

The two types of electric charges are called proton and electron.

Electrons are negative charged. They orbit the nucleus of the atom.

Protons are positive charged. They are found in the nucleus of the atom with the neutrons.

not a universal definition \rightarrow man made

Neutrons have None or neutral charge.

An atom is electrically neutral when the number of positive charges equals the number of negative charges.

$$\#p^+ = \#e^-$$

An atom that has an electrical charge is called an ion.

If an atom loses electrons, it will gain a positive charge

and it becomes a cations.

If an atom gains electrons, it will gain a negative charge

and it becomes a anion.

# of protons	# of electrons	electric charge?	gained or lost what?	Ion Type
8 p +	7 e-	1+	lose an e-	cation
10 p +	12 e-	2-	gained 2 e-	anion
15 p +	15 e-	0	nothing	atom
36 p +	34 e-	2+	lose 2 e-	cation

Protons are held very tightly in the nucleus of the atom.
 (Remember that the number of protons in the nucleus determines what kind of element an atom is. If the number of protons were to change, as in radioactive decay the type of element would change.)
 This means only the electrons will be able to move on and off atoms.

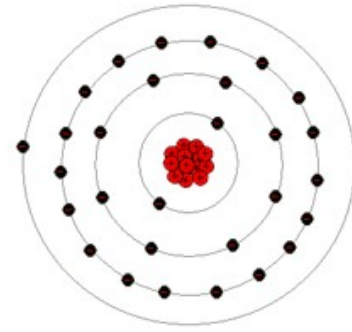
Valence Electrons

Valence electrons are the electrons found

in outermost shell

Valence electrons are the electrons that....

- ⇒ interact during a chemical reaction.
- ⇒ form bonds between atoms.
- ⇒ are gained or lost to form ions (usually).



↑
Bohr
model

Periodic Table of Elements

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18																		
1 H Hydrogen 1.00794	2 He Helium 4.002602											13 Al Aluminum 26.9815386	14 Si Silicon 28.0855	15 P Phosphorus 30.973762	16 S Sulfur 32.06	17 Cl Chlorine 35.453	18 Ar Argon 39.948																		
3 Li Lithium 6.941	4 Be Beryllium 9.012182	5 B Boron 10.811	6 C Carbon 12.011	7 N Nitrogen 14.0067	8 O Oxygen 15.9994	9 F Fluorine 18.9984032	10 Ne Neon 20.1797					19 K Potassium 39.0983	20 Ca Calcium 40.078	21 Sc Scandium 44.955912	22 Ti Titanium 47.867	23 V Vanadium 50.9415	24 Cr Chromium 51.9961	25 Mn Manganese 54.938045	26 Fe Iron 55.845	27 Co Cobalt 58.933195	28 Ni Nickel 58.6934	29 Cu Copper 63.546	30 Zn Zinc 65.38	31 Ga Gallium 69.723	32 Ge Germanium 72.64	33 As Arsenic 74.9216	34 Se Selenium 78.96	35 Br Bromine 79.904	36 Kr Krypton 83.796						
11 Na Sodium 22.98976928	12 Mg Magnesium 24.305											37 Rb Rubidium 85.4678	38 Sr Strontium 87.62	39 Y Yttrium 88.90585	40 Zr Zirconium 91.224	41 Nb Niobium 92.90638	42 Mo Molybdenum 95.94	43 Tc Technetium (98)	44 Ru Ruthenium 101.07	45 Rh Rhodium 102.90550	46 Pd Palladium 106.42	47 Ag Silver 107.8682	48 Cd Cadmium 112.411	49 In Indium 114.818	50 Sn Tin 118.710	51 Sb Antimony 121.760	52 Te Tellurium 127.60	53 I Iodine 126.90547	54 Xe Xenon 131.29						
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For elements with no stable isotopes, the mass number of the isotope with the longest half-life is in parentheses.																																			
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57 La Lanthanum (138.90547)	58 Ce Cerium (140.12)	59 Pr Praseodymium (140.90765)	60 Nd Neodymium (144.242)	61 Pm Promethium (144.9127)	62 Sm Samarium (150.36)	63 Eu Europium (151.964)	64 Gd Gadolinium (157.25)	65 Tb Terbium (158.92532)	66 Dy Dysprosium (162.50015)	67 Ho Holmium (164.93032)	68 Er Erbium (167.259)	69 Tm Thulium (168.93032)	70 Yb Ytterbium (173.05448)	71 Lu Lutetium (174.967)																					

The periodic table is arranged in a special way

The rows are called Periods, hence the name.

The columns are called Groups and the atoms there share similar chemical properties. Typically (not a guaranty), atoms in the same column have the same number of valence electrons.

Bonding

Atoms can form a bond, a way to join up, in different ways.

The 2 most common ways both involve electrostatic attraction.

