

Chemicals and Periodic Table

Chemistry



- A physical science that involves the study of the properties, composition, & structure of matter and the changes it undergoes.

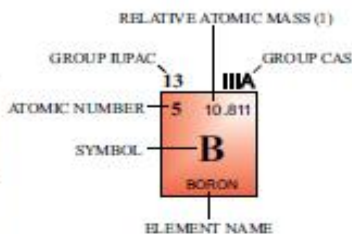
Elements

- Elements: are pure substances that cannot be decomposed by chemical changes.
- *Building blocks of all matter.*
- Each element has characteristic properties.
- Scientist came up with a way to organize the elements based on these characteristics.
- *The Periodic Table*

PERIODIC TABLE OF THE ELEMENTS

<http://www.kg-split.hr/periodni/en/>

PERIOD	GROUP																		
	1 IA	2 IA											13 IIIA	14 IVA	15 VA	16 VIA	17 VIIA	18 VIIIA	
1	1 1.0079 H HYDROGEN																		2 4.0026 He HELIUM
2	3 6.941 Li LITHIUM	4 9.0122 Be BERYLLIUM											5 10.811 B BORON	6 12.011 C CARBON	7 14.007 N NITROGEN	8 15.999 O OXYGEN	9 18.998 F FLUORINE	10 20.180 Ne NEON	
3	11 22.990 Na SODIUM	12 24.305 Mg MAGNESIUM											13 26.982 Al ALUMINIUM	14 28.086 Si SILICON	15 30.974 P PHOSPHORUS	16 32.065 S SULPHUR	17 35.453 Cl CHLORINE	18 39.948 Ar ARGON	
4	19 39.098 K POTASSIUM	20 40.078 Ca CALCIUM	21 44.956 Sc SCANDIUM	22 47.867 Ti TITANIUM	23 50.942 V VANADIUM	24 51.996 Cr CHROMIUM	25 54.938 Mn MANGANESE	26 55.845 Fe IRON	27 58.933 Co COBALT	28 58.693 Ni NICKEL	29 63.546 Cu COPPER	30 65.39 Zn ZINC	31 69.723 Ga GALLIUM	32 72.64 Ge GERMANIUM	33 74.922 As ARSENIC	34 78.96 Se SELENIUM	35 79.904 Br BROMINE	36 83.80 Kr KRYPTON	
5	37 85.468 Rb RUBIDIUM	38 87.62 Sr STRONTIUM	39 88.906 Y YTRIUM	40 91.224 Zr ZIRCONIUM	41 92.906 Nb NIOBIUM	42 95.94 Mo MOLYBDENUM	43 (98) Tc TECHNETIUM	44 101.07 Ru RUTHENIUM	45 102.91 Rh RHODIUM	46 106.42 Pd PALLADIUM	47 107.87 Ag SILVER	48 112.41 Cd CADMIUM	49 114.82 In INDIUM	50 118.71 Sn TIN	51 121.76 Sb ANTIMONY	52 127.60 Te TELLURIUM	53 126.90 I IODINE	54 131.29 Xe XENON	
6	55 132.91 Cs CAESIUM	56 137.33 Ba BARIUM	57-71 La-Lu Lanthanide	72 178.49 Hf HAFNIUM	73 180.95 Ta TANTALUM	74 183.84 W TUNGSTEN	75 186.21 Re RHENIUM	76 190.23 Os OSMIUM	77 192.22 Ir IRIDIUM	78 195.08 Pt PLATINUM	79 196.97 Au GOLD	80 200.59 Hg MERCURY	81 204.38 Tl THALLIUM	82 207.2 Pb LEAD	83 208.98 Bi BISMUTH	84 (209) Po POLONIUM	85 (210) At ASTATINE	86 (222) Rn RADON	
7	87 (223) Fr FRANCIUM	88 (226) Ra RADIUM	89-103 Ac-Lr Actinide	104 (261) Rf RUTHERFORDIUM	105 (262) Db DUBNIUM	106 (266) Sg SEABORGIUM	107 (264) Bh BOHRNIUM	108 (277) Hs HASSIUM	109 (268) Mt MEITNERIUM	110 (281) Uun UNUNNIUM	111 (272) Uuu UNUNUNIUM	112 (285) Uub UNUBIUM		114 (289) Uuq UNUNQUADIUM					



■ Metal	■ Semimetal	■ Nonmetal
■ Alkali metal	■ Chalcogens element	
■ Alkaline earth metal	■ Halogens element	
■ Transition metals	■ Noble gas	
■ Lanthanide		
■ Actinide		

