# Unit Four: Chapter 5
# The Periodic Table

## Cannizzaro

https://webspace.yale.edu/chem125/125/history99/6Stereochemistry/Cannizzaro/Cannizzaro1858.JPG

- Italian chemist
- Developed and proposed a _____

  for accurately measuring the relative _____ of atoms

  (_____)
- Enabled chemists to agree on _____

  _____.
- Allowed chemists to search for _____among the elements

## Berzelius

http://www.chemheritage.org/Discover/Online-Resources/Chemistry-in-History/Themes/Electrochemistry/asset_upload_file417_61092_thumbnail.jpg

- Swedish chemist
- Developed a table of _____
- Introduced _____

  _____.

# Forerunners to the Periodic Table

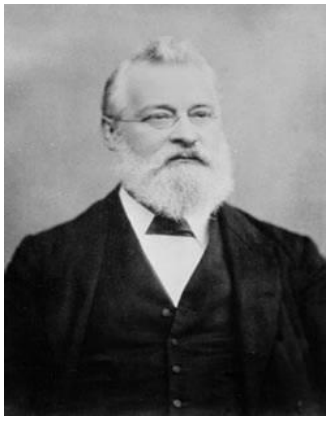
http://www.famouswhy.com/pictures/people/william_prout.jpg

- **Prout**
  - Stated that _____ was the _____ _____ from which all other _____ _____.

- **Dobereiner** – _____
  - Certain groups of _____ when placed in order of increasing _____showed similar _____ and the _____ element had properties _____ between the other _____.
    - <u>Ex</u>. _____

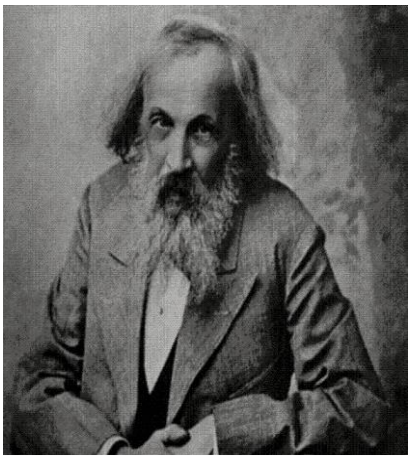
http://www.bpc.edu/mathscience/chemistry/images/johann_dobereiner.jpg

- **Newlands** – _____
  - The _____ elements when placed in order of _____have _____ _____.



http://upload.wikimedia.org/wikipedia/commons/e/e1/John_newlands.JPG

## Dmitri Mendeleev



http://famousscientist.net/wp-content/uploads/2012/05/dmitri-mendeleev.gif

- Russian chemist
- Organized the elements according to _____

  _____
- Noticed that _____

  _____.
- _____ (1869)
  - _____ left in the table for _____
    - He predicted the _____ of these elements
      - _____ were discovered by 1886 and all have properties almost _____ as Mendeleev predicted.

**Tabelle II.**

| Reihen | Gruppe I. — $R^1O$ | Gruppe II. — $RO$ | Gruppe III. — $R^2O^3$ | Gruppe IV. $RH^4$ $RO^2$ | Gruppe V. $RH^3$ $R^2O^5$ | Gruppe VI. $RH^2$ $RO^3$ | Gruppe VII. $RH$ $R^2O^7$ | Gruppe VIII. — $RO^4$ |
|---|---|---|---|---|---|---|---|---|
| 1 | H=1 | | | | | | | |
| 2 | Li=7 | Be=9,4 | B=11 | C=12 | N=14 | O=16 | F=19 | |
| 3 | Na=23 | Mg=24 | Al=27,3 | Si=28 | P=31 | S=32 | Cl=35,5 | |
| 4 | K=39 | Ca=40 | —=44 | Ti=48 | V=51 | Cr=52 | Mn=55 | Fe=56, Co=59, Ni=59, Cu=63. |
| 5 | (Cu=63) | Zn=65 | —=68 | —=72 | As=75 | Se=78 | Br=80 | |
| 6 | Rb=85 | Sr=87 | ?Yt=88 | Zr=90 | Nb=94 | Mo=96 | —=100 | Ru=104, Rh=104, Pd=106, Ag=108. |
| 7 | (Ag=108) | Cd=112 | In=113 | Sn=118 | Sb=122 | Te=125 | J=127 | |
| 8 | Cs=133 | Ba=137 | ?Di=138 | ?Ce=140 | — | — | — | — — — — |
| 9 | (—) | — | — | — | — | — | — | |
| 10 | — | — | ?Er=178 | ?La=180 | Ta=182 | W=184 | — | Os=195, Ir=197, Pt=198, Au=199. |
| 11 | (Au=199) | Hg=200 | Tl=204 | Pb=207 | Bi=208 | — | — | |
| 12 | — | — | — | Th=231 | — | U=240 | — | — — — — |

