How to be Successful in Chemistry

Succeeding in chemistry (or any science course for that matter) requires good thinking and good communication. Most high school students (and many college students) have difficulty organizing information and thinking logically about that information. Many also have difficulty writing in a clear, precise, and objective manner.

I have divided these problems (as they have arisen so far) into two categories: Procedure and Misconceptions.

1. Procedures

Procedure means how you handle the mechanics of communicating what you know (or don’t know).

1. For questions involving calculations, don’t write the answer and expect to receive any credit if you haven’t also shown how you calculated the answer (eg. density formula).
2. Circle the final answer if complex calculation (this will be an issue later on)
3. Record the hour on the paper (For grading, I separate assignments into piles by type, not hour, then sort out the hours to enter grades in Infinite Campus and for returning the papers.)
4. Submit all practice work on time! It does you no good to copy the answers blindly without having attempted to solve the problems on your own (or with a study buddy).
5. Never copy someone else’s answers when doing practice work. If you do this it means you have not practiced. You are not impressing anyone by turning in someone else’s work as your own.
6. Always revise practice work during class review or on your own if you missed the review), but never turn it in (your practice grade will not appear on your report card but is a reflection of the effort you have put into your work)
7. Always read the entire question and make sure you understand what is being asked (for obvious reasons). If it is unclear, ask.
8. Multiple parts in a question (eg. a-e) does not always mean multiple choice. Look for the word “each” in the instructions for the question (such as “Give the symbol for each of the following elements”).
9. Don’t use pronouns unless you make it clear what “they” refer to. (“It will float, but the other won’t” is not clear unless you indicate what “it” is and what the “other” is. Sorry, I can’t read your mind.
10. Don’t make stuff up (for example, don’t pretend that information is given in the problem that is really not). Also, don’t try to change the question to suit the answer you want to give.
11. Be internally consistent in calculations. If a later calculation relies on an earlier calculation you got wrong, I expect to see you use the wrong figure. If you did not do the earlier calculation, it raises a red flag if I see that you did the later calculation (how?).
12. Focus on answering the question – don’t throw in true statements that are irrelevant to the question.
13. Yes, there are absolutes, but be careful with them (such as never, not any, always.) For example, don’t write “Gases have no density” when you mean “Gases have very low density”. Don’t write “never” when you mean rarely. Don’t write “always” when you mean “usually”. In addition, keep in mind that there are often exceptions to rules, which means you will almost always be wrong if you always write “always”.
14. When expressing a measurable quantity, it is important to write the correct unit of measurement after the number. This includes “derived” units.
15. Common Misconceptions  
    Misconception means “mistaken notion”. These are very common among students and often prevents them from further learning. It is therefore important to correct all misconceptions related to chemistry before we go deeper into the subject.

The following are based on the “Science and Engineering Preassessment” and Density Quiz 2:

1. Many people believe that salty water is cloudy. This is a good observation from what you have seen in the kitchen, but the statement is nevertheless FALSE.
2. Water expands when frozen, but not for the reasons you think.
3. Many people have a difficult time deciding if a change in a substance’s appearance is a physical or chemical change.
4. Some people think a compound is a mixture of atoms. It is in a way, but not really.
5. Related to (4), some people think that only individual elements can be pure substances because compounds are “mixtures of atoms” and therefore not pure. This is FALSE.
6. It is FALSE to think that when doing division the larger number is always divided by the smaller number. Along with that, it is FALSE to think that numbers can’t be smaller than 1.
7. Many students think that the numbers they get on their calculator have to be right. How wrong they are!
8. Being specific is not the same as making a general statement that is true. “The sky has color” is a true statement, but it doesn’t specify what color, or even more specifically what color under what circumstances.
9. Don’t assume that “water” is a liquid. This is our most common experience with water, but it can also be a solid or a gas depending on temperature and pressure.
10. Don’t assume that something that is “invisible” has no mass, such as air. This is FALSE.
11. Some people think that the volume of air can’t be measured. This is FALSE.
12. Although gases have a density less than 1g/mL, it is FALSE to think that all substances with a density less than 1g/mL are gases.
13. Many students confuse the concepts of weight, mass, and density. These are all different (but related) ideas.
14. Although mL (or L) is usually used to measure the volume of a liquid, other units (such as cm3 or m3) can be used as well. In fact, any unit of volume can be used regardless of whether you are measuring a liquid or a gas or a solid. However, solids such as rectangular prisms are usually measured in cm or m and therefore their volume is usually expressed as cm3 or m3.
15. mL and cm3 are not different – they are equivalent to each other. Usually mL refers to liquids and cm3 refers to solids, but not always. Also, what about gases?
16. Mixing liquids of different densities does NOT result in a mixture that is more dense than either.