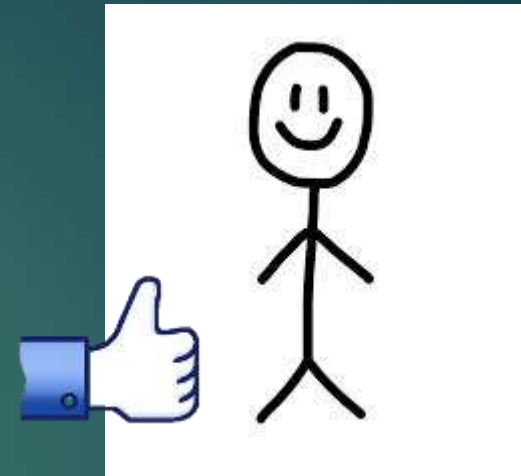


Chapter 1 - Matter

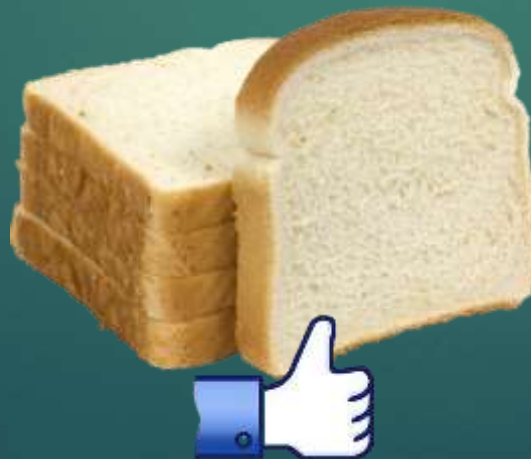
CHEMISTRY

What is Chemistry?

- ▶ The study of matter
- ▶ Wait... what's matter?