STANDARD STATE (100 °C; 101 kPa)
Ne - gas Fe - solid
Ga - liquid Te - synthetic

LANTHANIDE

57 138.91 La LANTHANUM	58 140.12 Ce CERIUM	59 140.91 Pr PRASEODYMIUM	60 144.24 Nd NEODYMIUM	61 (145) Pm PROMETHIUM	62 150.36 Sm SAMARIUM	63 151.96 Eu EUROPIUM	64 157.25 Gd GADOLINIUM	65 158.93 Tb TERBIUM	66 162.50 Dy DYSPROSIUM	67 164.93 Ho HOLMIUM	68 167.26 Er ERBIUM	69 168.93 Tm THULIUM	70 173.04 Yb YTTERIUM	71 174.97 Lu LUTETIUM
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ACTINIDE

89 (227) Ac ACTINIUM	90 232.04 Th THORIUM	91 231.04 Pa PROTACTINIUM	92 238.03 U URANIUM	93 (237) Np NEPTUNIUM	94 (244) Pu PLUTONIUM	95 (243) Am AMERICIUM	96 (247) Cm CURIUM	97 (247) Bk BERKELIUM	98 (251) Cf CALIFORNIUM	99 (252) Es EINSTEINIUM	100 (257) Fm FERMIUM	101 (258) Md MENDELEVIUM	102 (259) No NOBELIUM	103 (262) Lr LAWRENCIUM
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(1) Pure Appl. Chem., 73, No. 4, 667-683 (2001)

Relative atomic mass is shown with few significant figures. For elements having no stable nuclides, the value enclosed in brackets indicates the mass number of the longest-lived isotope of the element.

However three such elements (Th, Pa, and U) do have a characteristic terrestrial isotopic composition, and for these an atomic weight is tabulated.

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Periodic Table

- Groups: Vertical columns all have similar chemical properties.
- Periods: Horizontal rows properties change regularly across periods.
- Elements that are close together in a period tend to be more similar than one that are far apart.

Three Major Classes of Elements

- Metals- located on the left of the Periodic Table- most of the elements
- Non-Metals- located on the right of the Periodic Table
- Metalloids- on the zigzag line between Metals and Nonmetals- have properties that are skewed- ie...Silicon is conductive
- *You will have to memorize the symbol and element name for approximately 40 common elements*

Properties of Metals

- ❑ Metals are good conductors of heat and electricity
- ❑ Metals are malleable (*can be shaped*)
- ❑ Metals are ductile (*can be drawn into wires*)
- ❑ Metals have high tensile strength
- ❑ Metals have luster (*shiny*)



Properties of Nonmetals



Carbon, the graphite in “pencil lead” is a great example of a nonmetallic element.

- Nonmetals are poor conductors of heat and Electricity
- Nonmetals tend to be brittle
- Many nonmetals are gases at room temperature

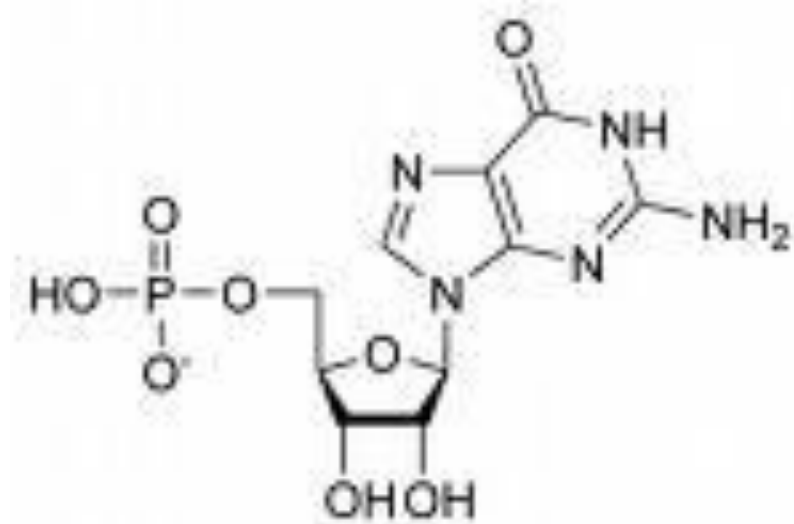
Atoms Unite To Form Compounds

- Chemical Formula indicates number and type of atoms within the molecule The formula to the left is the molecule for indigo:



What type of atoms and how many are there in one molecule?

What is a chemical?



- Any substance that has a definite composition or is used or produced in a chemical process.
- Sugar is an example of a chemical

Indications of A Chemical Reaction

- 1) Bubbles- gas given off
- 2) Change in energy-
 - a. Becomes warm- exothermic
 - b. Becomes cool- endothermic
 - c. Light is given off
- 3) A precipitate (solid) forms
- 4) A change in color

All Chemical Changes can be written as a reaction



- $A + B \rightarrow AB$
- A, B are the starting materials- reactants
- AB is the result-product