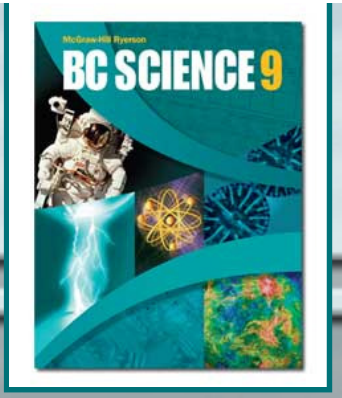
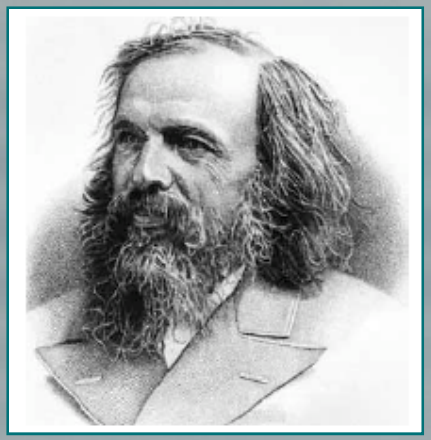
2.2 Periodic Table



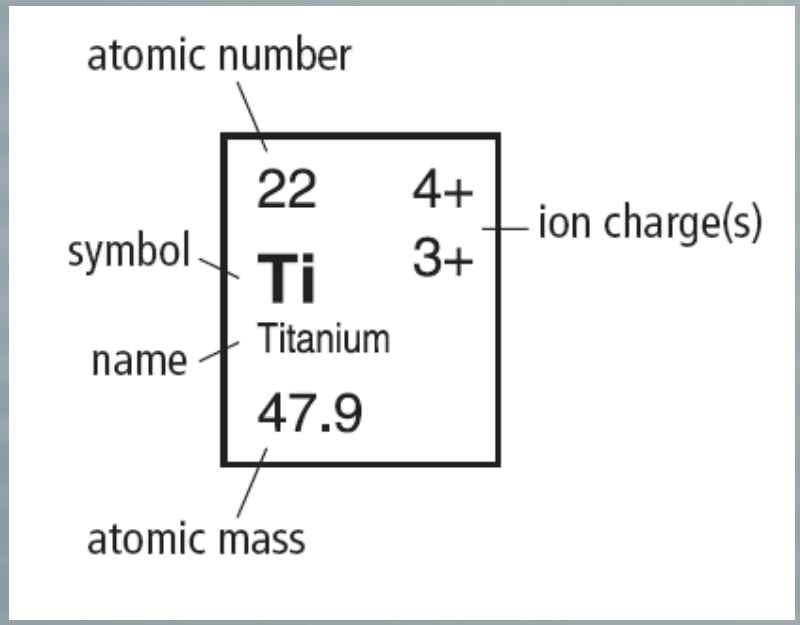
- Origin of the periodic table
  - Chemists in the 10th century wished to organize elements
  - Attempts focused on grouping elements with similar properties
  - In 1867, Dimitri Mendeleev found patterns in the elements and organized them into table
  - The resulting table had holes for elements not yet discovered



See page 52

Periodic Table

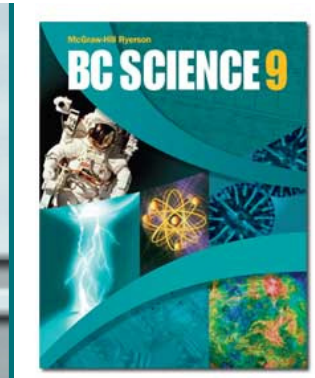
- The Periodic Table provides information on the physical and chemical properties of elements



Atomic Mass - mass of average atom
Atomic Number - number of protons
Ion Charge - electric charge that forms when an atom gains or loses electrons

