



THE ATOM

Our Introduction to Biochemistry

HERE'S WHAT MATTERS

- Matter
 - Anything that takes up space
 - Found in 3 states
 - Solid
 - Liquid
 - Gas
 - (rarely plasma)

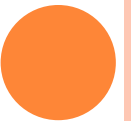


THE ATOM:

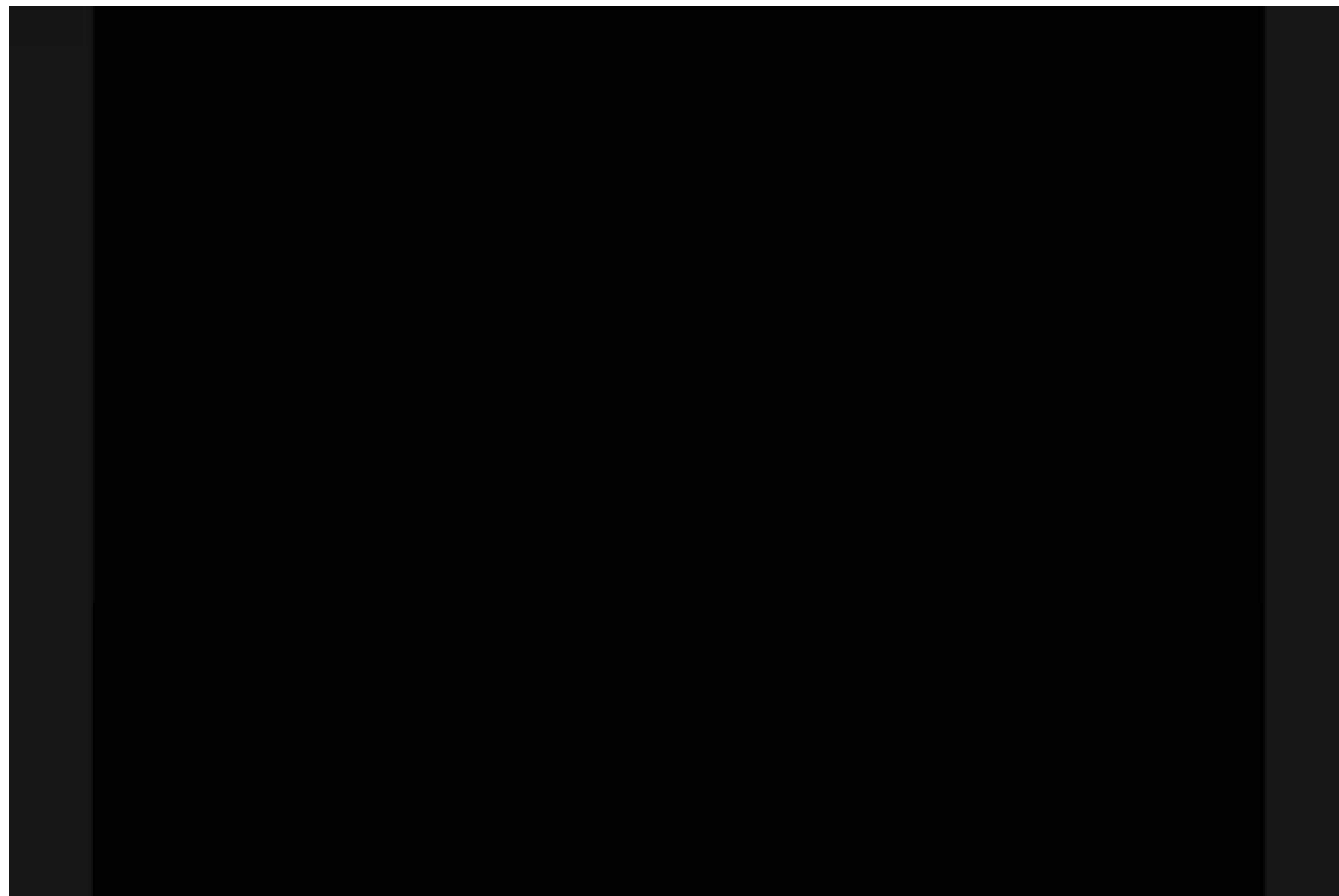
- The basic unit of matter:
 - The atom
 - Incredibly tiny particle
 - Fun fact: there are more atoms in a teaspoon of water than there are teaspoons of water in all the oceans!!!
 - Fun fact: your pinky finger is about 100,000,000 atoms wide!!!

