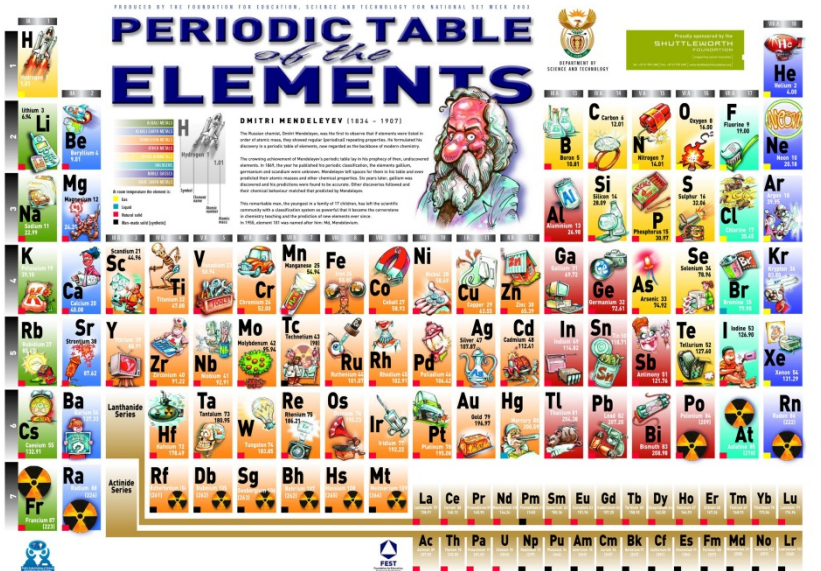


**“What Are We Made Of?”**  
**Newcomer Academy High School**  
**Visualization Two**

	Subtopic/Media	Key Points of Discussion	Notes/ Vocabulary
1	<b>What Are We Made Of?</b>	<p><b>What are we made of?</b></p> <ul style="list-style-type: none"> <li>We are made of <b>matter</b> and energy in the form of <b>atoms</b>.</li> <li>“We are all star stuff”.</li> <li>118 <b>Elements</b> in the universe, of which 92 occur naturally (27 created using powerful particle accelerators to force particles to collide at high speeds, producing synthetic, short-lived elements)</li> </ul>  <p><b>How does carbon from a star become a part of you?</b></p> <ul style="list-style-type: none"> <li>The <b>fusion</b> process inside of stars is able to create all of the elements up to Iron (Fe)</li> <li>When stars <b>supernovae</b> they produce the heavier elements, depending on the size of the star</li> <li>Atoms make up elements</li> <li>These atoms/elements then coalesce into rock and debris as they cool, due to gravity.</li> <li>Some gas becomes new stars, while other gas and debris become <b>planets, asteroids, meteorites</b> and <b>comets</b>.</li> <li>Those elements are then <b>transported</b> to stellar objects (as mentioned below) and become a part of the planet’s organisms.</li> <li>Vehicles that move elements throughout space are: stars, meteors (shooting star = 300 tons enter Earth’s atmosphere daily), asteroids, comets (dirty snowballs... pass through their tails) and other planets</li> </ul>	<p><i>Activity 2</i></p> <p>Mater</p> <p>Atom</p> <p>Element</p> <p>Fusion</p> <p>Supernova(e)</p> <p>Planet</p> <p>Asteroid</p> <p>Meteorite</p> <p>Comet</p> <p>Transport</p>