The stuff that forms ALL living and nonliving things



STATES OF MATTER

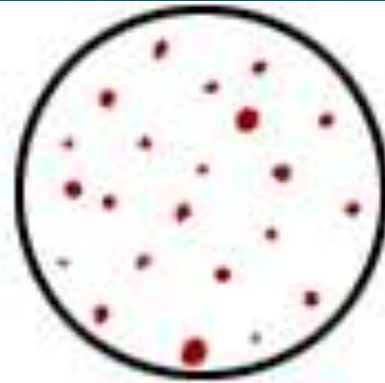




SOLIDS

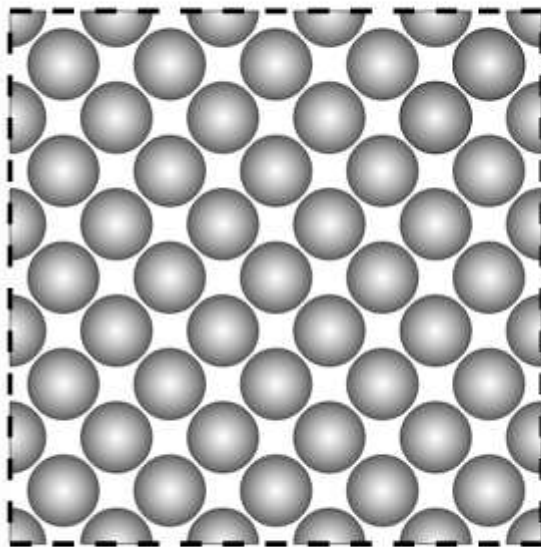


LIQUIDS

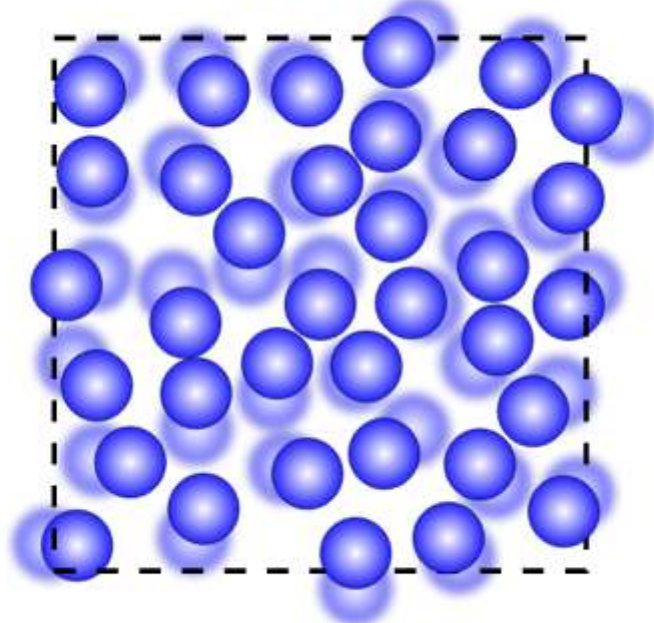


GASES