http://upload.wikimedia.org/wikipedia/en/3/35/Mendeleev's_1871_periodic_table.jpg

## Henry Moseley

http://cdn.timerime.com/cdn-4/upload/resized/77123/846760/resized_image2_7dda54c3ceb4fab3654036a35d8e1d5c.jpg

- British chemist
- The elements in the periodic table _____ better when they were arranged in increasing order according to _____ _____.
    - Led to the modern definition of the _____ and the recognition that _____, is the basis for the _____ of the periodic table.

## Periodic Law

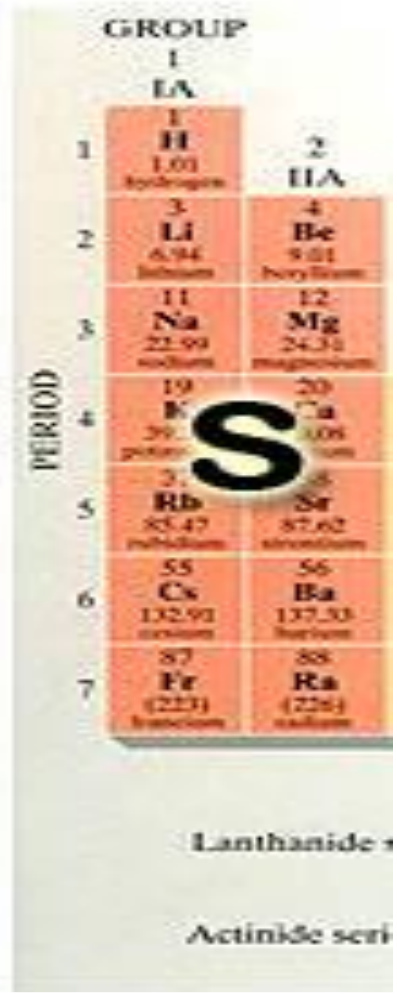
- The _____ of the elements (_____) are a _____ (_____) function of their _____.
    - _____ _____ _____ _____.

## Modern Periodic Table

- **_____:** an arrangement of the elements in order of their _____ so that elements with similar _____ fall in the same _____.
- After Mendeleev:
  - _____
  - _____
  - _____
- **_____:** a horizontal _____ on the periodic table
  - Corresponds to the _____
  - The _____ of each period is determined by the number of _____ that can occupy the _____ being filled in that _____.
- **_____:** vertical _____ on the periodic table
  - Based on the _____ of the elements, the periodic table can be divided into _____ blocks.
    - _____

## s-Block elements

- Groups _____
- _____
- Valance electrons/Group configurations
    - Group _____ = _____ valence electron
        - Ex. Li = _____
        - Group configuration = _____
        - _____
    - Group _____ = _____ valence electrons
        - Ex. Be = _____
        - Group configuration = _____
        - _____




http://2.bp.blogspot.com/-Tir3kv3nkYk/UHXe2tL4LZI/AAAAAAAAAEs/OuiT06VxRNI/s1600/PeriodicTableOrbitals.jpg