**Video: Death of Stars and creation of atoms**

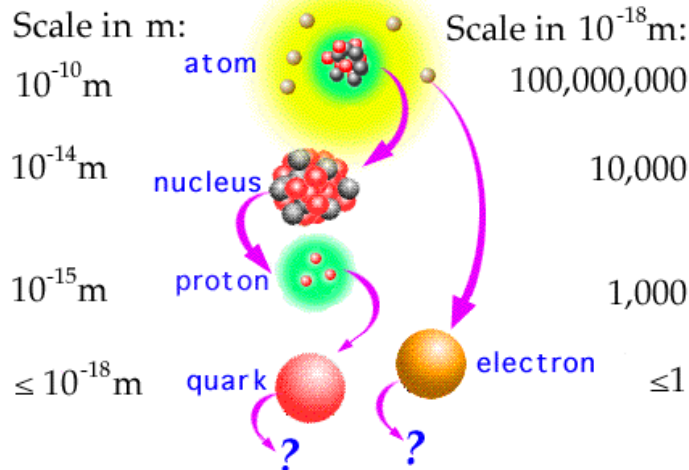
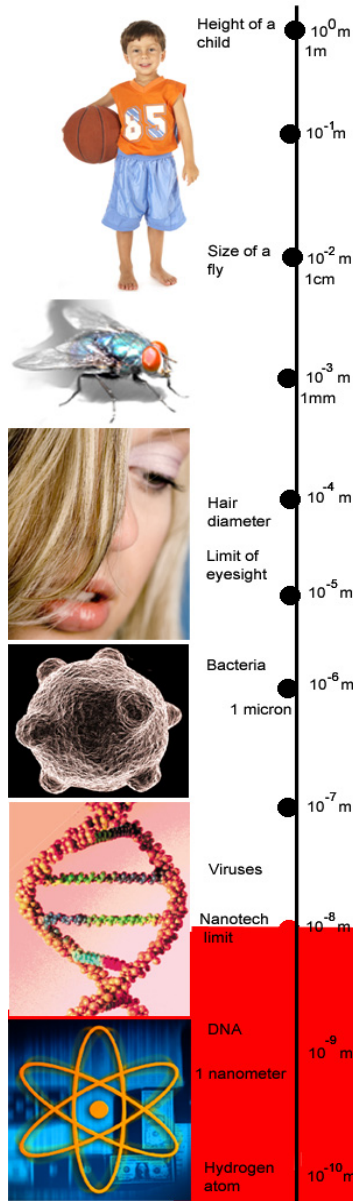
2

Size of Atoms

**How Big is Small?**

- An **atom** is the smallest particle of an element that still exhibits the properties of that element (e.g. If you break apart an atom of Gold, none of the separate parts will act like Gold)

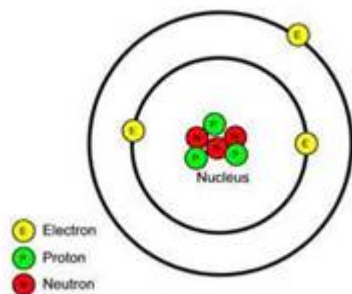
Atom



3

**Atomic Structure**

**I can identify the parts of the atom, and describe their electrical charge and relative location.**



**Nucleus**

- **Protons** – **Positive** Charge (Equal in size to Neutron = have to line up 100 billion protons to make something visible to the human eye)
- **Neutrons** – **Neutral** Charge
- Above cluster together to form the nucleus

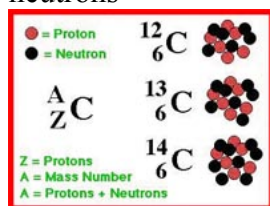
**Atomic Number** is equal to the number of protons in an atom of that particular element

**Atomic Mass** is found by adding the number of protons and neutrons. (It is an average of all the possible isotopes, therefore it is rarely found on the periodic table as a whole number)

Number of neutrons is found by subtracting the Atomic Number from the Atomic Mass (A.M. – A# = #n)

#ofP	#ofe <sup>-</sup>	Element-Symbol		Row Shell #	Column #e/outer shell	Atomic Number #P - #e <sup>-</sup>	Atomic Wt	# of N At. Wt-#P
1	1	Hydrogen	H	1	1	1	1.008	0
2	2	Helium	He	1	8	2	4.003	2
3	3	Lithium	Li	2	1	3	6.941	4
4	4	Berrilium	Be	2	2	4	9.021	5
5	5	Boron	B	2	3	5	10.810	6
6	6	Carbon	C	2	4	6	12.010	6
7	7	Nitrogen	N	2	5	7	14.010	7
8	8	Oxygen	O	2	6	8	16.000	8
9	9	Fluorine	Fl	2	7	9	19.000	10
10	10	Neon	Ne	2	8	10	20.180	10