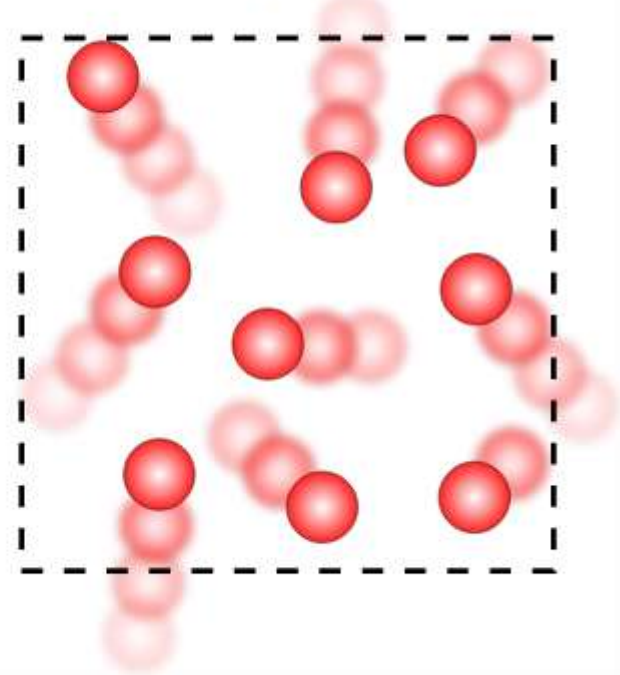
SOLID



LIQUID



GAS



TEMPERATURE



SOLID



FREEZING
POINT



LIQUID



BOILING
POINT



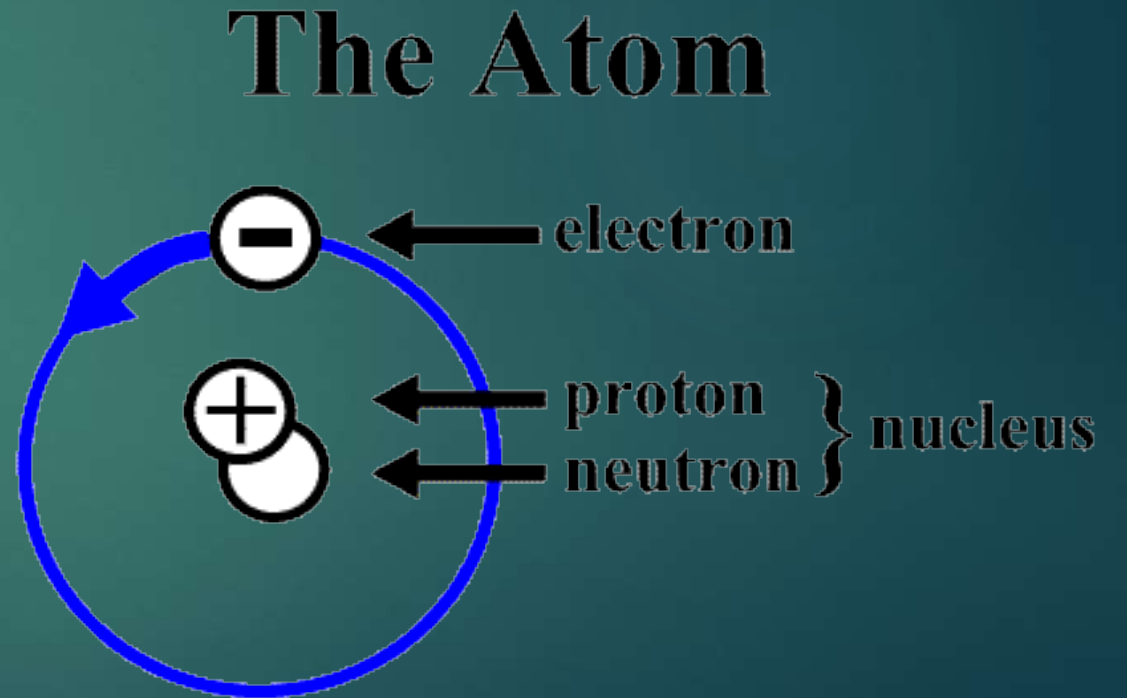
GAS

PHASE CHANGES HAPPEN AS THE TEMPERATURE CHANGES

Atoms

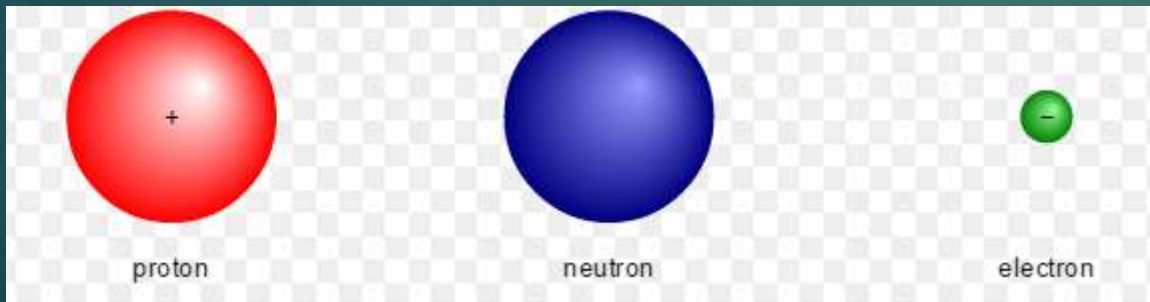