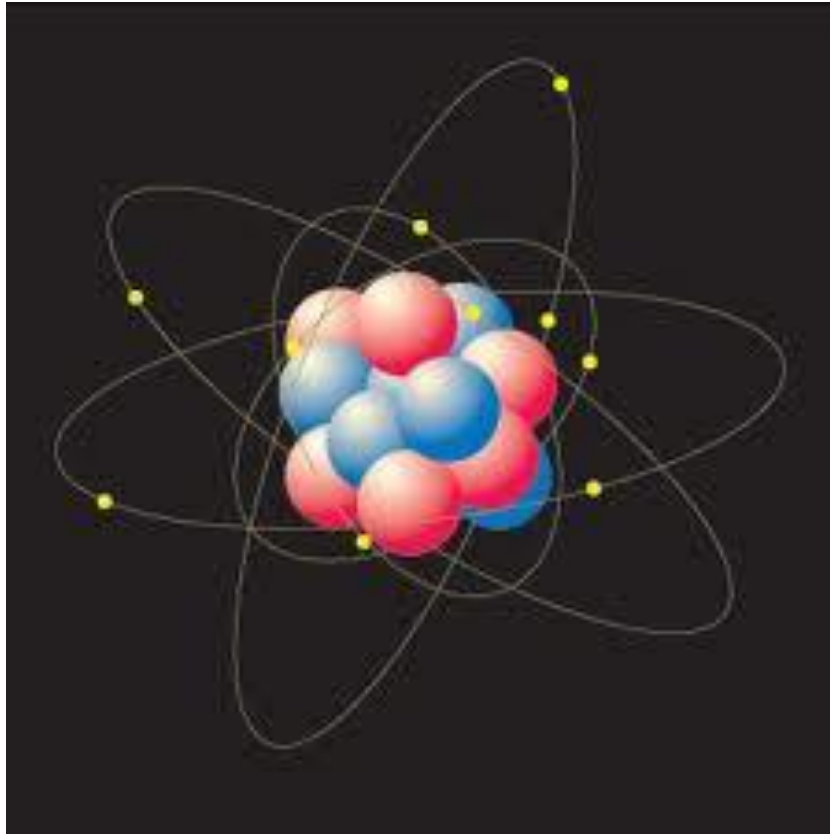


GIGANTIC ENERGY POTENTIAL FROM
SUCH A TINY PARTICLE!!!