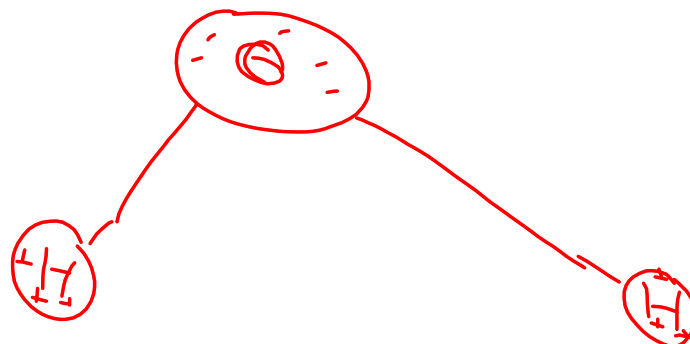
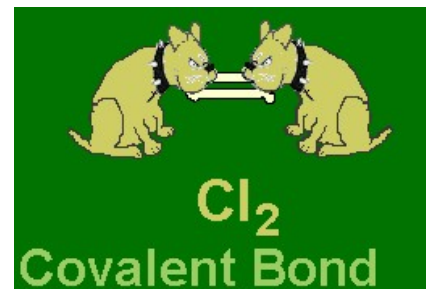
1. Ionic Bonding

- > One atom has a Very strong attraction to the valence electrons and takes them completely
- > In this case, each atom becomes an ion and are attracted to each other



2. Covalent Bonding

- > Each atom pulls has enough attraction to both hold onto the valence electrons.
- > Sometimes one atom has the valence electrons more than the other
- > That molecule then becomes polarized and each side becomes slightly charged



Basic Rule for Electric Charges

"Like" charges repel each other

> ++ and --

"Opposite" charges attract each other

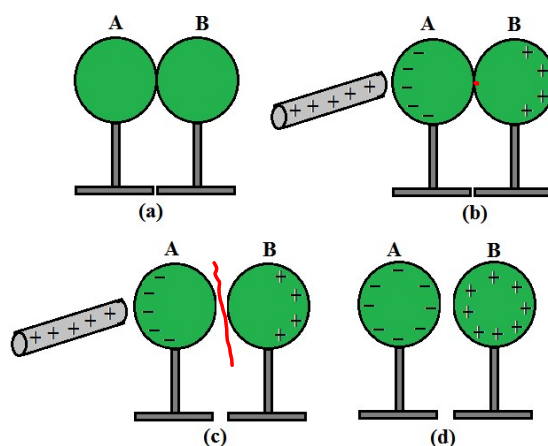
> +- and -+

Electrostatics is the study of electric charges that can be collected and held in one place. Charges in place will feel a force from others around them.

Current Electricity is the flow of electric charges from one place to another. Charges will feel a force that pushes/pulls them in a particular direction.

The **Law of Conservation of Electric Charges** states that the total charge of the system remains constant. Individual charges are never created or destroyed. These charges may be transferred from one location to another within the system.

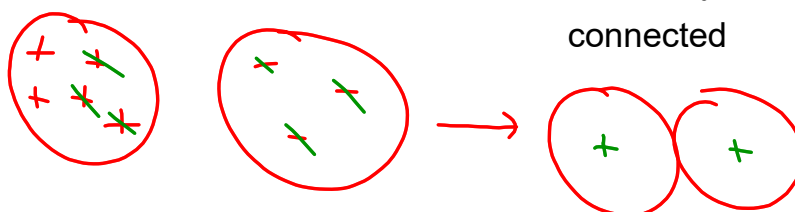
Induction



Connected objects have equal charge

Collection of charge can be separated if objects no longer remain connected

Reverse is also true, charged objects balance out if they become connected

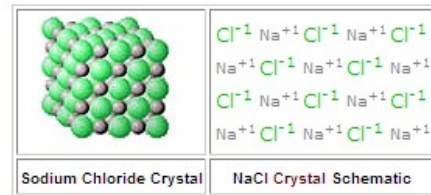


Electric Conductivity

Electrical conductors are materials that allow electric charges to move from one spot to another spot easily.

metals - silver, copper, gold, aluminum, tungsten, zinc, etc.

solutions - ionic solutions (ex. salt solutions with NaCl)



For example, if electrons are added to one spot on a conductor, these extra electrons will repel each other. They will be pushed to other locations trying to get as far away as possible from each other. The extra electrons are able to move physically throughout the material.

Electrical insulators are materials that do not allow electric charges to move through them easily.

dry air, wool, ceramics, glass, plastic, vinyl, rubber, etc.

For example, if electrons are removed from one location on an insulator, that area becomes positively charged. These lost electrons will not be replaced from electrons in other areas because they cannot physically move there.

Semi conductors are materials that are found between conductors and insulators.

qubit

They are used in electronic devices because they can easily be controlled to allow electric charges to move only when desired to

Types of Semiconductor Devices

