

## Organic Chemistry Laboratory

### Writing an “Experimental”

A typical article in a chemistry journal has several sections: an abstract, an introduction, an experimental section, a results section, a discussion section, and a conclusion. In the abstract a very brief description of the goals and results of the article are presented. The introduction introduces the topic that is being addressed. The results are presented in the results section and they are discussed in the discussion section. The conclusion is typically a short summation of the work. The experimental section is the part of the article where all of the laboratory work is described. Chemists often refer to the descriptions of the lab work that appear in the experimental section as “experimentals”. An “experimental” is a concise description of the procedure that the experimentalist (you) follows to accomplish the goal of the experiment.

In general, the writer assumes that the reader has a working knowledge of all the techniques that are used during the procedure; thus, descriptions of how to perform techniques or how to assemble an apparatus are not necessary. In other words, you do not need to tell the reader how the vacuum filtration apparatus was assembled. For example, the following phrase

After 15 minutes elapsed, the inside of the flask was scratched with a microspatula to dislodge the crystals that had formed. The crystals were emptied onto a filter in the Hirsch funnel that was attached to a vacuum system.

could be rewritten

The solution was cooled in an ice-bath for 15 minutes, and the resulting white crystals were isolated by vacuum filtration on a Hirsch funnel.

An experimental is a very formal way of writing. It is written in the third person, the past tense, and the passive voice. “I” should never appear in an experimental. Measurements are typically placed in parentheses following the item that is being measured. For reactants, the measurement includes the amount in both grams and mol or mmol. A space should be included between the measurement and the unit; however, when a measurement is used as an adjective to, for example, describe the size of a container the measurement and unit are hyphenated. For example,

Benzoic acid (0.502 g, 4.11 mmol) and water (5 mL) were added to a 50-mL Erlenmeyer flask.

Notice that the number of moles is not calculated for the solvent, water in this example. Additionally, note how “Erlenmeyer” is capitalized but “flask” is not. “Erlenmeyer” is capitalized because the type of flask is named after the person who designed the flask. Things that are not proper nouns are not capitalized: contrast “Erlenmeyer flask” with “boiling flask”, Erlenmeyer is a proper noun, whereas boiling and flask are not. Similarly, only trademarked chemical names are proper nouns; thus, Tylenol is capitalized because it refers to a trademarked brand of acetaminophen, whereas the chemical name for the analgesic, acetaminophen, is not capitalized.

## Steps for Writing an Experimental

Comments concerning the difficulty of the lab, or what was learned during the lab are inappropriate in an experimental. Discussing the quality of one's results in an experimental is also inappropriate. An experimental is a description of the experiment.

1. Type each step that you did into a computer.

For example...

I added benzoic acid to a flask.

I added water to the flask.

I heated the flask on a hot plate.

I added more hot water until the benzoic acid dissolved.

2. Convert all sentences to third person past passive voice.

For example...

Benzoic acid was added to a flask.

Water was added to the flask.

The flask was heated in a boiling-water bath on a hot plate.

Boiling-hot water was slowly added until the benzoic acid dissolved.

3. Add data and observations to each step

For example...

0.5013 g Benzoic acid was added to a 50 ml flask.

5 ml Water was added to the flask and a white slush formed.

The flask was heated in a boiling-water bath on a hot plate.

15 ml Boiling-hot water was slowly added until the benzoic acid dissolved. A colorless solution resulted.

4. Clean up technical details

For example...

Benzoic acid (0.5013 g, 4.105 mmol) was added to a 50-mL Erlenmeyer flask.

Water (5 mL) was added to the flask and a white slush formed. (*Its a style thing; chemists avoid starting sentences with numerals unless absolutely necessary.*)

The flask was heated in a boiling-water bath on a hot plate.

Boiling-hot water (15 mL) was slowly added until the benzoic acid dissolved. A colorless solution resulted.

5. Convert to paragraph form and clean up language.

Benzoic acid (0.5013 g, 4.105 mmol) and water (5 mL) were added to a 50-mL flask. The resulting white slurry was heated in a boiling-water bath on a hot plate. Boiling-hot water was slowly added (15 mL) until the benzoic acid dissolved; a colorless solution resulted.

6. The experimental ends with a statement about the chemical that was isolated. Typically, one describes the appearance, lists the amount of chemical that was isolated (g and mol or mmol), the yield or percent recovered (whichever is appropriate), and any analytical data (like melting point) that were used to identify the chemical. For example, an experimental describing the recrystallization of benzoic acid could end as follows:

A white crystalline solid (mass, moles, % recovered or % yield) was collected and identified as benzoic acid (MP xx – xx °C).