- ▶ *atomos*- uncuttable
- ▶ Made of smaller particles
 - ▶ Protons (+)
 - ▶ Neutrons (neutral)
 - ▶ Electrons (-)

There HAS to be the same number of Protons and Electrons



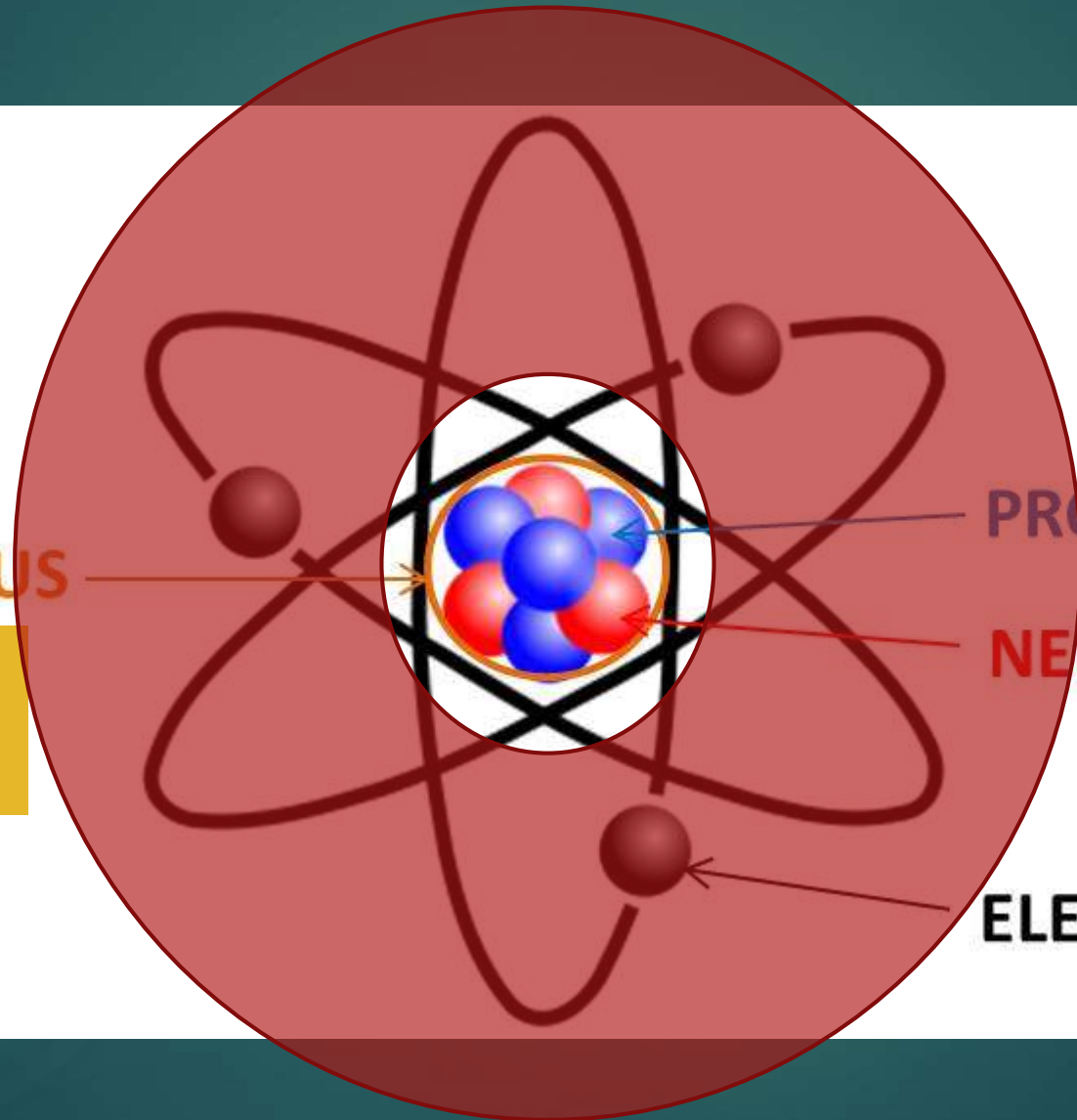
How big are they?