**Isotopes** are atoms of the same element with a different number of neutrons



Basic Structure and Function of Atomic Components

Begin Final Project

Nucleus

Proton

Neutron

Atomic Number

Atomic Mass

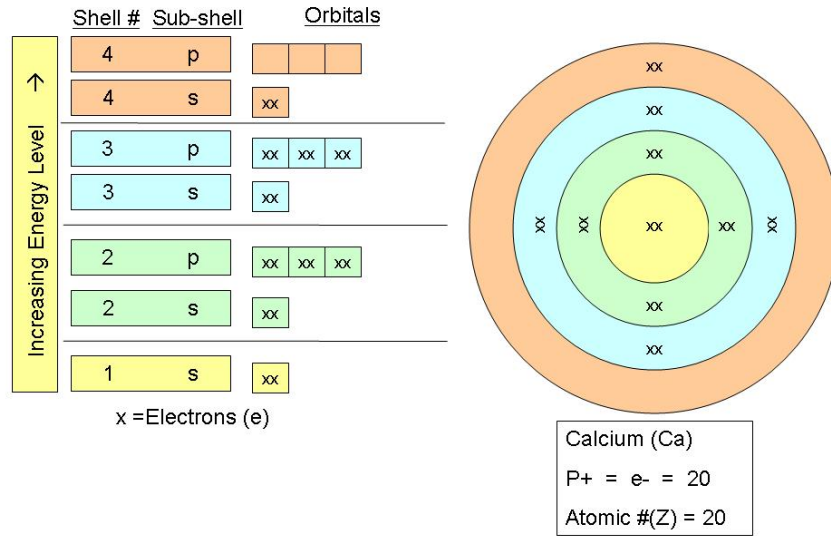
Isotope

### Orbit in Concentric Shells

- **Electrons** – **Negative** Charge (100,000 times smaller than a proton)
- **Valence** Electrons – Outermost Shell
- 1<sup>st</sup> Shell can hold 2 Electrons
- 2<sup>nd</sup> Shell can hold 8 Electrons
- 3<sup>rd</sup> Shell can hold 8 Electrons

Concentric  
Shell  
Electron  
Valence

### Elements – Atomic Structure



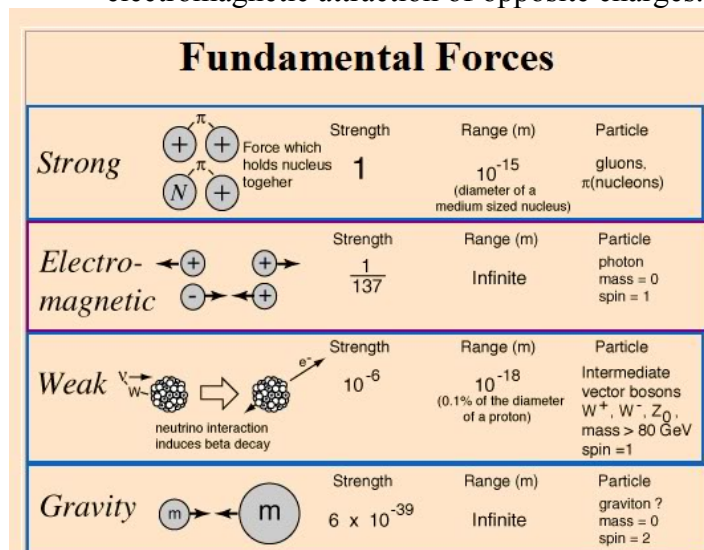
### Quick Animation of Atomic Structure

**4** **Fundamental Forces Determine the Structure of Atoms**

### How do the fundamental forces determine the structure of atoms?

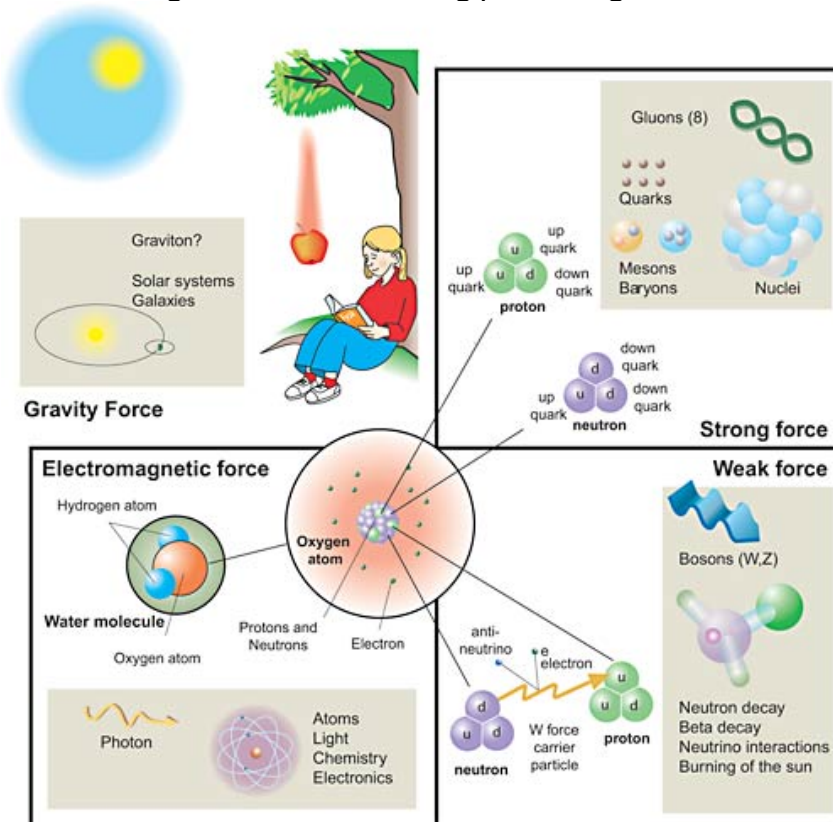
- The **Universe** contains two components-**matter** and **energy**.
- The three fundamental **forces**, the pushes and pulls in the universe are **gravitational**, **electromagnetic** and **nuclear**. The interaction of these three forces determines the structure of matter.
- The nuclear force overpowers the opposing electromagnetic force of protons in the nucleus.
- The electrons (-) orbit the nucleus (+), being pulled by the electromagnetic attraction of opposite charges.

