

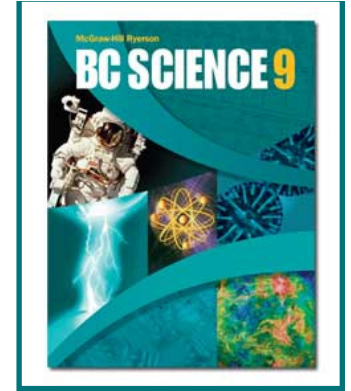
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- **for students to copy in their own hand-writing**
 - **in order to complete their class notes**
 - **if student did not have enough time in class**
 - **if student was away and missed this section**
- **for assistants and tutors to follow progress of the concepts taught**

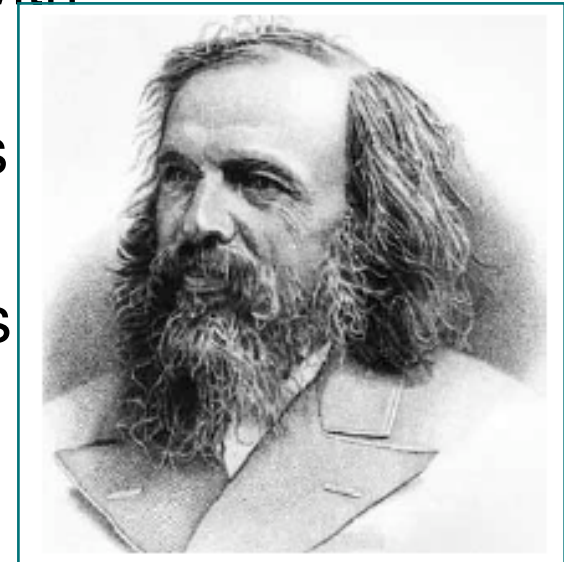
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ndupuis@sd61.bc.ca dupuis.shawbiz.ca

2.2 Periodic Table

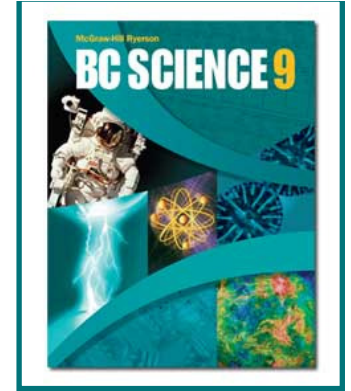


- Origin of the periodic table
 - Chemists in the 10th century wished to organize elements
 - Attempts focused on grouping elements with similar properties
 - In 1867, Dimitri Mendeleev found patterns elements and organized them into table
 - The resulting table had holes for elements not yet discovered