- ▶ Not very big...
- ▶ Protons and Neutrons are about the same size
- ▶ Electrons are tiny



NUCLEUS

The core... most mass is here: protons, neutrons



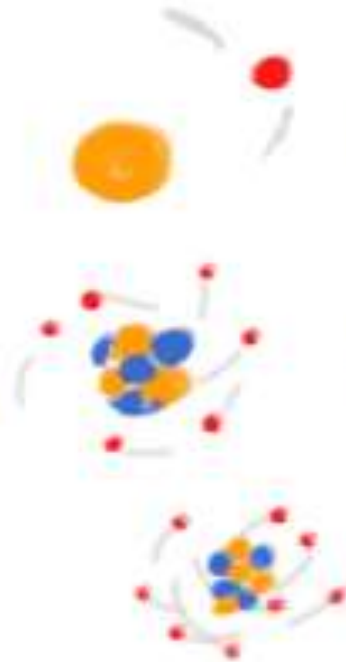
PROTON

NEUTRON

ELECTRON

Electron cloud- most of the space, not very heavy

How do we know what they look like???



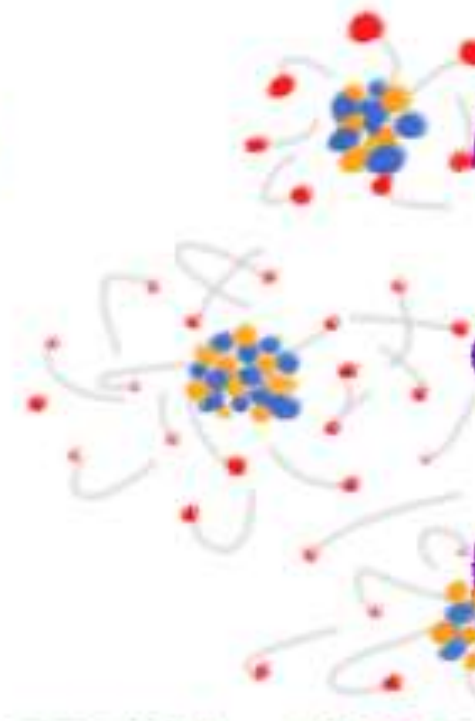
HYDROGEN (H)