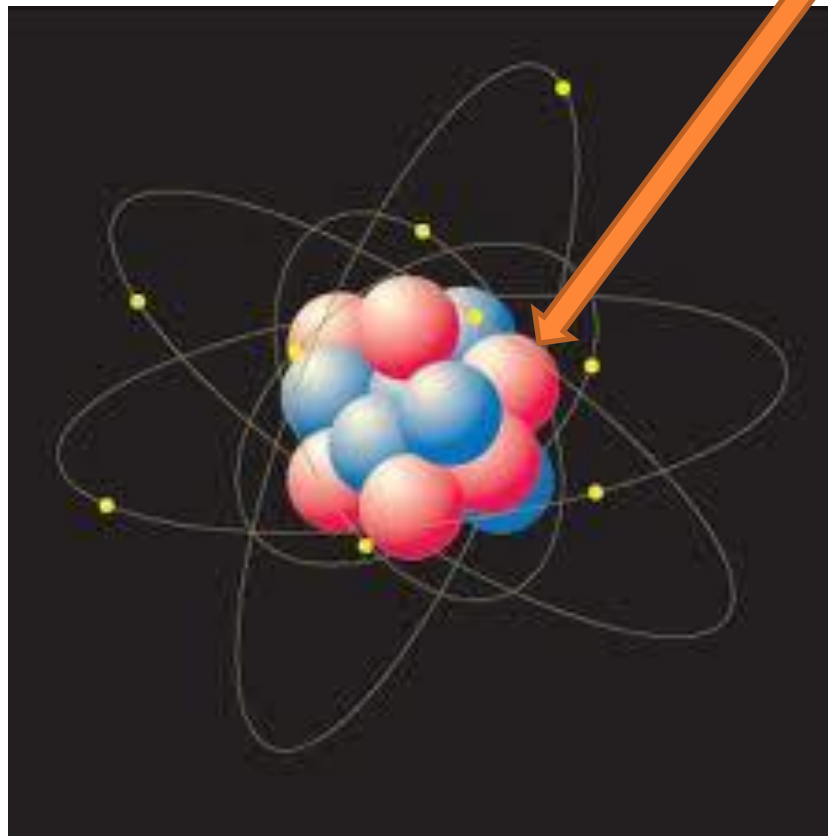


LET'S TAKE A TRIP...



