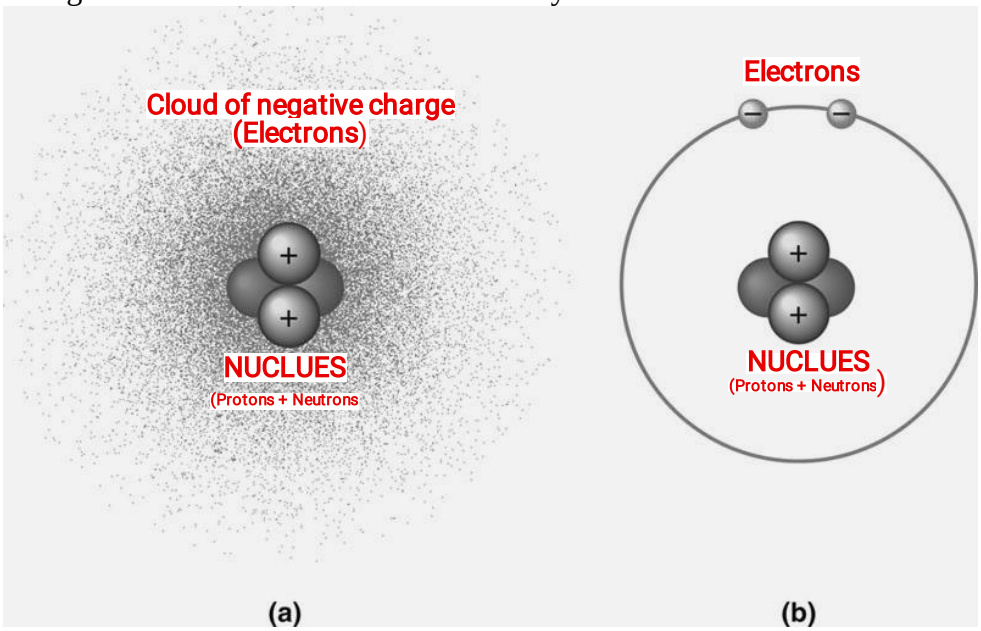
Guided Reading: Chapter 2

(p.27) **1.** Contrast the term element with compound.

Elements are substances that cannot be broken down to other substances by chemical reactions and compounds are substances consisting of two or more elements combined in a fixed ratio.

(p.27) **2.** Label the diagram below and define the terms that you label.



(p.29) **3.** Contrast the terms atomic mass and atomic number.

Atomic Mass is the sum of protons and neutrons in the nucleus of an atom and the Atomic Number is the number of protons which is unique to that element.

(p.29) **4.** What is an isotope and what is "special" about radioactive isotopes?

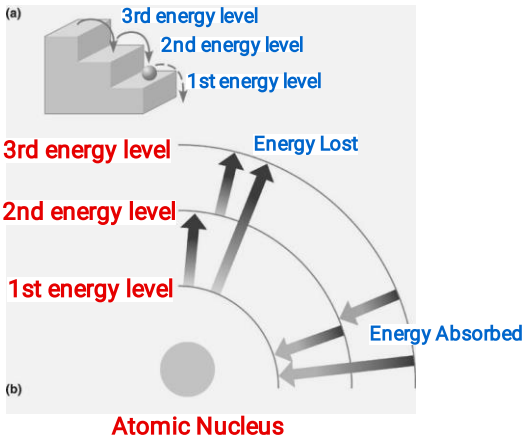
Isotopes are atoms with the same atomic number (# of protons) but different atomic mass (more neutrons). Radioactive isotopes are special in that they decay and emit energy that can be traced.

(p.29-30). Explain how radioactive tracers (isotopes) are used in scientific research?

Radioactive isotopes are are useful as tracers to follow atoms through metabolism; the chemical processes of an organism. This year we will study how radioactive isotopes were used in determining DNA as the "genetic" material, DNA replication and photosynthesis.

(p.31) **6.** Explain how the movement of electrons relates to the concept of potential energy – use the diagram to the right to help answer the question.

Potential Energy is the energy possessed by an object by virtue of its position. Electrons on the first energy level closet to the nucleus have the LOWEST energy like a ball on the first step. Electrons on thethird energy level farthest from the nucleus have a HIGHER energy like the ball on the third step. During photosynthesis, light energy is absorbed by chlorophyll and is used to excite electrons and move them to higher energy levels. This energy is ultimately used to make sugar.



