

Properties of Matter – It Matters

Name: _____ class: _____ Date: _____

Matter is all around us and it is made of atoms. The things that we see and feel are not made of one atom, they are made of billions of atoms and in some cases, made of stable combinations of atoms called molecules. We use materials for specific functions or to serve a purpose based on the characteristics of that material. Take for instance a bicycle.



Each part of a bicycle is designed for the function that it serves, and the material used to make that part is purposefully used for the characteristics or properties that make it the best material for that purpose. The properties of the material come from the atoms and molecules that make up that material. The frame is strong and rigid and is made of metal alloys like aluminum or composite material like carbon fiber. The wheels' tires are made of rubber that is hard enough to withstand the road and sharp stones but soft enough to absorb the bumps on the road. The chain must bend but be strong and link the crank sprocket to the wheel sprockets on the back wheel. To make sure it does not rust and that it stays flexible, grease is applied to all moving parts.

So the material has characteristics or properties from the atoms and molecules and that leads us to the fact that all atoms have properties that are specific to each atom. Some atoms are very light and are gases at room temperature and others are solid or liquids. Some are highly reactive chemically and some are not reactive at all (this is called inert).

As scientists became more educated on the existing elements and began to learn the many properties, they were able to see that there were groupings or 'periods' and came up with what we now know of as the Periodic Table of the Elements.

Periodic Table of the Elements																		18 VIII A 8A			
1 H Hydrogen 1.0079		2 IIA 2A										13 IIIA 3A	14 IVA 4A	15 VA 5A	16 VIA 6A	17 VIIA 7A	2 He Helium 4.00260				
3 Li Lithium 6.941		4 Be Beryllium 9.01218										5 B Boron 10.811	6 C Carbon 12.011	7 N Nitrogen 14.00674	8 O Oxygen 15.9994	9 F Fluorine 18.998403	10 Ne Neon 20.1797				
11 Na Sodium 22.989768		12 Mg Magnesium 24.305		3 IIIB 3B	4 IVB 4B	5 VB 5B	6 VIB 6B	7 VIIB 7B	8 VIII 8		9 VIII 8	10 VIII 8	11 IB 1B	12 IIB 2B	13 Al Aluminum 26.981539	14 Si Silicon 28.0855	15 P Phosphorus 30.973762	16 S Sulfur 32.066	17 Cl Chlorine 35.4527	18 Ar Argon 39.948	
19 K Potassium 39.0983		20 Ca Calcium 40.078		21 Sc Scandium 44.95591	22 Ti Titanium 47.88	23 V Vanadium 50.9415	24 Cr Chromium 51.9961	25 Mn Manganese 54.938	26 Fe Iron 55.847	27 Co Cobalt 58.9332	28 Ni Nickel 58.6934	29 Cu Copper 63.546	30 Zn Zinc 65.39	31 Ga Gallium 69.732	32 Ge Germanium 72.64	33 As Arsenic 74.92159	34 Se Selenium 78.96	35 Br Bromine 79.904	36 Kr Krypton 83.80		
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 98.9072	44 Ru Ruthenium 101.07	45 Rh Rhodium 102.9055	46 Pd Palladium 106.42	47 Ag Silver 107.8662	48 Cd Cadmium 112.411	49 In Indium 114.818	50 Sn Tin 118.71	51 Sb Antimony 121.760	52 Te Tellurium 127.5	53 I Iodine 126.90447	54 Xe Xenon 131.29		
55 Cs Cesium 132.90543		56 Ba Barium 137.327		57-71		72 Hf Hafnium 178.49	73 Ta Tantalum 180.9479	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 196.9665	80 Hg Mercury 200.59	81 Tl Thallium 204.3833	82 Pb Lead 207.2	83 Bi Bismuth 208.98037	84 Po Polonium [209]	85 At Astatine 209	86 Rn Radon 222.0176	
87 Fr Francium 223.0197		88 Ra Radium 226.0254		89-103		104 Rf Rutherfordium [261]	105 Db Dubnium [262]	106 Sg Seaborgium [266]	107 Bh Bohrium [264]	108 Hs Hassium [269]	109 Mt Meitnerium [268]	110 Ds Darmstadtium [289]	111 Rg Roentgenium [272]	112 Cn Copernicium [277]	113 Uut Ununtrium unknown	114 Fl Flerovium [289]	115 Uup Ununpentium unknown	116 Lv Livermorium [293]	117 Uus Ununseptium unknown	118 Uuo Ununoctium unknown	
Lanthanide Series				57 La Lanthanum 138.9055	58 Ce Cerium 140.115	59 Pr Praseodymium 140.90765	60 Nd Neodymium 144.24	61 Pm Promethium 144.9127	62 Sm Samarium 150.36	63 Eu Europium 151.9655	64 Gd Gadolinium 157.25	65 Tb Terbium 158.92534	66 Dy Dysprosium 162.50	67 Ho Holmium 164.93032	68 Er Erbium 167.26	69 Tm Thulium 168.93421	70 Yb Ytterbium 173.04	71 Lu Lutetium 174.967			
Actinide Series				89 Ac Actinium 227.0279	90 Th Thorium 232.0381	91 Pa Protactinium 231.03688	92 U Uranium 238.02891	93 Np Neptunium 237.04817	94 Pu Plutonium 244.0642	95 Am Americium 243.0614	96 Cm Curium 247.0703	97 Bk Berkelium 247.0703	98 Cf Californium 251.0799	99 Es Einsteinium [254]	100 Fm Fermium [257]	101 Md Mendelevium 258.10	102 No Nobelium 259.1089	103 Lr Lawrencium [262]			
Alkali Metals		Alkaline Earths		Transition Metals				Basic Metals		Semi-Metals		Nonmetals		Halogens		Noble Gases		Lanthanides		Actinides	

Today, chemists, physicists and material scientists all over the world use this to look up properties of elements such as Atomic Number, Atomic Mass, Density, Boiling Point, Freezing Point, Electrical Conductivity, Chemical Reactivity and Valence Electrons – to name a few. Knowing the properties can allow scientists to design materials that are put together for all of us to enjoy – such as a bicycle.

Questions:

What are properties?

What are some examples of properties of materials on a bicycle?

What elements occur as elements in nature?

What are some examples of properties of elements?

What are some examples of metals?

What properties do metals all have in common?

What does 'ductile' mean?

What does the word Period or Periodic mean in 'The Periodic Table'?