

Properties of Matter

Definitions

- Chemistry - study of matter and the changes it undergoes.
- Matter – anything that has mass and takes up space.

Elements

- - a substance that can not be broken down into simpler substances
 - 119 elements
 - 88 are found naturally, about 90%
 - others are made in laboratories
- majority of the elements are not found in abundance
- some are exceedingly rare
- only a dozen or so make up everyday things
 - primarily: carbon, hydrogen, oxygen, nitrogen

Periodic Table of the Elements

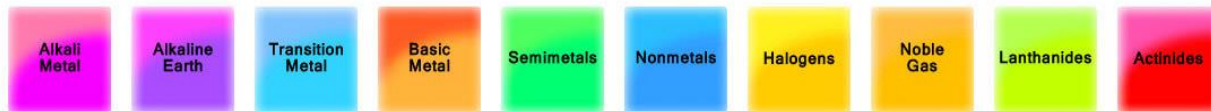
1 1IA 11A																	13 IIIA 3A	14 IVA 4A	15 VA 5A	16 VIA 6A	17 VIIA 7A	18 VIIIA 8A													
1 H Hydrogen 1.0079																	5 B Boron 10.811	6 C Carbon 12.011	7 N Nitrogen 14.00674	8 O Oxygen 15.9994	9 F Fluorine 18.998403	10 Ne Neon 20.1797													
3 Li Lithium 6.941	4 Be Beryllium 9.01218																	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 107.8682	48 Cd Cadmium 112.411	49 In Indium 114.818	50 Sn Tin 118.71	51 Sb Antimony 121.760	52 Te Tellurium 127.6	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 [208.9824]	85 At Astatine 209.9871	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 [269]	111 Rg Roentgenium [272]	112 Cn Copernicium [277]	113 Uut Ununtrium unknown	114 Uuq Ununquadium [289]	115 Uup Ununpentium unknown	116 Uuh Ununhexium [298]	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
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Actinide Series

89 Ac Actinium 227.0278	90 Th Thorium 232.0381	91 Pa Protactinium 231.03688	92 U Uranium 238.0289	93 Np Neptunium 237.0482	94 Pu Plutonium 244.0642	95 Am Americium 243.0614	96 Cm Curium 247.0703	97 Bk Berkelium 247.0703	98 Cf Californium 251.0796	99 Es Einsteinium [254]	100 Fm Fermium 257.0951	101 Md Mendelevium 258.1	102 No Nobelium 259.1009	103 Lr Lawrencium [262]
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Compounds

- a substance made of atoms of more than one element bound together
 - unique and different from the elements it contains
 - ex. Water: (H₂O) liquid, clear, non toxic

hydrogen

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oxygen

- gas, colorless

- gas, colorless

- non toxic

- non toxic

- volatile

Mixtures

- - combination of more than one substance, where no chemical change has taken place.
ex. salsa, air, salad, iced tea

Types of Mixtures

- Homogenous

Homo-: same *-genus*: type

- substances are so evenly distributed that it is difficult to distinguish one substance from another

- appears to contain only one substance

ex. Iced tea: sugar, tea, water

Types of Mixtures

- Heterogeneous
 - *Hetero-*: different *-genus*; type
 - not uniform in composition
 - different components can be seen as individual substances
 - ex: salsa: tomatoes, peppers, onions, cilantro
- A suspension is a type of heterogeneous mixture that at first appears uniform, but separates into layers over time
 - ex: mud, hot chocolate

Physical Properties of Matter

- a characteristic of a substance that can be observed or measured without changing the composition of the substance
 - Melting pt.: temperature at which a substance changes from a solid to liquid
 - Boiling Pt.: temperature at which a substance changes from a liquid to a gas
 - Density: the ratio of a material's mass to its volume.
 - $D = M/V$

Chemical Properties of Matter

- Any change in the composition of matter that produces one or more new substances.
 - can only be observed when the substances in a sample of matter are changing into a different substance

Flammability - material's ability to burn in the presence of oxygen

Reactivity- how readily a substance combines chemically with other substances



Chemical Changes Cont.

- How do you know if a chemical change occurred?
- Look for evidence of a chemical change
 - production of a gas
 - the formation of a precipitate
 - production of heat, or it becomes very cold.
 - production of light
 - color change

