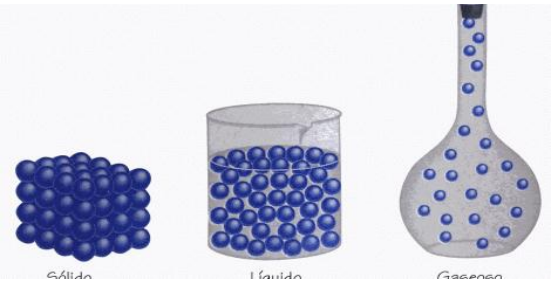
WHAT IS MATTER?



What is matter? How is matter composed? How do components of the atom behave? Which are the states of matter?

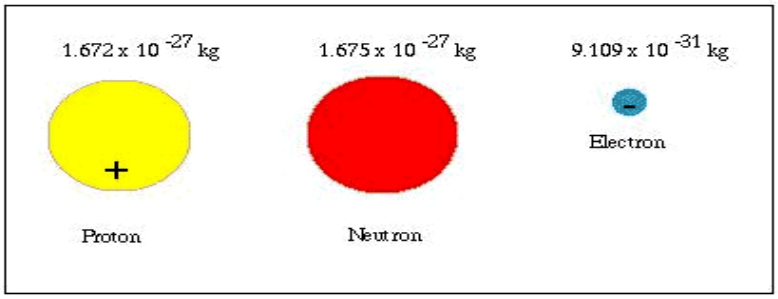
Given the definition of “space” which is said it is a three-dimensional representation of everything we see and everything that occurs in the universe. Matter is any substance that occupies space.

Everything in the universe is made of energy that manifests itself in many ways. The matter is merely energy in a condensed form.

All physical objects are made of material which can be converted into energy and vice versa (see relativity Einstein formula where Energy = (mass) x (the square of the constant speed of light).

The atom is the smallest and chemically indivisible unit of matter maintaining the properties of an element. It consists of an atomic nucleus in the center of the atom (protons and neutrons).

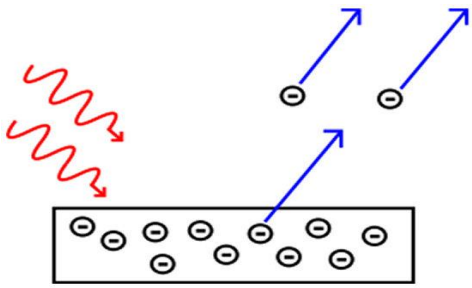
A neutron is an uncharged particle in the nuclei of an atom. A proton is a charged particle in the nuclei of an atom which we call “positive” (1673 x 10^{-24} grams) while an electron has a mass of 9.10 x 10^{-28} grams. This means that the protons and neutrons have more than one thousand times the mass of electrons.



The nucleus is surrounded by electrons. The electron interacts with the nucleus of the atom by the electromagnetic charge and if there are several, are scattered in

different energy levels, for each level can only accept a certain amount of energy, displacing the other electrons further.

The matter of the universe changes naturally. As these changes occur, for example in the case of the matter, it will naturally release energy. When an electron changes of position in space and into or out of an electromagnetic field, this will emit or absorb photons of light.



To classify an atom, we count the number of particles that it has in its nucleus (the number of protons determines the atomic number and neutron number helps determine the isotope of the atom).

Thus, an atom can be classified on the periodic table of the elements.

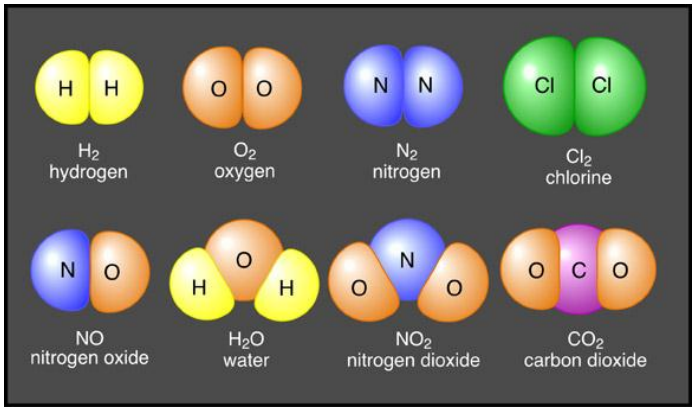
hydrogen 1 H 1.0079																		helium 2 He 4.0026
lithium 3 Li 6.941	beryllium 4 Be 9.0122												boron 5 B 10.811	carbon 6 C 12.011	nitrogen 7 N 14.007	oxygen 8 O 15.999	fluorine 9 F 18.998	neon 10 Ne 20.180
sodium 11 Na 22.990	magnesium 12 Mg 24.305												aluminium 13 Al 26.982	silicon 14 Si 28.086	phosphorus 15 P 30.974	sulfur 16 S 32.065	chlorine 17 Cl 35.453	argon 18 Ar 39.948
potassium 19 K 39.098	calcium 20 Ca 40.078		scandium 21 Sc 44.956	titanium 22 Ti 47.867	vanadium 23 V 50.942	chromium 24 Cr 51.996	manganese 25 Mn 54.938	iron 26 Fe 55.845	cobalt 27 Co 58.933	nickel 28 Ni 58.693	copper 29 Cu 63.546	zinc 30 Zn 65.39	gallium 31 Ga 69.723	germanium 32 Ge 72.61	arsenic 33 As 74.922	selenium 34 Se 78.96	bromine 35 Br 79.904	krypton 36 Kr 83.80
rubidium 37 Rb 85.468	strontium 38 Sr 87.62		yttrium 39 Y 88.906	zirconium 40 Zr 91.224	niobium 41 Nb 92.906	molybdenum 42 Mo 95.94	technetium 43 Tc [98]	ruthenium 44 Ru 101.07	rhodium 45 Rh 102.91	palladium 46 Pd 106.42	silver 47 Ag 107.87	cadmium 48 Cd 112.41	indium 49 In 114.82	tin 50 Sn 118.71	antimony 51 Sb 121.76	tellurium 52 Te 127.60	iodine 53 I 126.90	xenon 54 Xe 131.29
caesium 55 Cs 132.91	barium 56 Ba 137.33	57-70 *	lutetium 71 Lu 174.97	hafnium 72 Hf 178.49	tantalum 73 Ta 180.95	tungsten 74 W 183.84	rhenium 75 Re 186.21	osmium 76 Os 190.23	iridium 77 Ir 192.22	platinum 78 Pt 195.08	gold 79 Au 196.97	mercury 80 Hg 200.59	thallium 81 Tl 204.38	lead 82 Pb 207.2	bismuth 83 Bi 208.98	polonium 84 Po [209]	astatine 85 At [210]	radon 86 Rn [222]
francium 87 Fr [223]	radium 88 Ra [226]	89-102 * *	lawrencium 103 Lr [262]	rutherfordium 104 Rf [261]	dubnium 105 Db [262]	seaborgium 106 Sg [266]	bohrium 107 Bh [264]	hassium 108 Hs [269]	meitnerium 109 Mt [268]	ununnilium 110 Uun [271]	unununium 111 Uuu [272]	ununbium 112 Uub [277]		ununquadium 114 Uuq [289]				