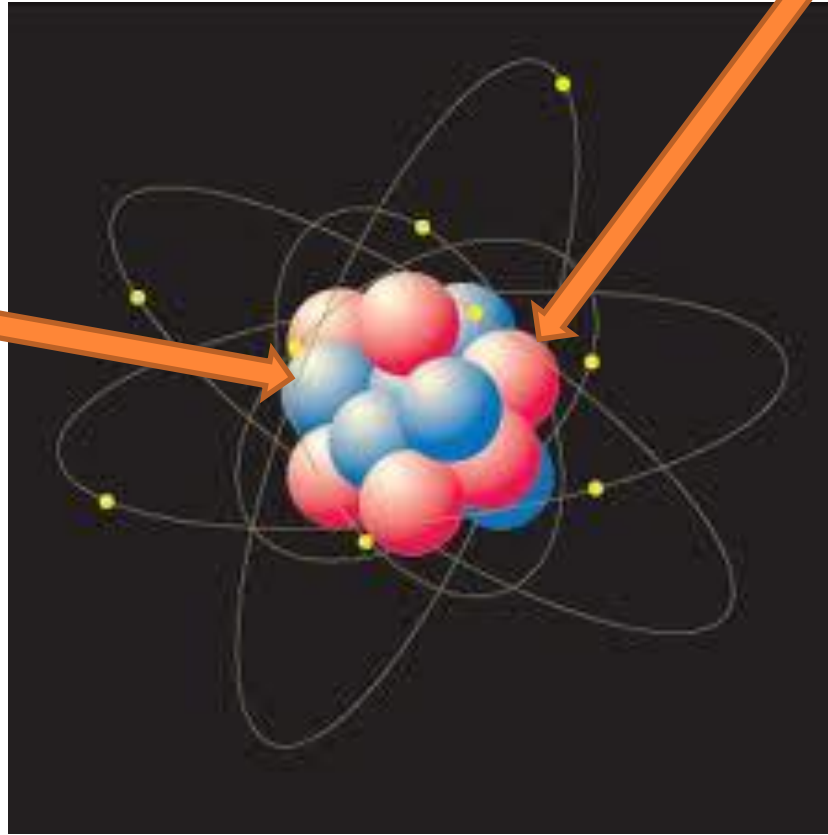


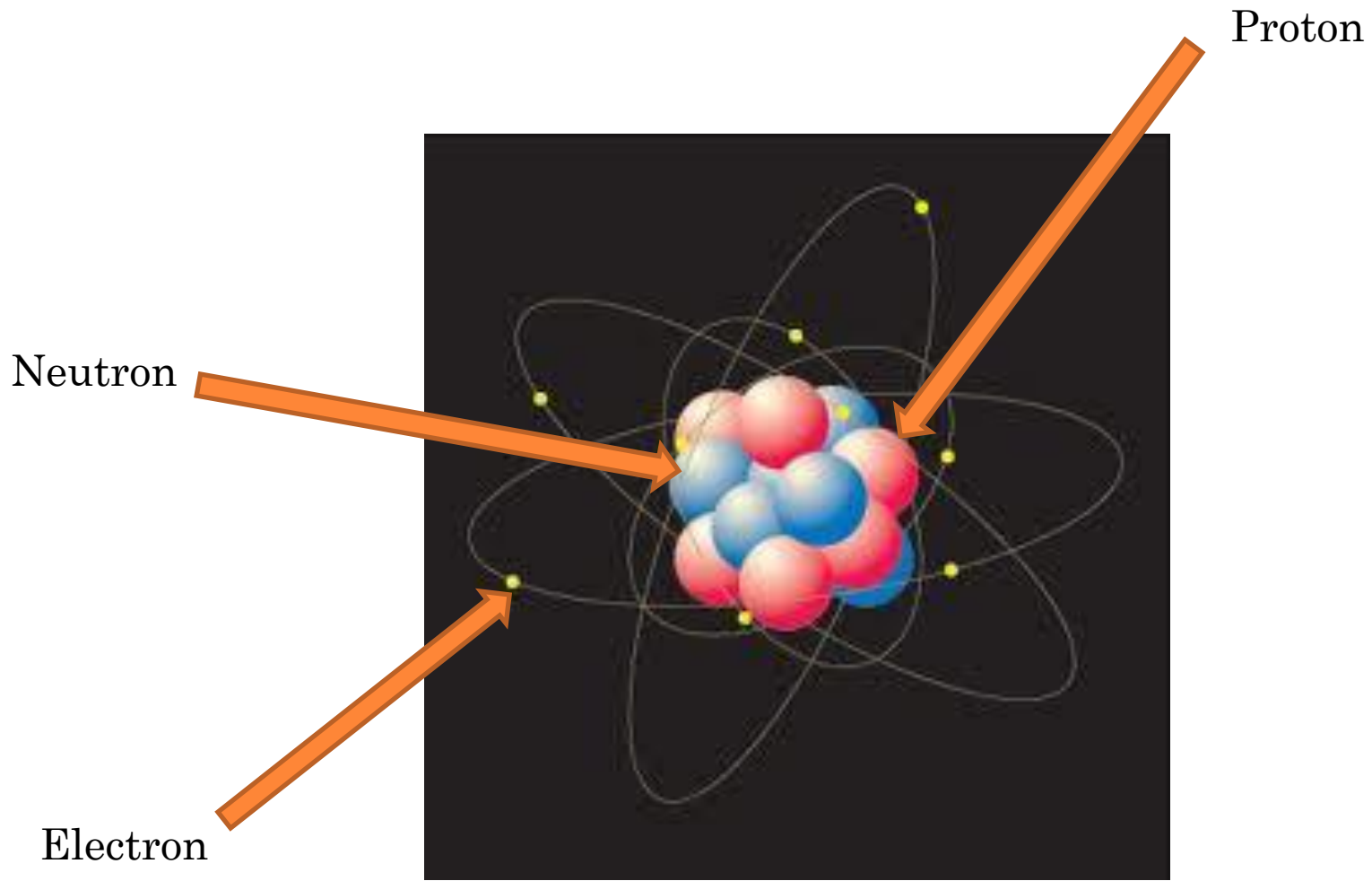
Proton

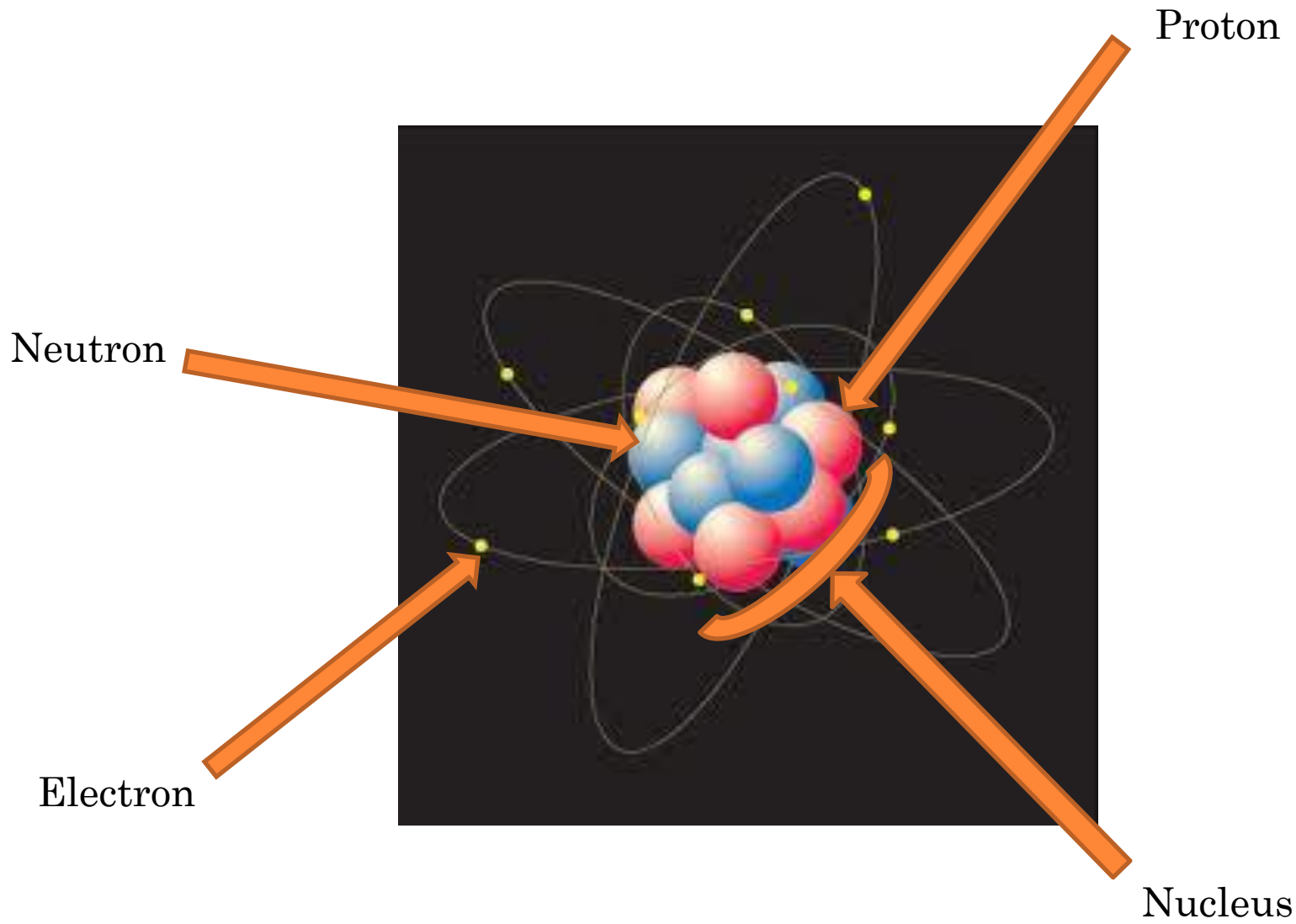


Neutron

Proton









THE PARTS

○ Nucleus

- Center mass of atom

○ Proton

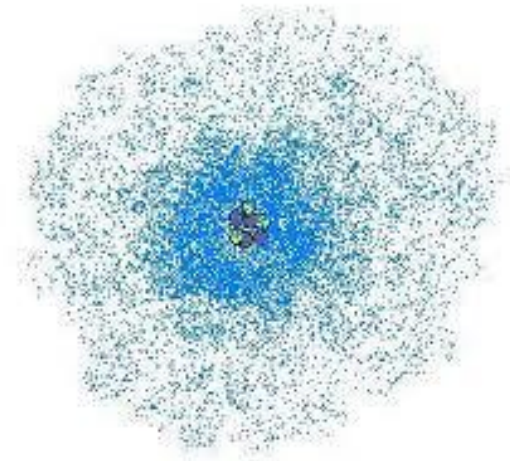
- Positively (+) charged particle found in nucleus
- Mass of 1 amu

○ Neutron

- Neutral particle found in nucleus
- Mass of 1 amu

○ Electron

- Negatively (-) charged particle found orbiting/circling nucleus in an “electron cloud”
- No mass!