## p-Block elements

- Groups _____
- _____the _____elements

  together with the _____elements

- Valence electrons/Group configurations
    - Number of valence electrons = _____
    - Group _____ = _____ valance electrons
        - Ex. B = _____
        - Group configuration = _____
    - Group _____ = _____ valence electrons
        - Ex. C = _____
        - Group configuration = _____
    - Continues with this pattern in Groups _____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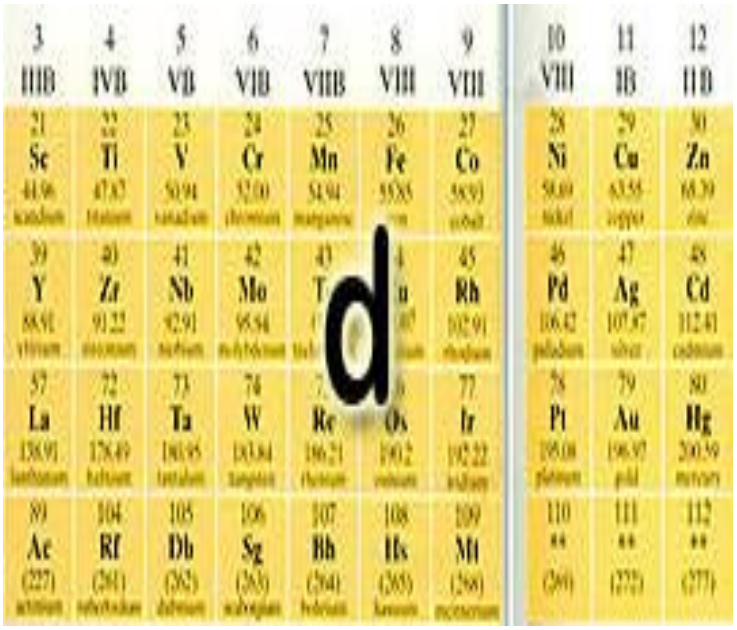
## d-Block elements

- Groups _____
- _____:

  the d-block elements are _____

  with typical _____

  properties

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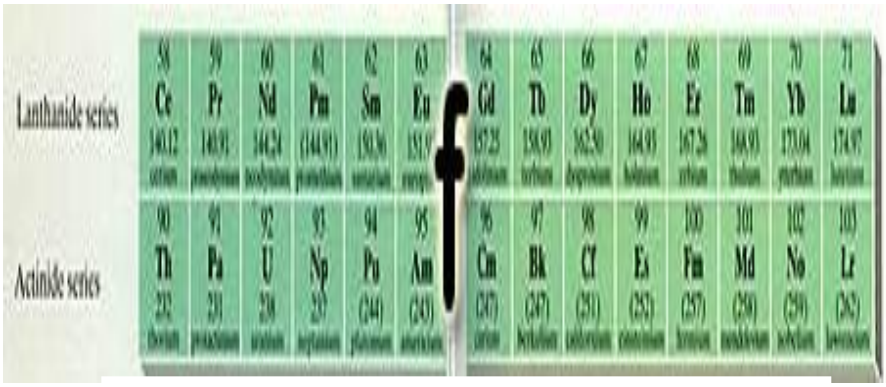
- Group configurations
    - Group _____
        - Ex. Sc = _____
        - Group configuration = _____
    - Group _____
        - Ex. Zn = _____
        - Group configuration = _____
    - Sum of the outer _____ and _____ electrons is equal to the _____ number

