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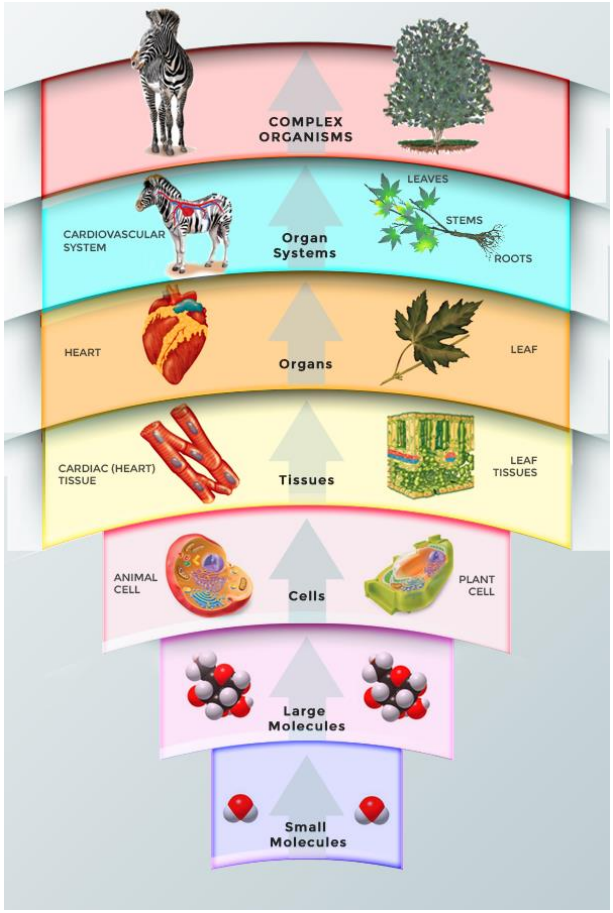
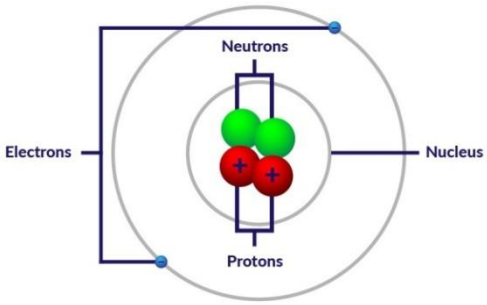
An organism can be broken down into smaller levels of _____. These levels are pictured below.



The Chemical Level

The smallest level of organization is called the _____ level and includes atoms and _____. Atoms are the smallest units which make up _____– this is the case in both living and non-living things. The main components of the atom are shown in the diagram below:



Atoms contain two regions:

1. The _____is found in the center of the atom. It contains two kinds of subatomic particles, positively charged particles known as _____ and neutral, uncharged, particles known as _____. It is this region of the atom which gives it its mass.
2. The region surrounding the nucleus of the atom is called the _____ _____ or orbitals. In this area, one or more negatively charged particles called _____ orbit the nucleus in different energy levels.

The forces which operate between the oppositely charged particles - protons and electrons - hold the atom together. Most atoms contain all three types of subatomic particles. Hydrogen atom (H) is an exception because it has one proton and one electron and no neutrons. The number of _____in the nucleus determines the kind of the element an atom is, this is known as the _____ _____, while the number of electrons determines how the atom _____.