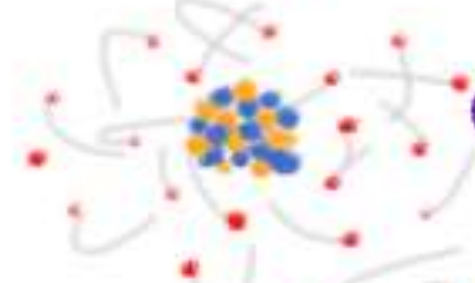
CARBON (C)



OXYGEN (O)



NITROGEN (N)



CALCIUM (Ca)



PHOSPHORUS (P)

YOU ARE MADE UP OF DIFFERENT TYPES OF ATOMS

Elements

- ▶ All the atoms that make up the world= chemical elements
- ▶ 1867- Dmitri Mendeleev organized the 55 elements
- ▶ **Periodic Table of Elements**
- ▶ Pg.2 in your books

Periodic Table of the Elements

Legend:

- Alkali Metal
- Alkaline Earth
- Transition Metal
- Diatomic
- Semimetal
- Nonmetal
- Halogen
- Noble Gas
- Lanthanide
- Actinide

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18																		
1A	2A	3A	4A	5A	6A	7A	8	9	10	11A	12A	13A	14A	15A	16A	17A	18A																		
1 H Hydrogen 1.008	2 He Helium 4.003											3 Li Lithium 6.941	4 Be Beryllium 9.012	5 B Boron 10.811	6 C Carbon 12.011	7 N Nitrogen 14.007	8 O Oxygen 15.999	9 F Fluorine 18.998	10 Ne Neon 20.180																
11 Na Sodium 22.990	12 Mg Magnesium 24.305	13 Al Aluminum 26.982	14 Si Silicon 28.086	15 P Phosphorus 30.974	16 S Sulfur 32.065	17 Cl Chlorine 35.453	18 Ar Argon 39.948	19 K Potassium 39.098	20 Ca Calcium 40.078	21 Sc Scandium 44.956	22 Ti Titanium 47.88	23 V Vanadium 50.942	24 Cr Chromium 51.996	25 Mn Manganese 54.938	26 Fe Iron 55.845	27 Co Cobalt 58.933	28 Ni Nickel 58.693	29 Cu Copper 63.546	30 Zn Zinc 65.39	31 Ga Gallium 69.723	32 Ge Germanium 72.61	33 As Arsenic 74.922	34 Se Selenium 78.96	35 Br Bromine 79.904	36 Kr Krypton 83.80										
37 Rb Rubidium 85.468	38 Sr Strontium 87.62	39 Y Yttrium 88.906	40 Zr Zirconium 91.224	41 Nb Niobium 92.906	42 Mo Molybdenum 95.94	43 Tc Technetium 98.906	44 Ru Ruthenium 101.07	45 Rh Rhodium 102.906	46 Pd Palladium 106.42	47 Ag Silver 107.868	48 Cd Cadmium 112.411	49 In Indium 114.818	50 Sn Tin 118.71	51 Sb Antimony 121.757	52 Te Tellurium 127.6	53 I Iodine 126.905	54 Xe Xenon 131.29	55 Cs Cesium 132.905	56 Ba Barium 137.327	57-71 Lanthanide Series	72 Hf Hafnium 178.49	73 Ta Tantalum 180.948	74 W Tungsten 183.85	75 Re Rhenium 186.207	76 Os Osmium 190.23	77 Ir Iridium 192.22	78 Pt Platinum 195.08	79 Au Gold 196.967	80 Hg Mercury 200.59	81 Tl Thallium 204.383	82 Pb Lead 207.2	83 Bi Bismuth 208.980	84 Po Polonium 209	85 At Astatine 210	86 Rn Radon 222
87 Fr Francium 223	88 Ra Radium 226	89-103 Actinide Series	104 Rf Rutherfordium 261	105 Db Dubnium 262	106 Sg Seaborgium 266	107 Bh Bohrium 264	108 Hs Hassium 277	109 Mt Meitnerium 268	110 Ds Darmstadtium 271	111 Rg Roentgenium 272	112 Cn Copernicium 285	113 Nh Nihonium 284	114 Fl Flerovium 289	115 Uup Ununpentium 288	116 Lv Livermorium 293	117 Uus Ununseptium 289	118 Uuo Ununoctium 294																		
89 La Lanthanum 138.905	90 Ce Cerium 140.12	91 Pr Praseodymium 140.908	92 Nd Neodymium 144.24	93 Pm Promethium 144.913	94 Sm Samarium 150.36	95 Eu Europium 151.964	96 Gd Gadolinium 157.25	97 Tb Terbium 158.925	98 Dy Dysprosium 162.50	99 Ho Holmium 164.930	100 Er Erbium 167.259	101 Tm Thulium 168.934	102 Yb Ytterbium 173.04	103 Lu Lutetium 174.967	104 Ac Actinium 227	105 Th Thorium 232.038	106 Pa Protactinium 231.036	107 U Uranium 238.029	108 Np Neptunium 237.048	109 Pu Plutonium 244.064	110 Am Americium 243.061	111 Cm Curium 247.070	112 Bk Berkelium 247.070	113 Cf Californium 251.083	114 Es Einsteinium 252.083	115 Fm Fermium 257.095	116 Md Mendelevium 258.1	117 No Nobelium 259.101	118 Lr Lawrencium 262						

