactions:

Materials: You will need notecards to do this activity!

1. Write the beginning of each reaction (i.e., the reactants and anything over the arrow) on the board using the general symbol R for alkyl groups.
2. Have students refer to their notes to tell you what they think the general products will be. Also discuss other important information (intermediates, Markovnikov rules, etc.) to know about the reactions.
3. With the completed list, give students a few minutes to copy the reactions onto notecards. You can give them tips—for example, I like to write the starting materials and everything on the arrow on one side and product on the other side.

4. Give the students a worksheet or examples on the board to practice. Make sure they understand why and how the "R" abbreviation is used—often, students don't understand how to take the examples learned in class and apply them to any reaction of the same type.

Tips on Writing and Using Examples of Reactions:

1. Have students be constantly identifying electrophiles and nucleophiles (or acids and bases) in reactions.
2. Find examples from old tests in ALL organic classes (you can use examples or molecules from old 331/332 tests in 231 SI!) or on websites (the McMurray text used for 331 has an excellent companion site at *chemistry.brookscole.com/mcmurry6e/*).
3. When students have finished an example, have them identify what happened in the reaction (e.g., one functional group substituted for another or something added across a double bond).
4. Reacting one molecule with many different reagents can showcase many concepts at once (e.g., why does this molecule react with $LiBH_4$ but not $NaBH_4$?).
5. It can be helpful in preparation for tests to write examples of bad reactions and have students identify what is incorrect about them (especially for reactions with carbocation intermediates!).
6. Give a product and what was "over the arrow" and have students identify starting materials (especially for condensation reactions!).
7. Look at old exams to see how the professor might write "tricky" questions (e.g., two functional groups reacting at the same time).