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



* 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



**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?**