

Trends in the Periodic Table

- Properties
- Periodic Table Groups
- Metals, Nonmetals, Metalloids
- Shielding
- Periodic Table Trends
- Atomic Radius
- Ionic Radius
- Ionization Energy
- Electronegativity



Group → 1 2 3 4 5 6 7 8 9

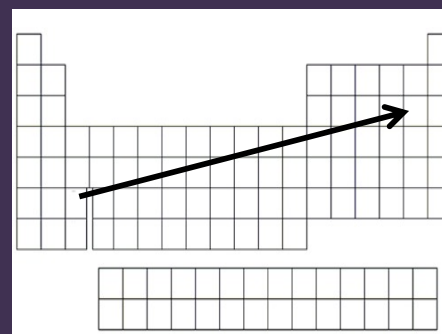
↓ Period

The Periodic Table of the Elements

1 H																	2 He														
3 Li	4 Be																	10 Ne													
11 Na	12 Mg																	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	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	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	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	103 Lr	104 Rf	105 Db	106 Sg	107 Bh	108 Hs	109 Mt	110 Ds	111 Rg	112 Cn	113 Nh	114 Fl	115 Mc	116 Lv	117 Ts	118 Og

Lanthanides: 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, 71 Lu

Actinides: 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, 103 Lr



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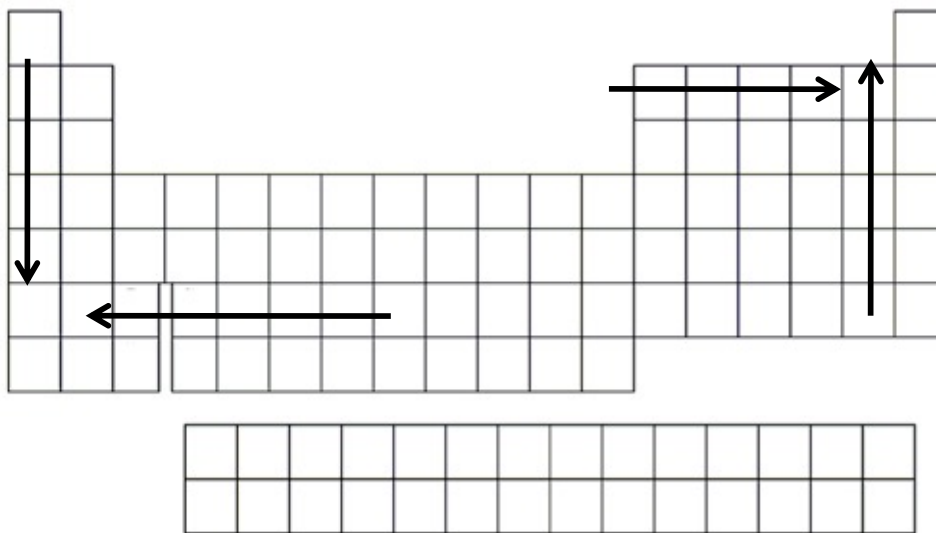
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Properties of Elements

- Elements in the same column (group) have similar properties but not identical properties.

- _____



- Reactivity of metals increases down and to the left
- _____
- Noble gasses are considered unreactive

The Periodic Table

Group→	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
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Lanthanides			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	71 Lu	
Actinides			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	103 Lr	

Alkali Metals – Group 1

- The alkali family is found in the first column of the periodic table
- Atoms of the alkali metals have a single electron in their outermost level
- _____
- They react violently with water and so are never found free in nature

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Transition Metals – Groups 3-12

- These are the metals you are most familiar with: copper, tin, zinc, iron, nickel, gold, and silver
- For many, their number of valence electrons is variable (changes)
- Form colored elements and demonstrate catalytic activity
- _____

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Halogen Family – Group 17

- The elements in this family are fluorine, chlorine, bromine, iodine, and astatine

•

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Noble Gases – Group 18

- Noble Gases are colorless gases that are extremely unreactive
- They are inactive because their outermost energy level is full
- The family of noble gases includes helium, neon, argon, krypton, xenon, and radon

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Helium is lighter than air. This allows balloons filled with it to float.