TERMS:

- Atomic #
- Mass #
- Average Atomic Mass



VARIATIONS

○ Isotope

- An atom with either more or fewer neutrons than the “typical” or “average” atom
- Let’s look at the Atoms Packet again

○ Ion

- An atom with either more or fewer electrons than the neutral form
- This results in the atom being charged
- Let’s look at the Atoms Packet again



SUBATOMIC PARTICLE PRACTICE

- If we are familiar with subatomic particles, and variations of “normal” atoms, we can use fragmented information to uncover all we need to know about an atom.
- Let's look at the Subatomic particle chart



ELEMENTS

- If you have a substance made up of only *one kind* of atom, you have an element
- EX: gold is an element – a pure substance made up of the same atoms (gold atoms)
- There are over 100, but not all occur naturally, and only 25 are found in living things, and only 4 make up the majority of living tissue
 - Carbon, Hydrogen, Oxygen, Nitrogen



ELEMENTS

- Elements are assigned symbols (one or two letters) and organized on the Periodic Table of the Elements

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	57-71 * Lu	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	89-103 * Lr	104 Rf	105 Db	106 Sg	107 Bh	108 Hs	109 Mt	110 Uun	111 Uuu	112 Uub						113 Uuq

* Lanthanide series

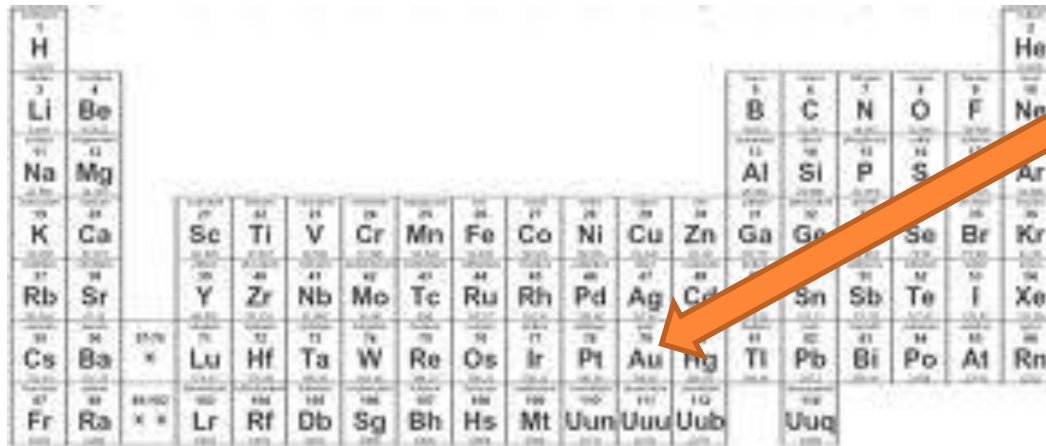
57 La	58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb
89 Ac	90 Th	91 Pa	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No

** Actinide series



ELEMENTS

- Elements are assigned symbols (one or two letters) and organized on the Periodic Table of the Elements



The image shows a standard periodic table of elements. An orange arrow points from the right side of the table towards the element Gold (Au), which is located in the 6th period and 11th group.

There is the element “gold” with the symbol “Au”

* Lanthanide series

57	58	59	60	61	62	63	64	65	66	67	68	69	70	71
La	Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	
72	73	74	75	76	77	78	79	80	81	82	83	84	85	86
Ac	Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	

** Actinide series



ELECTRONS AROUND THE NUCLEUS

- Electrons orbit the nucleus in defined energy levels – each energy level has a defined number of orbitals
 - Think of an electron orbital as a region of 3-D space surrounding the nucleus occupied by electrons
- Stability
 - An atom's stability depends on whether or not its highest energy level is full
 - The first energy level fills with 2 electrons
 - The second energy level fills with 8 electrons