(p.32) **7.** What determines interactions between atoms and why are valence electrons important?

Interactions between atoms is determined by its electron configurations - that is, the distribution of electrons in the atom's electron shells. Valence electrons are those electrons found on the outermost shell and are ultimately responsible for the chemical behavior of an atom.

8. Define the following terms:

(p.33) **a.** **Chemical bond** - attractions between valence electrons

(p.33) **b.** **Covalent bond** - chemical bond formed through the SHARING of one or more pair of electrons

(p.33) **c.** **Single bond** - chemical bond formed through the SHARING of a single pair of electrons

(p.34) **d.** **Double bond** - chemical bond formed through the SHARING of TWO pair of electrons

(p.32) **e.** **Valence** - electrons found in the outermost energy level or shell and are ultimately responsible for the chemical behavior of an atom.

(p.34) **f.** **Nonpolar covalent bond** - bonds between atoms with the SAME electronegativities resulting in the EQUAL sharing of electrons.

(p.34) **g.** **Polar covalent bond** - bonds between atoms with the DIFFERENT electronegativities resulting in the UNEQUAL sharing of electrons.

(Prior Knowledge) **9.** What is the difference between a structural and molecular formula?

A molecular formula uses chemical symbols and subscripts to indicate the exact numbers of different atoms in a molecule or compound while a structural formula indicates the bonding arrangement of the atoms in the molecule.

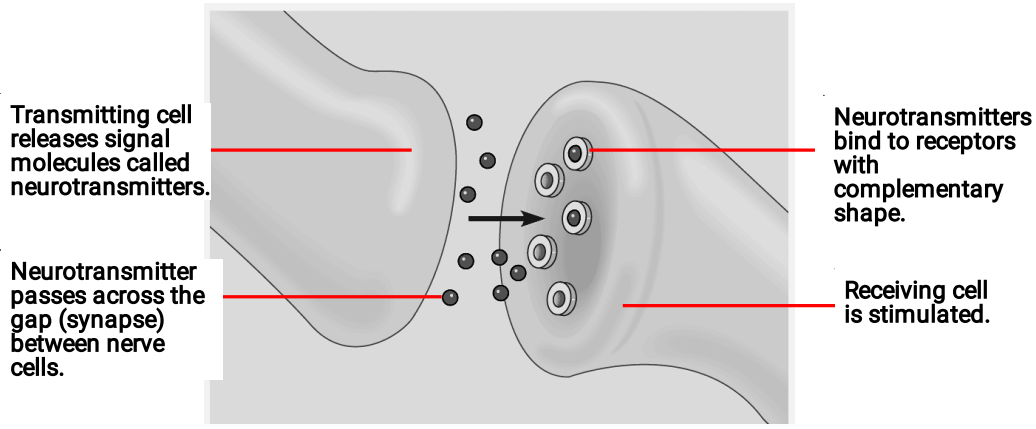
(p.35) **10.** Compare and contrast with ionic and covalent bonds?

Both ionic and covalent bonds involve the interactions of elections, however, ionic bonds are formed through the TRANSFER of electrons while covalent bonds are formed through the SHARING of electrons.

(p.36) **11.** Compare and contrast hydrogen bonds and van der Waals interactions.

Both hydrogen bonds and van der Waals interactions involve INTERmolecular attractions between two atoms or molecules, however, hydrogen bonds are stronger than the much weaker van der Waals interactions.

(p.37) **12.** Label the diagram and use it as an example of how molecular shape is critical to its function?



One nerve cell in the brain signals another by releasing signal molecules (neurotransmitters) into the gap (synapse) between the cells. The shape of the neurotransmitter is complementary to the shape of the receptor molecule located on the surface (cell membrane) of the receiving cell. The actual molecules have a much more complex shape than represented here.

(p.38-39) **13.** Define a dynamic chemical equilibrium in terms of quantities of reactants and products.

(This is a critical concept!)

Dynamic chemical equilibrium occurs when a chemical reaction is still going on, but with no net effect on the concentration of reactants and products. Equilibrium does NOT mean that the reactants and products are equal in concentration, but only that their concentrations have stabilized.