The Periodic Table

1A 1	1																8A 18
1 H	2A 2											3A 13	4A 14	5A 15	6A 16	7A 17	2 He
3 Li	4 Be							OD				5 B	6 C	7 N	8 0	9 F	10 Ne
11 Na	12 Mg	3B 3	4B 4	5B 5	6B 6	7B 7	8	<u>8B</u> 9	10	1B 11	2B 12	13 Al	14 Si	15 P	16 S	17 Cl	18 Ar
19 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr
37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe
55 Cs	56 Ba	71 Lu	72 Hf	73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	79 Au	80 Hg	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn
87 Fr	88 Ra	103 Lr	104 Rf	105 Db	106 Sg	107 Bh	108 Hs	109 Mt	110	111	112		114		116		0.
	Metal	s	57 La	58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb	
	Metal	loids	89 Ac	90 Th	91 Pa	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No	

Nonmetals

Reading the Periodic Table - The Basic

Families or groups – vertical columns (18)

- have similar properties
- contain the same outer electron configuration
- show similar chemical behavior because it is the outer electrons involved in chemical reactions
- Various ways of labeling and naming Roman numerals + letter (European) Arabic numerals + letter (American) Arabic numerals 1-18 (IUPAC)

Rows in the periodic table are called **periods**. (There are 7)



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GROUPS

 The periodic table shows all of the known elements in order of increasing atomic number.

	A	Alkalin	e															gases
	1 € 1A	earth m	netals													H	aloger	^{1\$} 18 8A
	1 H	2 2A											13 3A	14 4A	15 5A	16 6A	 17 7A	2 He
	3 Li	4 Be											5 B	6 C	7 N	8 O	9 F	10 Ne
netals	11 Na	12 Mg	3	3 4 5 6 7 8 9 10 11 12 Transition metals										14 Si	15 P	16 S	17 Cl	18 Ar
	19 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr
Alkali	37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe
	55 Cs	56 Ba	57 La*	72 Hf	73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	79 Au	80 Hg	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn
	87 Fr	88 Ra	89 Ac†	104 Rf	105 Db	106 Sg	107 Bh	108 Hs	109 Mt	110 Ds	111 Rg	112 Uub	113 Uut	114 Uuq	115 Uup			

*Lanthanides	58	59	60	61	62	63	64	65	66	67	68	69	70	71
	Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
[†] Actinides	90	91	92	93	94	95	96	97	98	99	100	101	102	103
	Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr

- The periodic table is organized to group elements with similar properties in vertical columns.
- Some of the groups in the periodic table are given special names.
- These names indicate the similarities between group members:
 - Group 1: Alkali metals.
 - Group 2: Alkaline earth metals.
 - Group 17: Halogens.
 - Group 18: Noble gases. 1A 8A 13 15 16 17 2 14 Η 2A ЗA 6A 7A 4A 5A etals ases Metals Halogens 3 4 5 6 7 8 9 10 11 12 arth kali laon (T) Transition Φ <u>i</u> Metals⁻ g

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The Periodic Table with the Inner Transition Elements in Place



Patterns of Elements....



- Most elements are metals and occur on the left side.
- The nonmetals appear on the right side.
- Metalloids are elements that have some metallic and some nonmetallic properties.

Comparison of Metals and Nonmetals

Metals

- Found on the left side of the periodic table. (Most elements are metals.)

<u>Metals tend to lose</u> <u>electrons!</u>

Metallic Properties:

- *Luster*: most metals have a silvery white "metallic" color because they reflect light of all wavelengths.
- Ductile, (capable of being drawn out into a wire)
- Malleable (can be hammered into thin sheets)
- Most semisolids @ room T^o
- High electrical conductivity & thermal conductivity

Nonmetals

Found on the right side of the periodic table

<u>Nonmetals tend to gain</u> <u>electrons!</u>

Nonmetallic Properties:

- Poor reflectors of light,
- Hard or brittle, some are gases or soft solids
- Not malleable or ductile
- Do not conduct electricity,
- Poor conductor of heat

Metalloids or Semimetals

- Found along jagged line on table
- <u>Metalloids lose or gain or SHARE electrons</u> depending on "who they're with!"
- Mixture of both types of properties, or intermediate type

Examples: B, Si, Ge, As, Sb, Te, At (the only metal on the solid "semimetal" line is Al.)

Natural States of the Elements

Most elements are very reactive. Elements are not generally found in uncombined form. Exceptions are: Noble metals – gold, platinum and silver Noble gases – Group 8

B. Natural States of the Elements

• Diatomic Molecules





Nitrogen gas contains N_2 molecules.

Oxygen gas contains O_2 molecules.

B. Natural States of the Elements

Diatomic Molecules

Table 3.5

Elements That Exist as Diatomic Molecules in Their Elemental Forms

Element Present	Elemental State at 25 °C	Molecule
hydrogen	colorless gas	H ₂
nitrogen	colorless gas	N ₂
oxygen	pale blue gas	0 ₂
fluorine	pale yellow gas	F ₂
chlorine	pale green gas	Cl ₂
bromine	reddish-brown liquid	Br ₂
iodine	lustrous, dark-purple solid	I_2

B. Natural States of the Elements

• Elemental Solids



Graphite