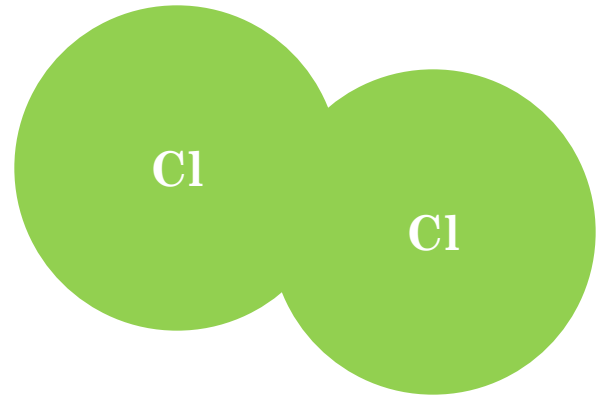
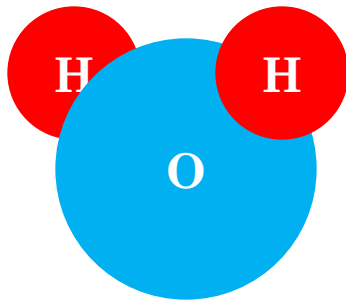
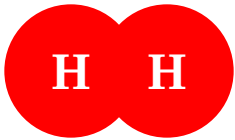
BONDING

- In an “effort” to become more stable, atoms of the same or different elements may chemically combine, or come together



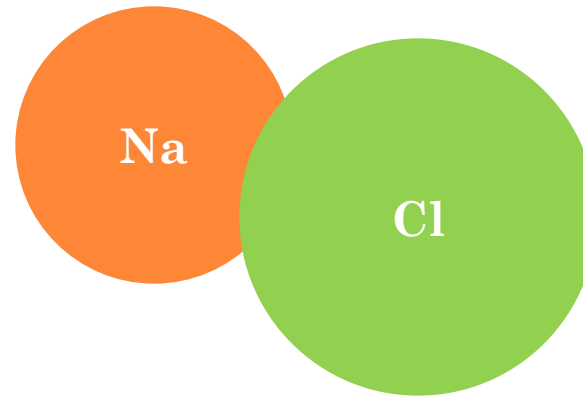
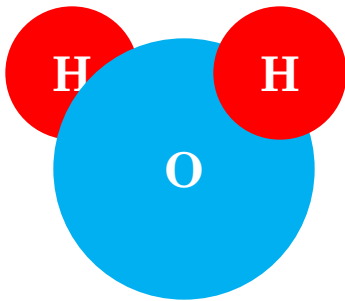
BONDING

- **Molecule**: any 2 or more atoms chemically combined (put together)



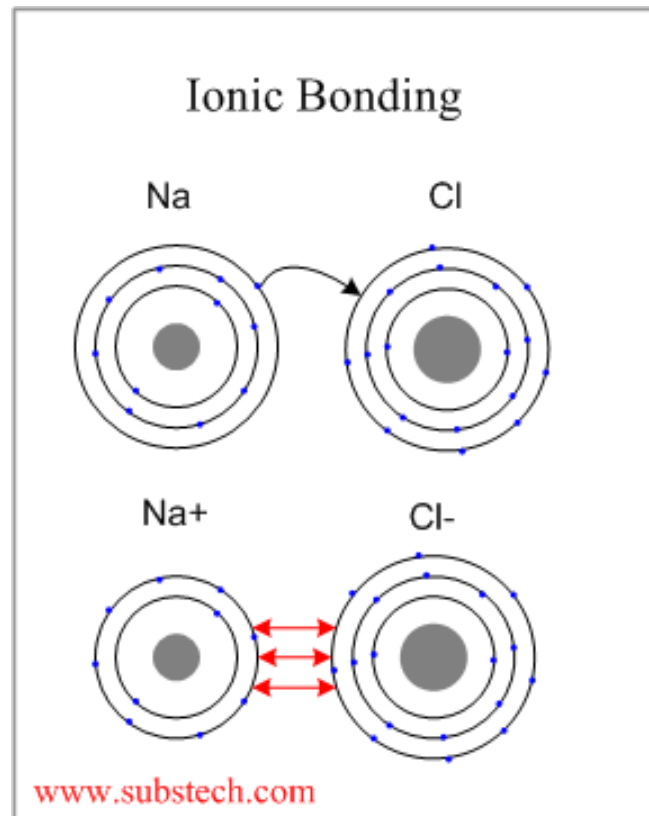
BONDING

- **Compound**: any 2 or more atoms *of different elements* chemically combined (put together)



IONIC BONDING

- An electron is **transferred** from one atom to another, resulting in two oppositely charged atoms.