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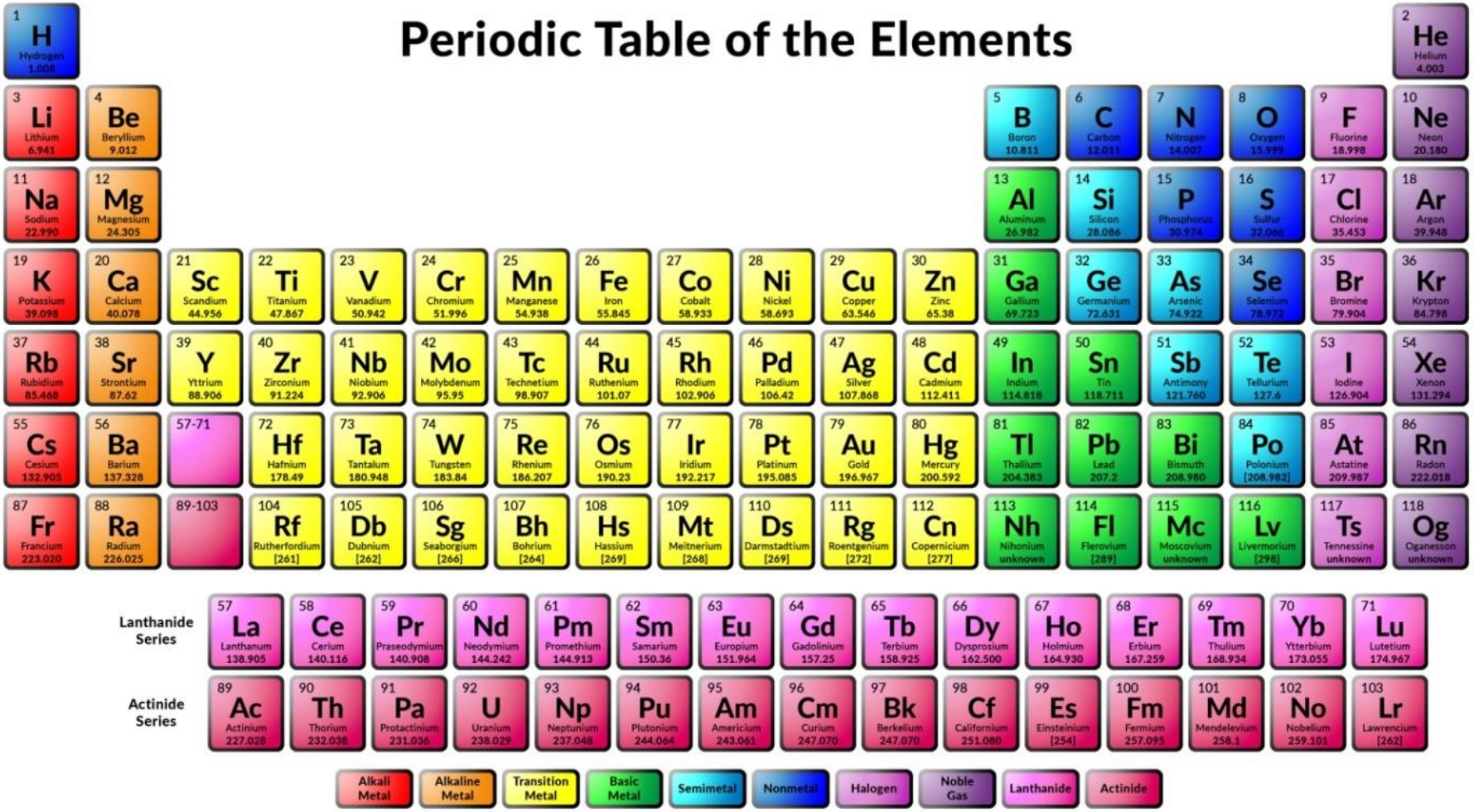
Elements

An element is a substance which is made up of _____type of atom. For this reason, elements are called _____substances. There are 94 naturally occurring elements known to scientists. These have been arranged on a chart called the _____ table (shown below).



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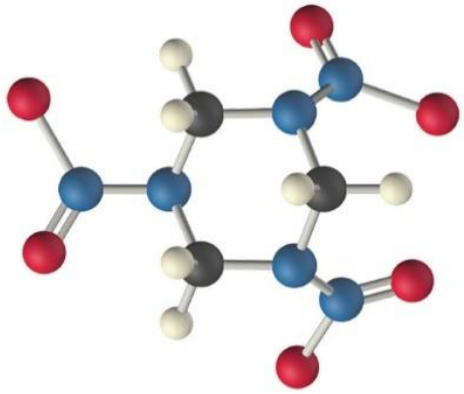
The main elements found in living things are:

- Carbon (_____)
- Hydrogen (_____)
- Oxygen (_____)
- Sulfur (_____)
- Nitrogen (_____)
- Phosphorous (_____)



It is the bonding between the atoms of the six elements mentioned above that makes all life possible. Chemical bonding involves atoms gaining, _____ or sharing electrons in order to form larger structures. In doing this, they are able to complete any partially full electron shells and become more _____ in the process.