*Lanthanide series	lanthanum 57 La 138.91	cerium 58 Ce 140.12	praseodymium 59 Pr 140.91	neodymium 60 Nd 144.24	promethium 61 Pm [145]	samarium 62 Sm 150.36	europium 63 Eu 151.96	gadolinium 64 Gd 157.25	terbium 65 Tb 158.93	dysprosium 66 Dy 162.50	holmium 67 Ho 164.93	erbium 68 Er 167.26	thulium 69 Tm 168.93	ytterbium 70 Yb 173.04
**Actinide series	actinium 89 Ac [227]	thorium 90 Th 232.04	protactinium 91 Pa 231.04	uranium 92 U 238.03	neptunium 93 Np [237]	plutonium 94 Pu [244]	americium 95 Am [243]	curium 96 Cm [247]	berkelium 97 Bk [247]	californium 98 Cf [251]	einsteinium 99 Es [252]	fermium 100 Fm [257]	mendelevium 101 Md [258]	nobelium 102 No [259]

If an atom has an equal number of protons and electrons, is said to be electronically neutral.

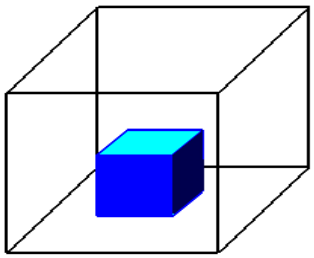
Several atoms of the same kind of protons are a type of matter which can be identified as an “element”. All atoms of a given element are identical, and atoms of different elements are different in size and properties.

The combination of elements by means of electromagnetic forces is called “compound”. The amount of matter in an object is determined by its mass.

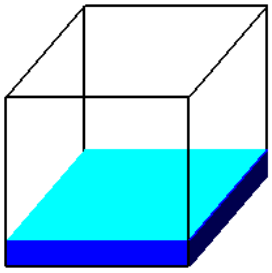


Although matter is within the whole universe, so far humans have only been able to find only five states of matter, called “phases”: solids, liquids, gases, plasmas and a state called Bose-Einstein condensate.

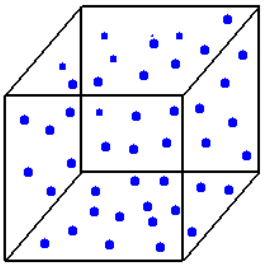
1. In solids, the molecules are strongly bonded by molecular forces. A solid holds its shape and its volume is determined by the shape of the solid.



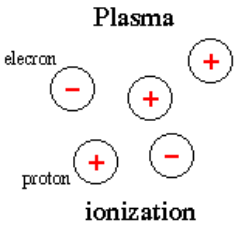
2. In the liquid phase molecular forces are weaker than in a solid. A liquid takes the shape of its container. Liquids have a fixed volume.



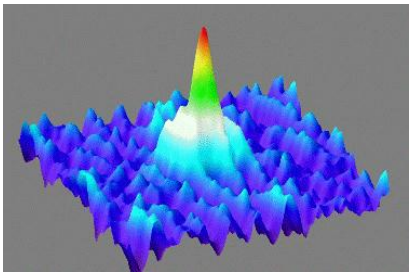
3. In the gas phase, the molecular forces are very weak. A gas fills, and takes the shape and volume of its container .



4. If a material is subjected to high temperatures and pressures (as in the sun), the atoms begin to unleash, shedding its electrons orbit and leaving a positive ion, thus becoming a “plasma”, which behaves like a fluid, which is responsive and generates electromagnetic forces. Most of the matter in the universe is plasma.



5. When matter approaches the absolute zero of temperature (-459.67° Farenheit, -273.15 degrees Celsius), the thousands of atoms of a substance condense into a single quantum state, forming the fifth state of matter, the Bose-Einstein condensate. Particles of this state of matter are fragile and light travels through them very slowly.



The states of matter are related to the physical state of the molecules and atoms. Such states can be switched from one to another, maintaining the same molecular structure.

When matter receives sufficient heat, it becomes ionized (losing its electrones), usually over 5,000 °C (9000°F), thus emitting a photon. This is the cause of the emission of light from stars like the sun.

Source: http://www.artinaid.com/2013/04/what-is-matter/