See page 53

Periodic Table



	1												13	14	15	16	17	18
1	1 + H Hydrogen 1.0	2																2 0 He Helium 4.0
2	3 + Li Lithium 6.9	4 2+ Be Beryllium 9.0											5 B Boron 10.8	6 C Carbon 12.0	7 3− N Nitrogen 14.0	8 2− O Oxygen 16.0	9 − F Fluorine 19.0	10 0 Ne Neon 20.2
3	11 + Na Sodium 23.0	12 2+ Mg Magnesium 24.3	3	4	5	6	7	8	9	10	11	12	13 3+ Al Aluminum 27.0	14 Si Silicon 28.1	15 3− P Phosphorus 31.0	16 2− S Sulphur 32.1	17 − Cl Chlorine 35.5	18 0 Ar Argon 39.9
4	19 + K Potassium 39.1	20 2+ Ca Calcium 40.1	21 3+ Sc Scandium 45.0	22 4+ 3+ Ti Titanium 47.9	23 5+ 4+ V Vanadium 50.9	24 3+ 2+ Cr Chromium 52.0	25 2+ 3+ 4+ Mn Manganese 54.9	26 3+ 2+ Fe Iron 55.8	27 2+ 3+ Co Cobalt 58.9	28 2+ 3+ Ni Nickel 58.7	29 2+ 1+ Cu Copper 63.5	30 2+ Zn Zinc 65.4	31 3+ Ga Gallium 69.7	32 4+ Ge Germanium 72.6	33 3− As Arsenic 74.9	34 2− Se Selenium 79.0	35 − Br Bromine 79.9	36 0 Kr Krypton 83.8
5	37 + Rb Rubidium 85.5	38 2+ Sr Strontium 87.6	39 3+ Y Yttrium 88.9	40 4+ Zr Zirconium 91.2	41 3+ 5+ Nb Niobium 92.9	42 2+ 3+ Mo Molybdenum 95.9	43 7+ Tc Technetium (98)	44 3+ 4+ Ru Ruthenium 101.1	45 3+ 4+ Rh Rhodium 102.9	46 2+ 4+ Pd Palladium 106.4	47 1+ Ag Silver 107.9	48 2+ Cd Cadmium 112.4	49 3+ In Indium 114.8	50 4+ 2+ Sn Tin 118.7	51 3+ 5+ Sb Antimony 121.8	52 2− Te Tellurium 127.6	53 − I Iodine 126.9	54 0 Xe Xenon 131.3
6	55 + Cs Cesium 132.9	56 2+ Ba Barium 137.3	57 3+ La Lanthanum 138.9	72 4+ Hf Hafnium 178.5	73 5+ Ta Tantalum 180.9	74 6+ W Tungsten 183.8	75 4+ 7+ Re Rhenium 186.2	76 3+ 4+ Os Osmium 190.2	77 3+ 4+ Ir Iridium 192.2	78 4+ 2+ Pt Platinum 195.1	79 3+ 1+ Au Gold 197.0	80 2+ 1+ Hg Mercury 200.6	81 1+ 3+ Tl Thallium 204.4	82 2+ 4+ Pb Lead 207.2	83 3+ 5+ Bi Bismuth 209.0	84 2+ 4+ Po Polonium (209)	85 − At Astatine (210)	86 0 Rn Radon (222)
7	87 + Fr Francium (223)	88 2+ Ra Radium (226)	89 3+ Ac Actinium (227)	104 Rf Rutherfordium (261)	105 Db Dubnium (262)	106 Sg Seaborgium (263)	107 Bh Bohrium (262)	108 Hs Hassium (265)	109 Mt Meitnerium (266)	110 Ds Darmstadtium (281)	111 Rg Roentgenium (272)	112 Uub* Ununbium (285)	113 Uut* Ununtrium (284)	114 Uuq* Ununquadium (289)	115 Uup* Ununpentium (288)	116 Uuh* Ununhexium (292)		

metal
metalloid
non-metal

Atomic Number → 22 4+ 3+ ← Ion charge(s)
Symbol → Ti
Name → Titanium
Atomic Mass → 47.9

