

Making Qualitative Observations

In this lab, we will be making observations of the results of mixing chemicals. These will be qualitative observations because we will not be measuring any numeric quantities. After we record our observations, we will make conclusions based on the observations that attempt to explain the results. The quality of our conclusions will only be as good as the quality of our observations; therefore, it is important that we learn to make and record accurate, clear, and complete observations.

There are four general guidelines that we should always follow when making qualitative observations in order to have the clearest, most accurate, and most complete observations possible:

- 1) All observations are primary data and should be recorded in ink, directly on the experiment sheets at the time of the observation.
- 2) Observations should be recorded in complete sentences.
- 3) Observations should be recorded with enough detail that another person could reach the same conclusions by only looking at the records, without having actually observed the experiment.
- 4) Observations should not contain any conclusions. For example, the chemical identity of any solids formed during an experiment should not be included in the observations; these are conclusions that are made after the observation. Only the fact that a solid was formed, and the appearance of the solid, should be recorded in the observations.

Abbreviations help make observations neater, clearer, and more convenient to record. However, it is important that others be able to understand your abbreviations. Therefore, we have developed a set of standardized, acceptable abbreviations at OCC for use in your observations.

c/c	clear and colorless	ppt	precipitate
c/c/o/rt	clear, colorless, odorless, and room temp	tt	test tube
nocto	no observable change in temp or odor	dw	deionized water
temp	temperature	rt	room temperature

A proper complete observation of a chemical reaction has three basic parts: 1) a complete description of the reactants, 2) a description of the procedure, and 3) a complete description of the results. Below is an example of a proper qualitative observation:

Around 1 mL of c/c/pungent smelling/rt 6M HCl soln and ~ 1 mL of c/c/o/rt 0.01 M AgNO₃ soln were rapidly mixed, instantly forming an opaque white mixture. Nocto. After closer inspection, a finely divided white ppt could be seen dispersed in the tt.

Notice that the example contains only observations. Statements such as “a reaction occurred” or “a product was formed” do not appear in the example because these are conclusions that we would draw from the observation. The major components of a proper observation are summarized in outline form on the next page.

A proper qualitative observation should contain at the minimum the following sets of information:

I. For the **reactants**:

- A) *Amount*
 - B) *Clarity* (for solutions): clear, translucent or opaque
 - C) *Color*: if a substance has no color, then it is colorless
 - D) *Odor*
 - E) *Temperature*
 - F) *Concentration* (for solutions): concentration on the container
 - G) *Identity*: name and/or formula from the bottle
- Additional characteristics for **solid reactants** (insert between color and odor)
- H) *Size*
 - I) *Shape*: powder, small crystals, flakes, lumps, ribbons, etc.
 - J) *Surface*: shiny or dull

II. For the **procedure** (longer statements may be necessary when the experiment involves more than a simple mixing):

- A) *What was done?*: were rapidly mixed, was added to, was heated, etc.
- B) *Rate* at which change occurred: instantly, quickly, slowly, after heating, etc.

III. For the **changes that occur**, including formation of products

- A) Note any *temperature or odor changes* (use NOCTO if there aren't any)
- B) *Clarity*: clear, translucent, or opaque
- C) *Color*: if a substance has no color, then it is colorless
- D) *Evidence of gases*: bubbles, odor change, chemical test, color above the mixture
- E) For any **precipitates**:
 - 1) *Approximate amount*
 - 2) *Appearance*:
 - a) *Flocculent*: individual, fluffy, feathery, clumps that look like snowflakes
 - b) *Gelatinous*: continuous, translucent, jelly-like clumps
 - c) *Curdy*: dense clumps
 - d) *Finely divided*: small dispersed particles that may eventually aggregate to become curdy
 - e) *Crystalline*: distinct solid with flat surfaces and sharp angles (note shape in observations)
 - f) *Colloidal*: appears clear or faintly cloudy, and usually can only be detected by Tyndall effect (using light).