## f-Block elements

- Located between Groups _____in the _____ periods
- **_____:**



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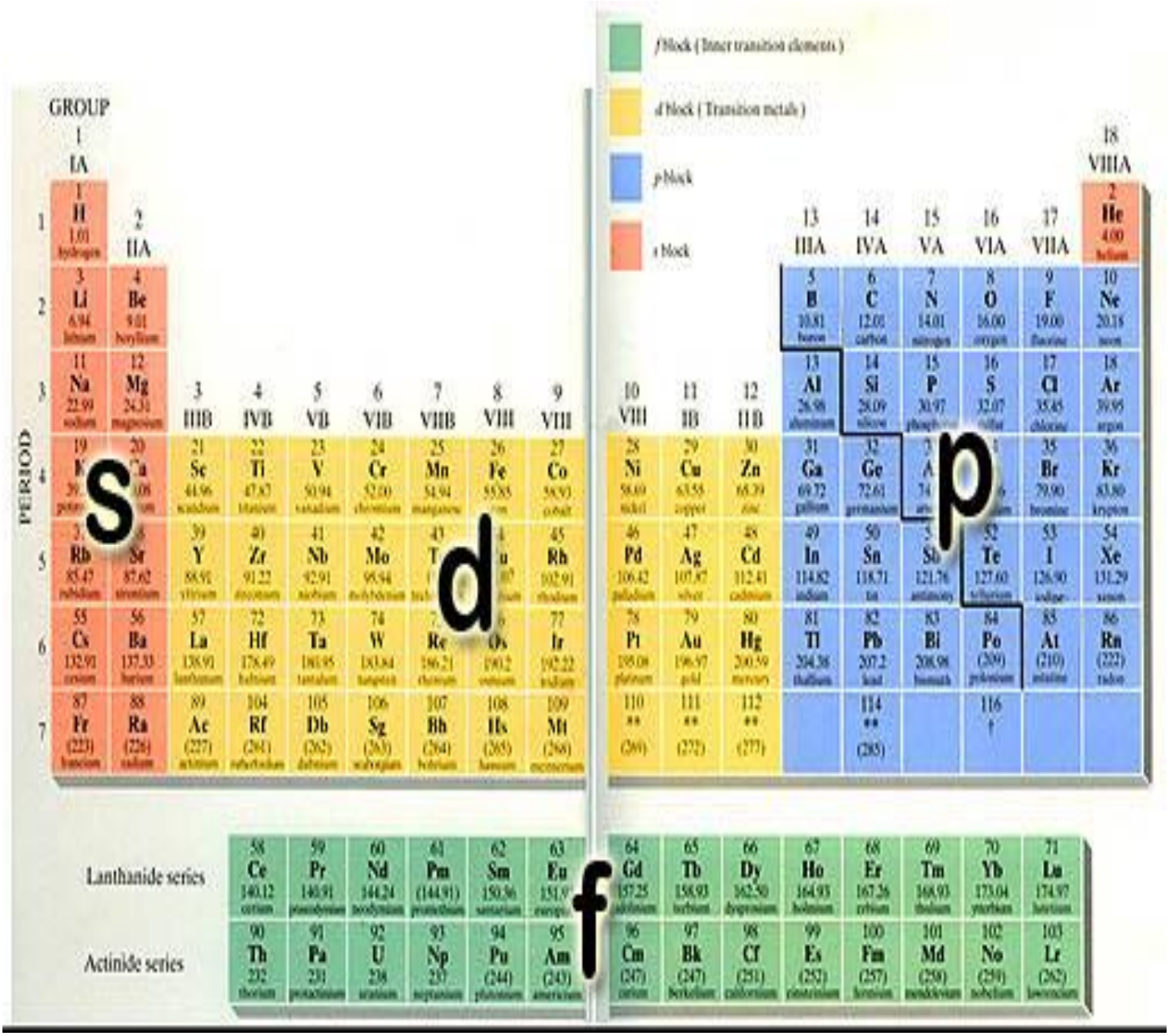
  fill the _____ sublevel
    - _____
    - Similar in reactivity to the _____

- _____: fill the_____ sublevel
    - All 14 of these elements are _____
    - First four have been found _____ on earth
    - Remaining ten are known only as _____

      (or synthetic) elements






http://2.bp.blogspot.com/-Tir3kv3nkYk/UHXe2tL4LZI/AAAAAAAAAEs/OuiT06VxRNI/s1600/PeriodicTableOrbitals.jpg

Identify the group #, period #, block, and element with the following valence electron/group configuration:

| Configuration | Group # | Period # | Block | Element |
|---|---|---|---|---|
| 1. | | | | |
| 2. | | | | |
| 3. | | | | |
| 4. | | | | |
| 5. | | | | |
| 6. | | | | |
| 7. | | | | |
| 8. | | | | |
| 9. | | | | |
| 10. | | | | |
| 11. | | | | |
| 12. | | | | |
| 13. | | | | |
| 14. | | | | |

Write the valence electron/group configuration for the following elements:

| Element | Configuration |
|---|---|
| 1. | |
| 2. | |
| 3. | |
| 4. | |
| 5. | |
| 6. | |
| 7. | |
| 8. | |
| 9. | |
| 10. | |
| 11. | |
| 12. | |
| 13. | |
| 14. | |