<http://www.infoplease.com/periodictable.php>

Periodic Table

1 H																	2 He									
3 Li	4 Be											5 B	6 C	7 N	8 O	9 F	10 Ne									
11 Na	12 Mg											13 Al	14 Si	15 P	16 S	17 Cl	18 Ar									
19 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr									
37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe									
55 Cs	56 Ba											72 Hf	73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	79 Au	80 Hg	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn
87 Fr	88 Ra	104 Rf	105 Db	106 Sg	107 Bh	108 Hs	109 Mt	110 Ds	111 Rg	112 Cn	113 Uut	114 Fl	115 Uup	116 Lv	117 Uus	118 Uuo										
		57 La	58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb	71 Lu										
		89 Ac	90 Th	91 Pa	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No	103 Lr										

Horizontal= by atomic number



Vertical= grouped by chemical properties



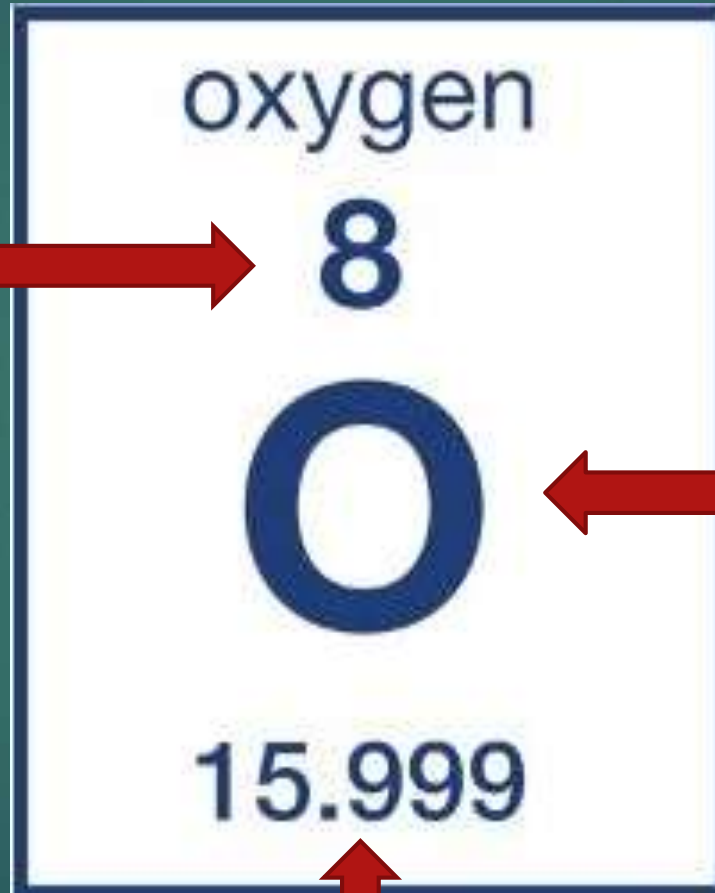
Periodic Table

1 H																	2 He	
3 Li	4 Be											5 B	6 C	7 N	8 O	9 F	10 Ne	
11 Na	12 Mg											13 Al	14 Si	15 P	16 S	17 Cl	18 Ar	
19 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr	
37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe	
55 Cs	56 Ba	72 Hf	73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	79 Au	80 Hg	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn		
87 Fr	88 Ra	104 Rf	105 Db	106 Sg	107 Bh	108 Hs	109 Mt	110 Ds	111 Rg	112 Cn	113 Uut	114 Fl	115 Uup	116 Lv	117 Uus	118 Uuo		
		59 Ce	60 Pr	61 Nd	62 Pm	63 Sm	64 Eu	65 Gd	66 Tb	67 Dy	68 Ho	69 Er	70 Tm	71 Yb	72 Lu			
		91 Ac	92 Th	93 Pa	94 U	95 Np	96 Pu	97 Am	98 Cm	99 Bk	100 Cf	101 Es	102 Fm	103 Md	104 No	105 Lr		

Alkali metals=
react with
LOTS of stuff

Nobel Gases=
don't react
with other
atoms

A closer look at an element:



Atomic number...
how many protons
an element has

**How many neutrons
does Oxygen have?**

Atomic symbol- often the
first letter of the name...
but not always

Atomic weight- protons + neutrons
(remember, electrons don't weigh much)

How to find the number of neutrons:

- ▶ First, how many protons?
 - ▶ Subtract from atomic mass
 - ▶ Equals the # of neutrons
- **Protons** weigh 1
 - **Neutrons** weigh 1
 - **Electrons** weigh pretty much nothing



8 protons

$$15.999 - 8 = 7.999$$

So... 7 neutrons

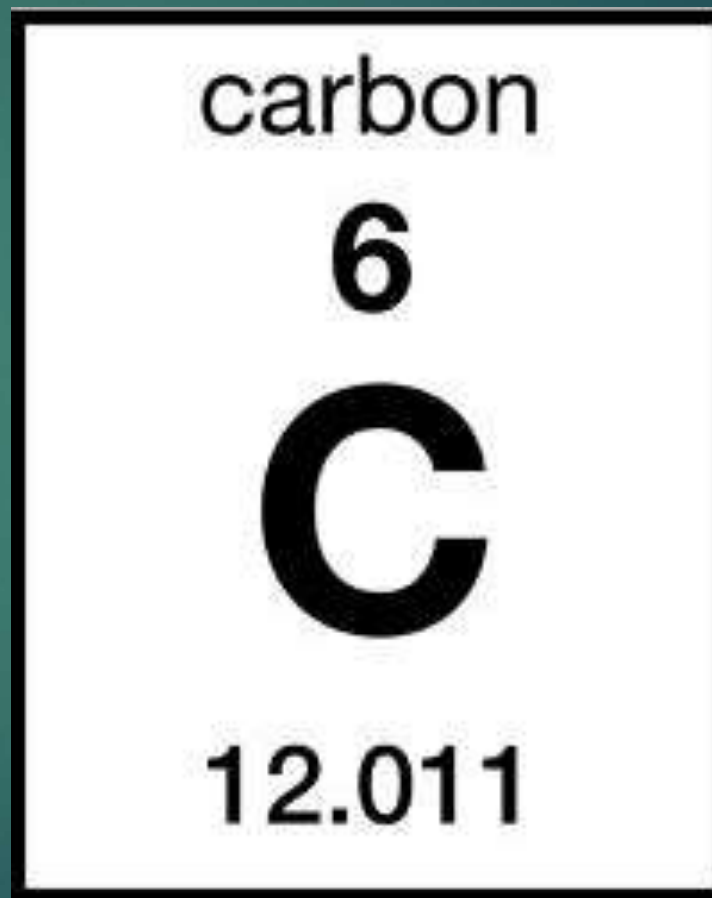
What about electrons?

You try:

How many protons? 6

How many neutrons? 6

How many electrons? 6



You try:

How many protons? 79
How many neutrons? 117
How many electrons? 79