* Temporary names

58 3+ 4+ Ce Cerium 140.1	59 3+ 4+ Pr Praseodymium 140.9	60 3+ Nd Neodymium 144.2	61 3+ Pm Promethium (145)	62 3+ 4+ Sm Samarium 150.4	63 3+ 2+ Eu Europium 152.0	64 3+ Gd Gadolinium 157.3	65 3+ 4+ Tb Terbium 158.9	66 3+ Dy Dysprosium 162.5	67 3+ Ho Holmium 164.9	68 3+ Er Erbium 167.3	69 3+ 2+ Tm Thulium 168.9	70 3+ 2+ Yb Ytterbium 173.0	71 3+ Lu Lutetium 175.0
90 4+ Th Thorium 232.0	91 5+ 4+ Pa Protactinium 231.0	92 6+ 4+ 5+ U Uranium 238.0	93 5+ 3+ 4+ 6+ Np Neptunium (237)	94 4+ 6+ 3+ 5+ Pu Plutonium (244)	95 3+ 4+ 5+ 6+ Am Americium (243)	96 3+ Cm Curium (247)	97 3+ 4+ Bk Berkelium (247)	98 3+ Cf Californium (251)	99 3+ Es Einsteinium (252)	100 3+ Fm Fermium (257)	101 2+ 3+ Md Mendelevium (258)	102 2+ 3+ No Nobelium (259)	103 3+ Lr Lawrencium (262)	

See page 54

Metals, Non-metals, Metalloids

- Period table has interesting patterns
- Due to Mendeleev's organization, interesting patterns are created, such as the groups: metals, non-metals and metalloids.

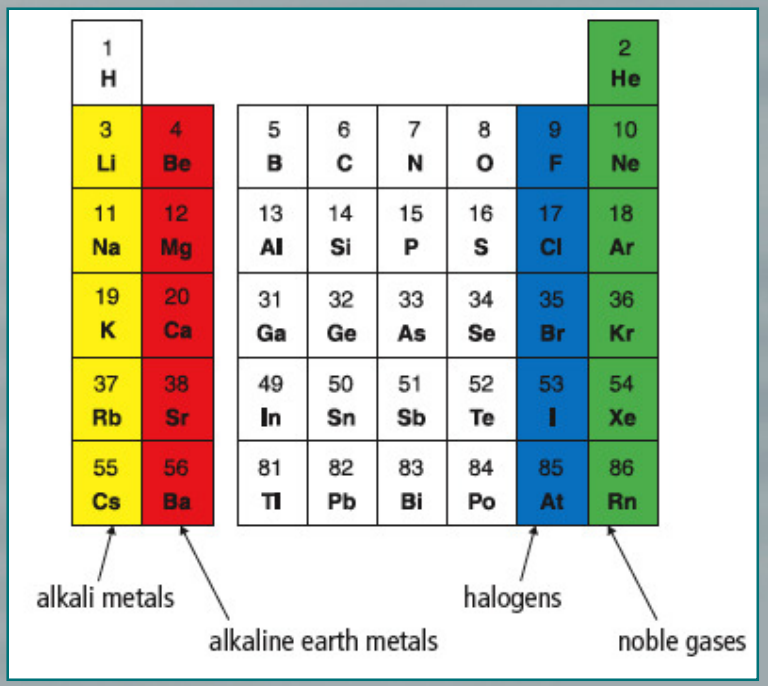
	State at Room Temperature	Appearance	Conductivity	Malleability and Ductility
Metals	• solid except for mercury (a liquid)	• shiny lustre	• good conductors of heat and electricity	• malleable • ductile
Non-metals	• some gases • some solids • only bromine is a liquid	• not very shiny	• poor conductors of heat and electricity	• brittle • not ductile
Metalloids	• solids	• can be shiny or dull	• may conduct electricity • poor conductors of heat	• brittle • not ductile

See page 55

Periods and Families

- Each horizontal row in the periodic table is a **period**
- Vertical columns form groups or **chemical families**

  - **Alkali metals** - highly reactive group 1
  - **Alkaline earth metals** - group 2, burn in air if heated
  - **Halogens** - group 17, highly reactive non-metals
  - **Noble gases** - group 18, stable and unreactive non-metals



Take the Section 2.2 Quiz

See pages 56 - 57