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Properties of Metals

- _____
- Metals are shiny
- Metals are ductile (can be stretched into thin wires)
- Metals are malleable (can be pounded into thin sheets)
- A chemical



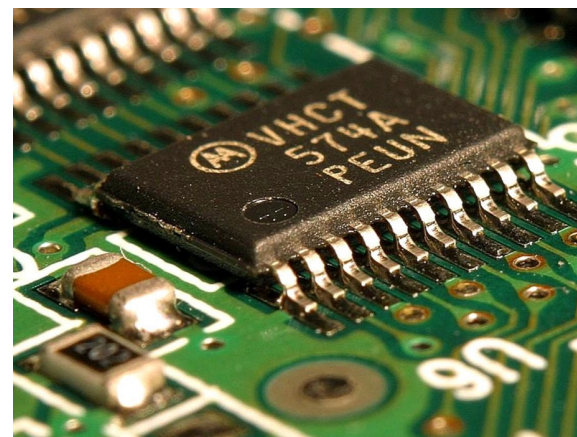
Properties of Nonmetals

- Nonmetals are poor conductors of heat and electricity
- Nonmetals are not ductile or malleable
- Solid nonmetals break easily
- They are dull
- _____

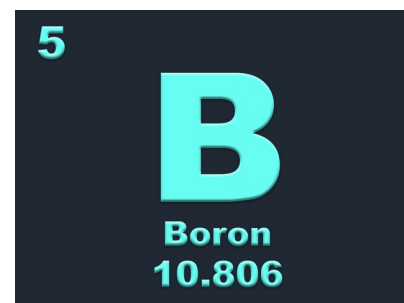


Properties of Metalloids

- Metalloids (metal-like) have properties of both metals and nonmetals
- _____
- They conduct heat and electricity better than nonmetals but not as well as metals
- They are ductile and malleable



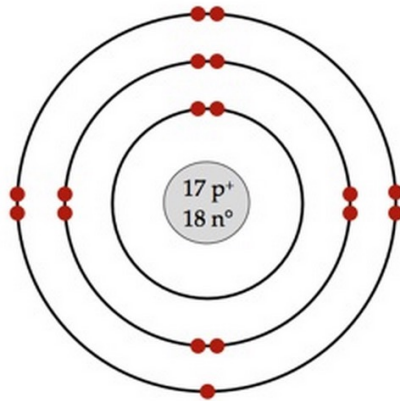
Silicon is used in many computer chips



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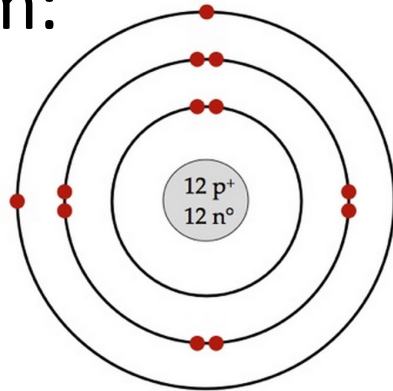
Shielding Examples:

Chlorine:



- Has 7 valence electrons
- Has $2 + 8 = 10$ shielding electrons

Magnesium:



- Has 2 valence electrons
- Has $2 + 8 = 10$ shielding electrons

Which electrons do you think will be held more strongly to the nucleus?

Trends

There are 4 trends in the Periodic Table:

1. Atomic Radius
2. Ionic Radius
3. Ionization Energy
4. _____

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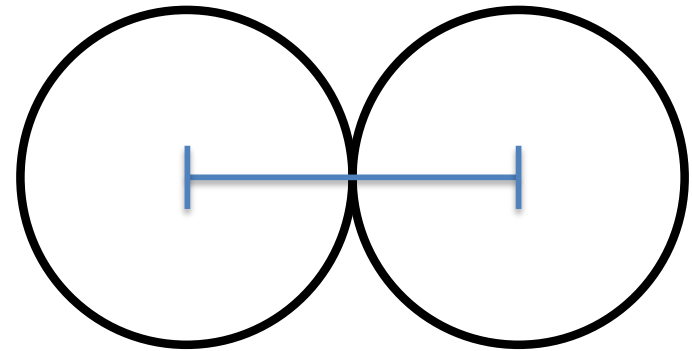
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1. Atomic Radius (AR)

- _____



- Across a Period:
 - AR decreases as the number of protons increases causing increased attraction of electrons towards the nucleus
- Down a Group:
 - AR increases as the number of shells increases

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2. Ionic Radius

An ion is an atom that has gained or lost electrons.

CATIONS (positive ions)

➤ Always have a radius that is smaller than the neutral atom because the outer orbit has decreased by at least one electron, therefore:

1. _____
2. There is less electron - electron repulsion therefore, the outer orbits are not pushed as far away.

ANIONS (negative ions)

➤ Are larger than the neutral state because:

1. The positive charge per # of electrons has decreased.
2. _____

3. Ionization Energy

- Is the amount of _____
- A "gaseous atom" means an atom that is all by itself (not bonded to others in a solid or a liquid state)
- 1st Ionization energy:
 - the amount of energy required to _____
- 2nd Ionization energy:
 - the amount of energy

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Check Your Understanding

Is the 2nd ionization energy going to be greater than, less than, or equal to the 1st ionization energy?

4. Electronegativity

- _____
- Each element is assigned a value between 0 to 4.0
- Fluorine is the most electronegative atom with an electronegativity of 4.0 and has the highest attraction for electrons of an atom on the periodic table
- _____

