Reading Guide

for the Nuclei and Atoms unit

Chemistry Chapter 1: Hidden Ingredients

This chapter gives the background to our study of chemistry. It explains concisely how chemists came to realize that matter is made of **atoms** of a certain number of **elements**. Skim this chapter.

Chemistry Chapter 2: Matter Becomes Electric

pp. 17–24. This section explains what all atoms are made of, and a little history of how we know.

- What are the three particles making up all atoms?
- What are their masses?
- What are their electric charges?

pp. 25–27. This brief section explains several terms. Key ideas are:

- What is an **atomic number**?
- What is an **isotope**?

One term that is not defined in this section, but which I think should be, is the **mass number**: the sum pf the number of protons and neutrons in an atom's nucleus. The mass number is used to name an isotope: Carbon-13, for example, has 6 protons and 7 neutrons in its nucleus, so its mass number is 13. That is why it is called Carbon-13.

pp 28–30. This section describes some of the bizarre behavior of electrons. Electrons are so tiny that the rules governing them are different from Newton's laws which govern the behavior of the objects in our familiar world.

- Why must electrons in atoms occupy only **orbitals** with specified energies instead of having any energy?
- What is the meaning of an atom's **ionization energy**?

p. 31. Now that we know what atoms are made of, and that an electron can be situated around the nucleus, we learn how the electrons are arranged in atoms with many electrons! This page shows the order in which electrons go into orbitals…

pp. 34–35. Here we see some examples of orbital occupancies, otherwise known as **electron configurations**, of atoms of different elements.

pp. 36–37. These pages show how the **periodic table** tells us the elements' electron configurations!

p. 38. Here is the whole periodic table itself.

pp. 39–41. Skim these pages. They describe properties of atoms that strongly influence their chemical behavior. We will not directly explore these properties in this class. The trends of these properties are periodic: they change in regular ways depending on an atom's position in the periodic table.

pp. 42–44. These pages are a continuation of the previous section, but I want you to read them more closely. They describe how the chemical properties of elements can be explained and predicted by the elements' position in the periodic table. Specifically, you should be able to define:

- **metal**
- **nonmetal**
- **noble gas**
- **rule of eight**

Wrap-Up

It turns out that if electrons didn't behave in the odd ways that they do, materials would behave very differently. The chemistry and the forces that are so familiar in our everyday experience would not exist, and all matter would have a boring, lifeless monotony. So even though electrons have very little mass, they are literally vital!