Molecules vs Compounds:

Molecules are defined as any group of atoms which are _____ bonded together. These atoms can be _____; for example, oxygen gas is made up of two oxygen atoms (_____). Compounds are two or more _____atoms bonded together. For example, water contains two hydrogen atoms and one oxygen atom (_____). Atoms are able to form three different types of chemical bonds - _____, _____, and _____ bonds.

1. **Ionic bonds**

   Ionic bonds are formed when atoms gain or lose _____and become ions. When an atom donates an electron from its outer shell, it forms a positive ion called a _____. Atoms which accept electrons form negatively charged ions known as _____.

   Since opposite charges _____, the positive and negative ions are pulled together and form an _____ _____. These bonds are _____ and therefore require large amounts of _____ in order to be broken. An example of the exchange of electrons between a sodium and chlorine atom can be seen in the diagram below.

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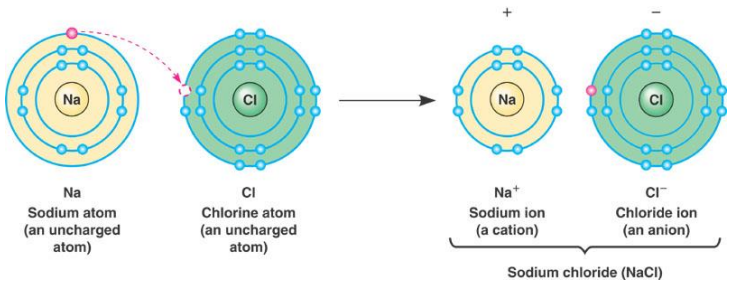
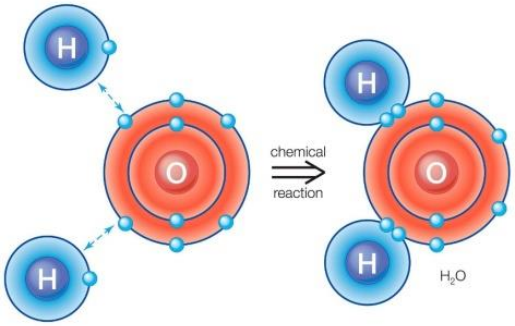


Generally, the donation of an electron by one atom cannot happen without an electron recipient, so these two processes of electron donation and electron acceptance must occur at the same time.

Certain ions such as sodium, potassium and calcium are referred to _____ in biology. These ions are essential for the function of the nervous system, _____ contraction and water _____ in the body.

2. Covalent Bonds

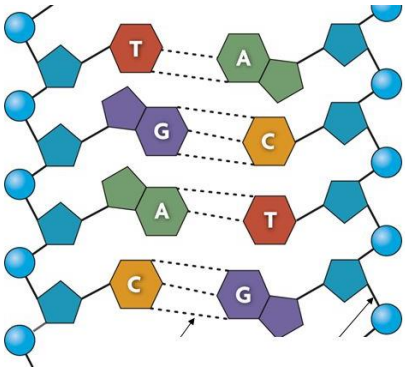
The covalent bond is the most common and _____form of chemical bonding existing in living organisms. This type of bond is formed when electrons are _____ between atoms. This is commonly seen in carbon-based molecules and also in _____ , an essential molecule found in all living things. In the water molecule, each hydrogen atom shares one electron with the oxygen atom and the oxygen atom shares two electrons (one electron with each hydrogen atom).



The shared electrons complete each atom's outermost (_____) shell, making the water molecule more stable than its component _____.

3. Hydrogen Bonds

Hydrogen bonds are relatively _____bonds which require little energy to break. These bonds occur between two molecules as a result of the _____ attraction between a proton in one molecule and an electronegative atom in the other. Both covalent and hydrogen bonds can be seen in the section of DNA molecule, shown below, The covalent bonds hold the backbone of the DNA molecule together, whereas the hydrogen bonds act to stabilize the two strands allowing it to form a double helix.



Hydrogen bond Covalent bond