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Periodic Table



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

atomic number	22	4+	ion charge(s)
symbol	Ti	3+	
name	Titanium		
atomic mass	47.9		

Atomic Mass - mass of average atom

Atomic Number - number of protons

Ion Charge - electric charge that forms when an atom gains or loses electrons

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	1											18						
1	H Hydrogen 1,0																	He Helium 4,0
2	Li Lithium 6,9	Be Beryllium 9,0											B Boron 10,8	C Carbon 12,0	N Nitrogen 14,0	O Oxygen 16,0	F Fluorine 19,0	Ne Neon 20,2
3	Na Sodium 23,0	Mg Magnesium 24,3	3	4	5	6	7	8	9	10	11	12	Al Aluminium 27,0	Si Silicon 28,1	P Phosphorus 31,0	S Sulphur 32,1	Cl Chlorine 35,5	Ar Argon 39,9
4	K Potassium 39,1	Ca Calcium 40,1	Sc Scandium 45,0	Ti Titanium 47,9	V Vanadium 50,9	Cr Chromium 52,0	Mn Manganese 54,9	Fe Iron 55,8	Co Cobalt 58,9	Ni Nickel 58,7	Cu Copper 63,5	Zn Zinc 65,4	Ga Gallium 69,7	Ge Germanium 72,6	As Arsenic 74,9	Se Selenium 79,0	Br Bromine 79,9	Kr Krypton 83,8
5	Rb Rubidium 85,5	Sr Strontium 87,6	Y Yttrium 88,9	Zr Zirconium 91,2	Nb Niobium 92,9	Mo Molybdenum 95,9	Tc Technetium (98)	Ru Ruthenium 101,1	Rh Rhodium 102,9	Pd Palladium 106,4	Ag Silver 107,9	Cd Cadmium 112,4	In Indium 114,8	Sn Tin 118,7	Sb Antimony 121,8	Te Tellurium 127,6	I Iodine 126,9	Xe Xenon 131,3
6	Cs Caesium 132,9	Ba Barium 137,3	La Lanthanum 138,9	Hf Hafnium 178,5	Ta Tantalum 180,9	W Tungsten 183,8	Re Rhenium 186,2	Os Osmium 190,2	Ir Iridium 192,2	Pt Platinum 195,1	Au Gold 197,0	Hg Mercury 200,6	Tl Thallium 204,4	Pb Lead 207,2	Bi Bismuth 209,0	Po Polonium (209)	At Astatine (210)	Rn Radon (222)
7	Fr Francium (223)	Ra Radium (226)	Ac Actinium (227)	Rf Rutherfordium (261)	Db Dubnium (262)	Sg Seaborgium (263)	Bh Bohrium (262)	Hs Hassium (265)	Mt Meitnerium (266)	Ds Darmstadtium (281)	Rg Roentgenium (272)	Uub* Ununbium (285)	Uut* Ununtrium (284)	Uuq* Ununquadium (288)	Uup* Ununpentium (288)	Uuh* Ununhexium (292)		

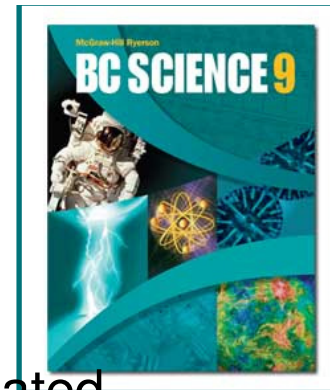
metal
 metalloid
 non-metal

Atomic Number → 22
 Symbol → Ti
 Name → Titanium
 Atomic Mass → 47,9

← Ion charge(s)
 4+
 3+

* Temporary names

Ce Cerium 140,1	Pr Praseodymium 140,9	Nd Neodymium 144,2	Pm Promethium (145)	Sm Samarium 150,4	Eu Europium 152,0	Gd Gadolinium 157,3	Tb Terbium 158,9	Dy Dysprosium 162,5	Ho Holmium 164,9	Er Erbium 167,3	Tm Thulium 168,9	Yb Ytterbium 173,0	Lu Lutetium 175,0
Th Thorium 232,0	Pa Protactinium 231,0	U Uranium 238,0	Np Neptunium (237)	Pu Plutonium (244)	Am Americium (243)	Cm Curium (247)	Bk Berkelium (247)	Cf Californium (251)	Es Einsteinium (252)	Fm Fermium (257)	Md Mendelevium (258)	No Nobelium (259)	Lr Lawrencium (262)



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	<ul style="list-style-type: none"> • solid except for mercury (a liquid) 	<ul style="list-style-type: none"> • shiny lustre 	<ul style="list-style-type: none"> • good conductors of heat and electricity 	<ul style="list-style-type: none"> • malleable • ductile
Non-metals	<ul style="list-style-type: none"> • some gases • some solids • only bromine is a liquid 	<ul style="list-style-type: none"> • not very shiny 	<ul style="list-style-type: none"> • poor conductors of heat and electricity 	<ul style="list-style-type: none"> • brittle • not ductile
Metalloids	<ul style="list-style-type: none"> • solids 	<ul style="list-style-type: none"> • can be shiny or dull 	<ul style="list-style-type: none"> • may conduct electricity • poor conductors of heat 	<ul style="list-style-type: none"> • brittle • not ductile

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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

1 H						2 He	
3 Li	4 Be	5 B	6 C	7 N	8 O	9 F	10 Ne
11 Na	12 Mg	13 Al	14 Si	15 P	16 S	17 Cl	18 Ar
19 K	20 Ca	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr
37 Rb	38 Sr	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe
55 Cs	56 Ba	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn

alkali metals alkaline earth metals halogens noble gases