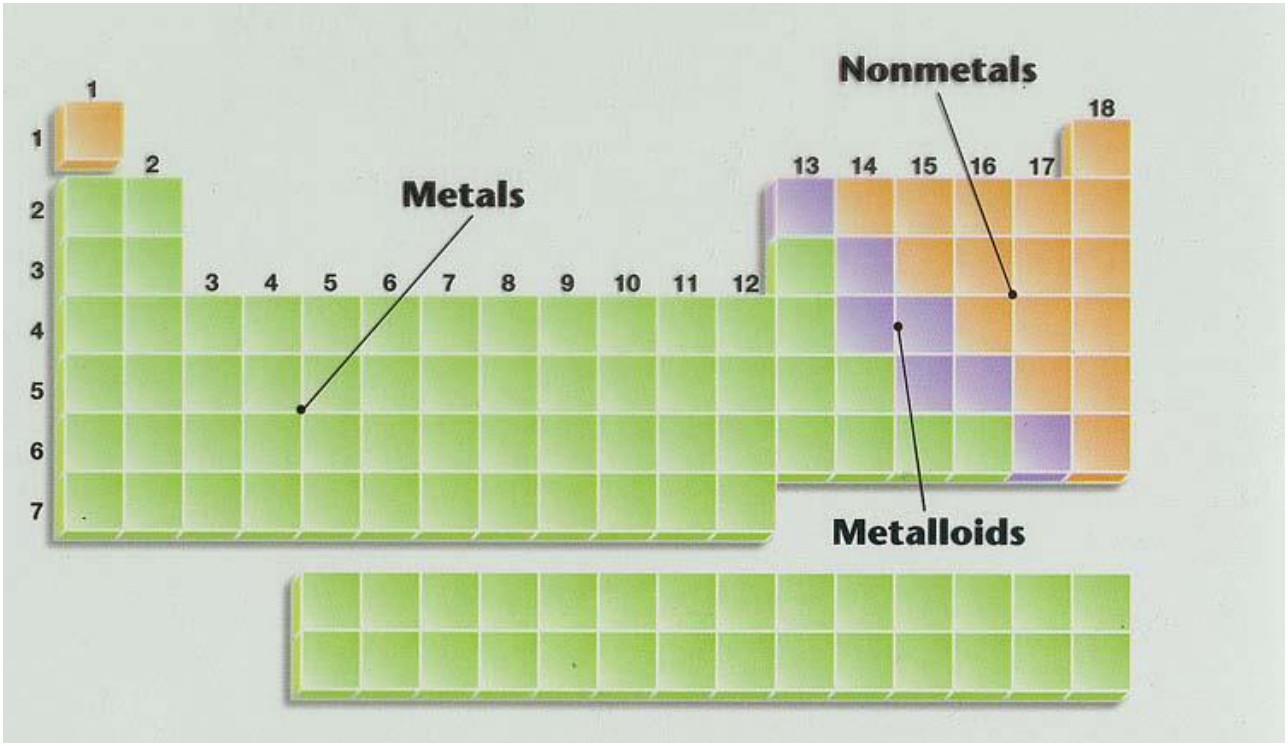
# Periodic Trends

## Elemental Properties and Patterns

### A Different Type of Grouping

- Besides the 4 blocks of the table (_____), there is another way of classifying elements:
  - _____
  - _____
  - _____

### Metals, Nonmetals, Metalloids




http://www1.whsd.net/courses/J0078/Periodic_Table/periodic_table.JPG

- There is a zig-zag line or _____ that divides the table.
- Metals are on the _____ of the line.
- Nonmetals are on the _____ of the line.
- Elements that _____ the staircase are the metalloids or semi-conductors.
- There is one important exception:
  - _____

## Metals

- Metals are _____

  _____

  _____.

http://www.sciencephoto.com/

- They are mostly _____ at room temperature.
- What is one exception?
  - _____

## Nonmetals


- Nonmetals are the _____.
- They are _____

  _____

  _____.
- Some are _____, but many are _____, and _____is a _____.

## Metalloids


- Metalloids have characteristics of _____

  _____.
- They are _____.
- They are _____.

## Periodic Trends

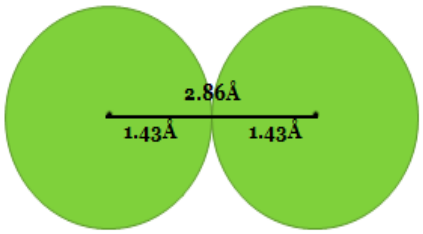
- Periodic trends are used to _____

  _____.

- Elements do not have their _____ because of their _____ on the periodic table, but rather both the _____ and the _____ arise from the_____ of the atom.

