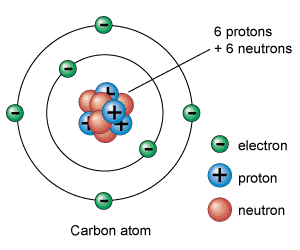
# CH2.1 Atoms, Ions, and Molecules

**KEY CONCEPT: All living things are based on atoms and their interactions.**

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| --- | --- | --- |
| **Objectives** | **Vocabulary** | |
| * **Identify elements common to all living things** * **Describe how ions form** * **Compare ionic and covalent bonding** | * **Atom** * **Element** * **Compound** * **Ion** * **Ionic bond** * **Covalent bond** * **Molecule** | * **Proton** * **Neutron** * **Electron** * **Nucleus** * **Atomic Number** * **Atomic Mass** |

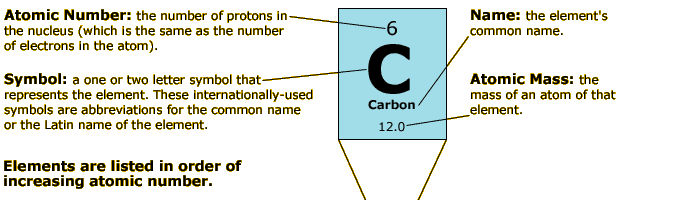
Living things consist of atoms of different **elements**.

[](http://www.google.com/url?sa=i&rct=j&q=protons%20neutrons%20electrons&source=images&cd=&cad=rja&docid=nRxIsgJtEyrF6M&tbnid=vuxUSksqlRA1nM:&ved=0CAUQjRw&url=http://www.universetoday.com/82128/parts-of-an-atom/&ei=xwYVUr2AG5OC9QTLzIHgCA&psig=AFQjCNGhpv5hTkhUcUyo3M637V8XmwokZw&ust=1377196080622308)

* An atom is the smallest basic unit of matter.
* An element is one type of atom.

Atoms are made of different subatomic particles.

* Protons have a positive charge
* Electrons have a negative charge
* Neutrons are neutral, so have no charge
* An atom has a nucleus and electrons.
  + The nucleus has protons and neutrons.
  + Electrons are in energy levels outside nucleus.
    - The outermost energy level determines the activity of the atom
* Each element has different numbers of protons, neutrons, and electrons than each other element
  + A particular element always has the same number of protons
  + You know how many protons an element has by looking at the periodic table
  + The atomic number always identifies the number of protons in an atom

[](http://www.google.com/url?sa=i&rct=j&q=carbon+periodic+table&source=images&cd=&cad=rja&docid=R1aQdj4tQSqpJM&tbnid=Q7QL8iw-RzMiSM:&ved=0CAUQjRw&url=http://www.amnh.org/ology/features/stufftodo_einstein/atommobile_read.php&ei=t_kUUqyIL4aY9QTOmIDoAw&bvm=bv.50952593,d.b2I&psig=AFQjCNEisc4ywaHMuLM_oWEUyGLS_j0CLQ&ust=1377192425455795)

**Elements are listed in order on the periodic table from lowest atomic number to the highest**

* The atomic weight tells you how many protons, electrons, and neutrons are in an atom
* Electrons are very small and don’t contribute much to weight
* If you round the atomic weight to the nearest whole number we call that the atomic mass
* If you subtract the number of protons from the atomic mass, that will tell you how many neutrons are in the atom
* 1st round the atomic weight to the nearest whole # to get the atomic mass 12.01 🡪 12
* 2nd subtract the # of protons from the atomic mass 12 - 6 = 6

Electrons are found in energy levels

* Atoms have many energy levels
* Each level can hold a different number of electrons
  + 1st energy level wants 2 electrons
  + 2nd energy level wants 8 electrons
  + 3rd energy level wants either 8 or 18 electrons

Atoms want to be stable

* Energy levels want to be full of electrons
* Lower energy levels always fill up before higher energy levels
  + - The 3rd energy level won’t have any electrons unless 1 and 2 are full
    - If the energy level isn’t full, the atom is not stable and will react with other atoms and form bonds and become stable

**Atoms can gain, lose, or share electrons to become stable**

* The outermost energy level of an atom is called its valence shell
* Electrons in the outermost energy level are called valence electrons
* It’s the valence electrons that determine
  + what types of bonds will form
  + How many bonds will form
* A compound is made of atoms of different elements bonded together.

**Different Compounds are held together by different types of bonds**

* **Covalent Bonds:** 
  + Atoms share pairs of electrons in covalent bonds
  + Compounds held together by covalent bonds are called **molecules**
* **Ionic Bonds**
  + Sometimes its easier for an atom to gain or lose an electron than to share
  + An ion is an atom that has gained or lost one or more electrons.
  + Atoms that gain electrons
    - Are called anions
    - what kind of charge will an anion have?
    - Atoms that lose electrons
    - Are called cations
    - what kind of charge will an cation have?
  + Ionic bonds form between oppositely charged ions.
* Hydrogen Bonds
* The type of bond that will form depends on the number of valence electrons

1. **What distinguishes one element from another?**
2. **Describe the formation of an ionic compound?**
3. **What is the difference between an ionic and a covalent bond?**
4. **How does a molecule differ from an atom?**
5. **Explain why a Hydrogen atom can become either an ion or a part of a molecule?**
6. **A sodium atom has one outer electron, and a carbon atom has 4 outer electrons. How might this difference be related to types of compounds formed by atoms of these 2 elements?**