*Activity 3*  
Universe  
Energy  
Force  
Gravitational  
Electromagnetic  
Nuclear



### What causes pushing and pulling?

- Gravitational forces pulling protons closer
- Electric force pushing the protons apart
- Strong Nuclear force holding protons together in the atom



### Video: Forces and the structure of atoms

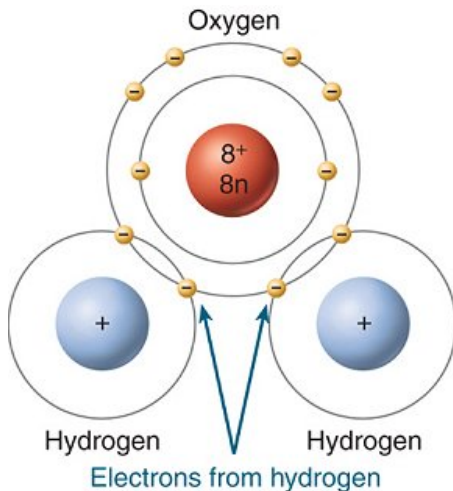
5

#### Bonding of Elements to form Compounds

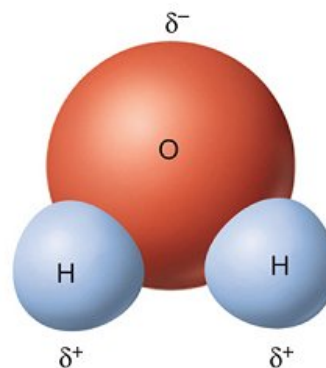
The shells of an atom always want to be “full”, so when an atom finds another with the proper amount of valence electrons they bond together.

#### Water: H<sub>2</sub>O

Oxygen has 6 valence electrons in its outer shell, and needs a total of 8 to fill that shell. Hydrogen has 1 valence electron in its outer shell. When two Hydrogen atoms approach an atom of Oxygen they fill in the open spaces in the outer shell of the Oxygen. This creates water.



(a) Electron shells in a water molecule

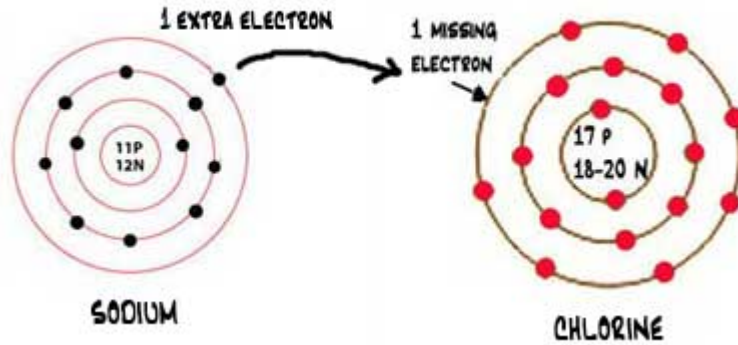


(b) Distribution of partial charges in a water molecule

Supplemental

**Salt: NaCl**

Chlorine has 7 valence electrons in its second shell; it needs a total of 8 to be “full”. Therefore it is looking for an element that has 1 valence electron. Sodium is a great match, because it has that 1 valence electron. When bonding occurs the deadly element, chlorine, becomes salt.



**Quick Animation of Elements bonding (from aforementioned examples)**

6

**Would Life Elsewhere be Made of Similar Things?**

**Would life elsewhere be made of similar things?**

- Evidence suggests that the entire universe is made of the same components, thus life (as we know it) would be made of the same elements

**Factors that would have to be present for life to exist:**

- Liquid Water (proper distance from the Sun – **Habitable Zones**... both solar and galactic)
- Time to develop and become **complex** (proper placement in a galaxy)
- **Produce** energy
- **Reproduce/Replicate**

*Activity 2*

Factor

Exist

Habitable Zone

Complex

Produce

Reproduce

Replicate

