# Chapter 7. Cracolice, 2/e. Chemistry X11.

**WRITTEN ASSIGNMENT #2**, due just after we finish the chapter (which will probably be in class 5 or 6). Part 1… Ch 7 #4 abce; added questions: calculate the molar masses of oxygen gas and of copper(II) sulfate 5-hydrate (recall Sect 6.10); 8b, 11a, 14a, 18, 35; use the method of dimensional analysis for conversions, and show clear work. Remember that the written assignment is just a few so I can spot check your work; you need to do many more to learn the material. Part 2… ask a question. OPTIONAL (on non-core sections, intended for those who have mastered the basics and want more): 21b, 23, 29, 37.

[Answers. Added questions with #4: 32.00, 249.70 amu or g/mol.]

There is a **supplemental worksheet** at the web site on mass-mole interconversions.

## Chapter 7

You are responsible only for Sections 1-5. The key idea is the mole. You will learn to calculate the mass of a "formula unit" (molecule or not), in units of grams/mole (Sect 2 & 4). This "molar mass" is the key to doing calculations involving amounts of chemicals (Sect 5 and Ch 9, 16). Use of dimensional analysis will help you through mole problems even while the mole remains a little vague to you.

⇒ **Pitfall**. The proper abbreviation for mole is mol (p 175). The use of m for mole is unacceptable; m means meters and M means molarity (Ch 16).

The problems here involve two main conversions, things ⇄ moles and mass ⇄ moles. As a practical matter, the latter are more important. The former, involving Avogadro's number, are good exercises on the mole concept, but you won't do many of these in the real world. Understanding the idea of a mole and relating it to mass are important; remembering the numeric value of Avogadro's number is not.

How many decimal places should you use when calculating molar masses? The most important answer to this is based on your needs in each specific case.

In real work, the number of places to carry is determined by the quality of your data. If the data is 3 SF, then you need 3 SF in your molar masses. (It is good to keep one extra until the end, to minimize rounding errors.) You will see this situation starting with Sect 5.

Prior to Sect 7.5, you are calculating molar masses in the abstract. This is not a normal situation; it is simply a step in learning to do the calculations. But it means that there is no context, hence no clue about the "needed" precision.

On p 173, Cracolice addresses this same question. His proposed solution is fine.

The main point I would emphasize is to be consistent. If you are going to read atomic masses to tenths, then read all to tenths (properly rounded).

When using a calculator, it is little extra work to carry extra decimal places. It is reasonable to do your calculations routinely with all the available digits, then round off the final result to the desired precision (say, 3-4 SF, as needed). I am happy to

discuss this further with those who have particular concerns.

Sect 6 & 8 build on the earlier material. These involve calculations between the mass percentage of a chemical and its formula (elemental composition). Those who are comfortable with the earlier material in this chapter are encouraged to try these sections; they are good "Chem 1" material. I am happy to talk with you about them privately, or to look at homework. We probably will not discuss Sect 6 & 8 in class. (I have included some optional problems for these sections on the assignment.)

A useful trick when you are working with percentages is to use 100%/1 as a CF, so you can follow the usual dimensional analysis. It is true, yes? In effect, you are treating % as a unit. If you have trouble figuring out what to do with percentage problems, give this a try.

The comments above that some Sect of the Ch are "core" and some are more advanced in that they "build on the earlier material" are intended to help you set priorities. I would prefer that everyone masters everything, but that isn't what happens in the real world. You need to prioritize. Start with -- and emphasize -- core material; go beyond that if you can. It would be bad to shortchange yourself on the basics but spend a lot of time on more advanced material that depends on the basics. That is bad priorities. (There will probably be some test questions on the advanced material; these are intended as hard questions, to challenge and reward the best students, or they may be bonus questions. But most of the tests will be on core material.)

Those who are going on to take regular college chemistry ("Chem 1") should of course learn as much as possible from this introductory course.

Section 7 is a summary of what a formula means. Ignore the % part of this section (which depends on Sect 6), and you may find it useful.

## Comments and errata

p 179. Example 7.7, last step. Unit "g" is missing in set-up for molar mass of $BaCl_2$.

On p 195, Cracolice provides a list of formulas that are needed for the homework problems. *You should not use this list.* You should use the problems in this chapter (and upcoming ones) as a chance to learn Ch 6 by practice. Relying on this list undermines learning chemistry, and will result in poor work on tests.

p 195, #12a. Units in answer are obviously incorrect.

#35. It is not necessary to convert to pounds, or to any other particular unit. The purpose of the calculation is to answer a question that was posed. So long as you convert the result to a unit that makes sense to you, it is fine.

## Further reading

B J Wood et al, Accretion of the Earth and segregation of its core. Nature 441:825, 6/15/06. Review. "The high-pressure nature of the core-forming process led to the Earth's core being

richer in low atomic number elements, notably silicon and possibly oxygen, than the smaller planetesimal building blocks would indicate." This discussion of how the earth formed is perhaps broadly relevant to the attached worksheet, below.

W B Jensen, How and when did Avogadro's name become associated with Avogadro's number? J Chem Educ 84:223, 2/07. From the "Ask the historian" column, addressing questions sent in by readers.

National Mole Day. Starts at 6:02 in the morning, on 10/23. Theme for Mole Day 2006 is Mole Madness. For 2005 it was Moles-go-round. For more… http://www.moleday.org/

***Attached****: Worksheet (elements in general; Ch 2, 5, and a little of 7). For fun. See Wood et al (2006) in Further Reading, above, for more. (You don't need to read the article to do the worksheet!)*

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