IONIC BONDING

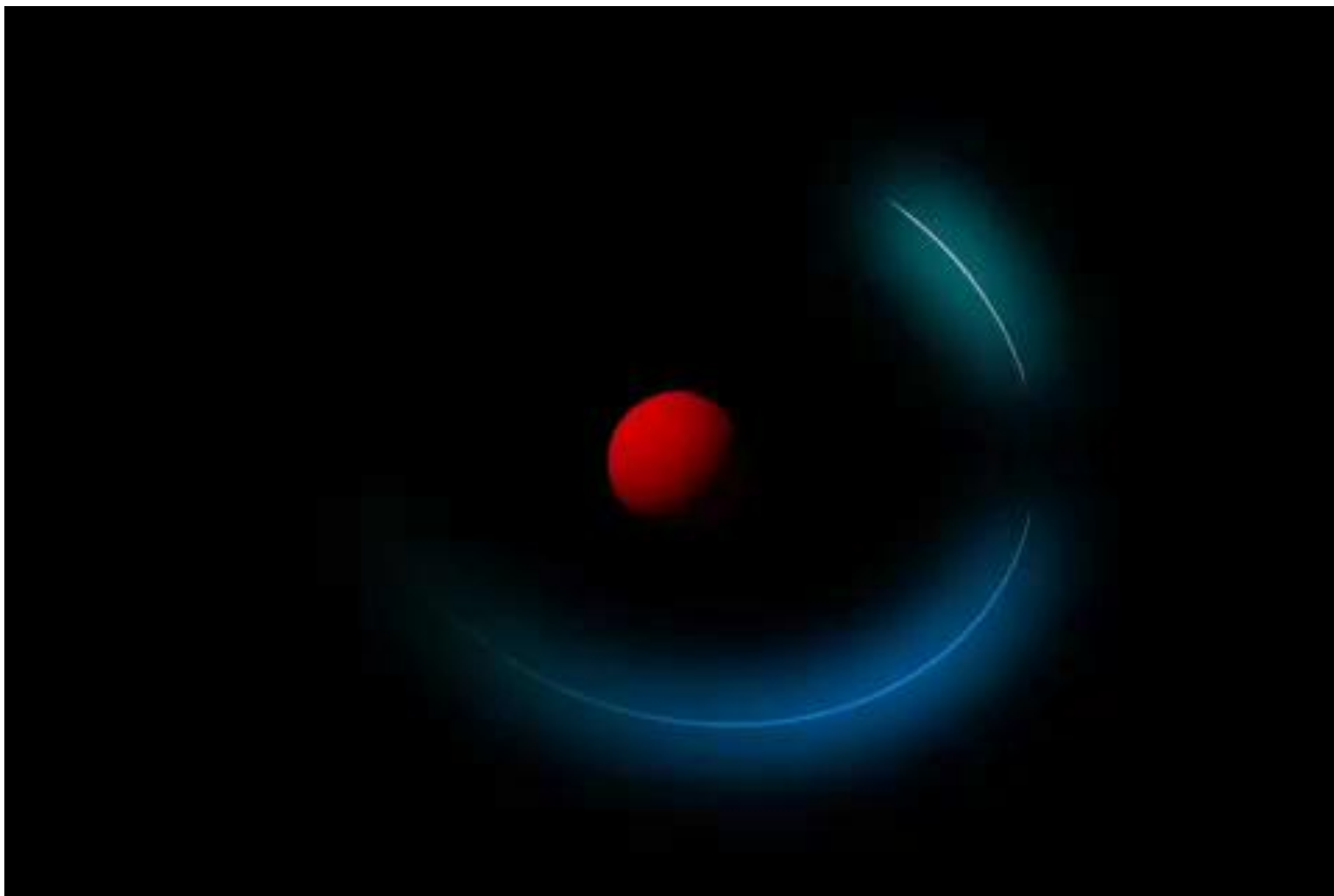


COVALENT BONDING

- Two atoms share one or more pairs of electrons
 - Examples:
 - H_2
 - H_2O
 - CH_4



COVALENT BONDING



COVALENT BONDING