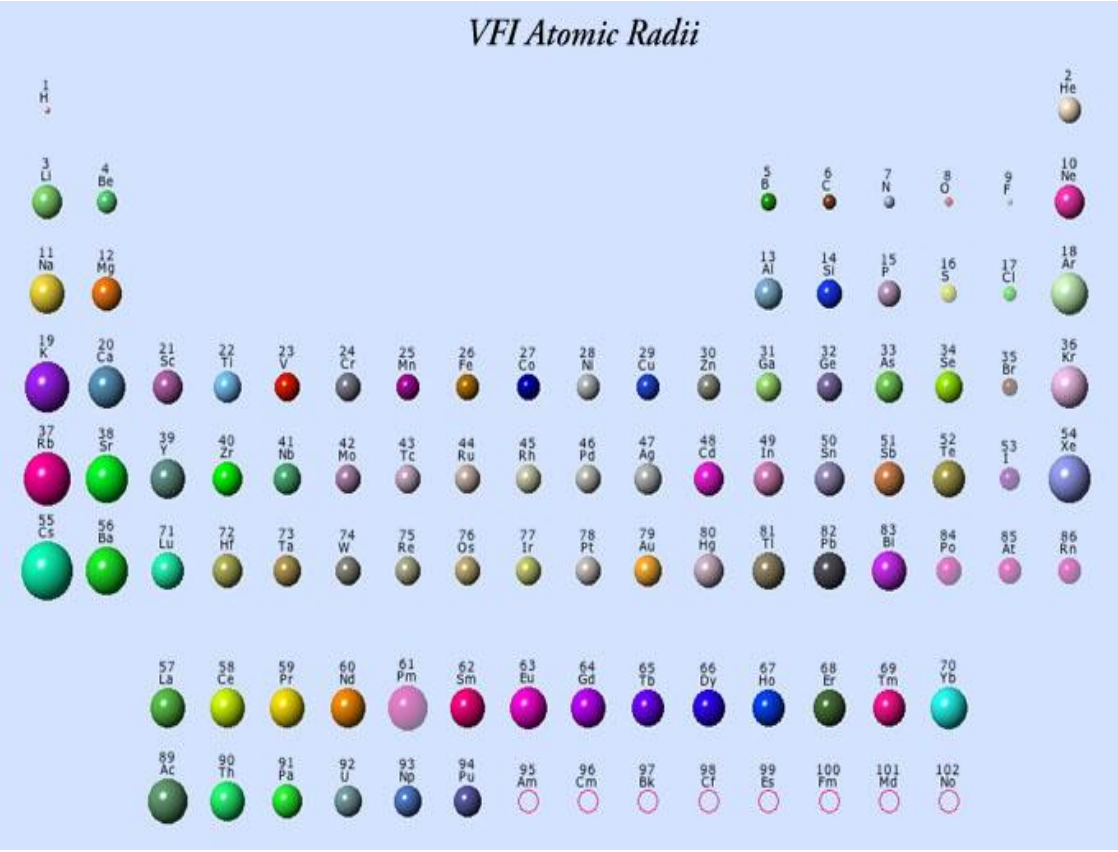
## Atomic Radius

- Radius is the _____ _____.
- Since a cloud's edge is _____ to define (and is just a _____ location), scientists use _____ radius, or _____ between the _____ of two _____ _____.
- Atomic radii are usually measured in _____ or _____. An _____ is _____ m.
- Two Br atoms bonded together are _____ angstroms apart. So, the atomic radius of each atom is _____Å.



- **Group trend:**
    - Group 1:
        - H: _____
        - Li: _____
        - Na: _____
        - K: _____
    - The atomic radius **_____** going down a vertical column (group).
        - With each step _____ a group, a new _____ _____ to the _____ in order to hold the _____, making the atoms _____.
- **Period trend:**
    - Period 2:
        - Li: _____
        - Be: _____
        - B: _____
        - C: _____

- The size of an atom generally _____ as you go across a period.
  - The effect is that the _____has a _____ on the _____.
  - The nucleus is more _____ and the electron cloud is more _____.
  - The _____, making atoms _____ as we move from left to right across a period.
    - MORE _____, MORE _____!




http://www.crystalmaker.com/support/tutorials/crystalmaker/atomic-radii/resources/VFI_Atomic_Radii_sm.jpg

## Review!

- **WHY** do atoms get **LARGER** as you move **DOWN** within the same group on the periodic table?
    - _____

      _____

      _____

      _____

- **WHY** do atoms get **SMALLER** as you move **RIGHT** within the same period on the periodic table?
    - _____

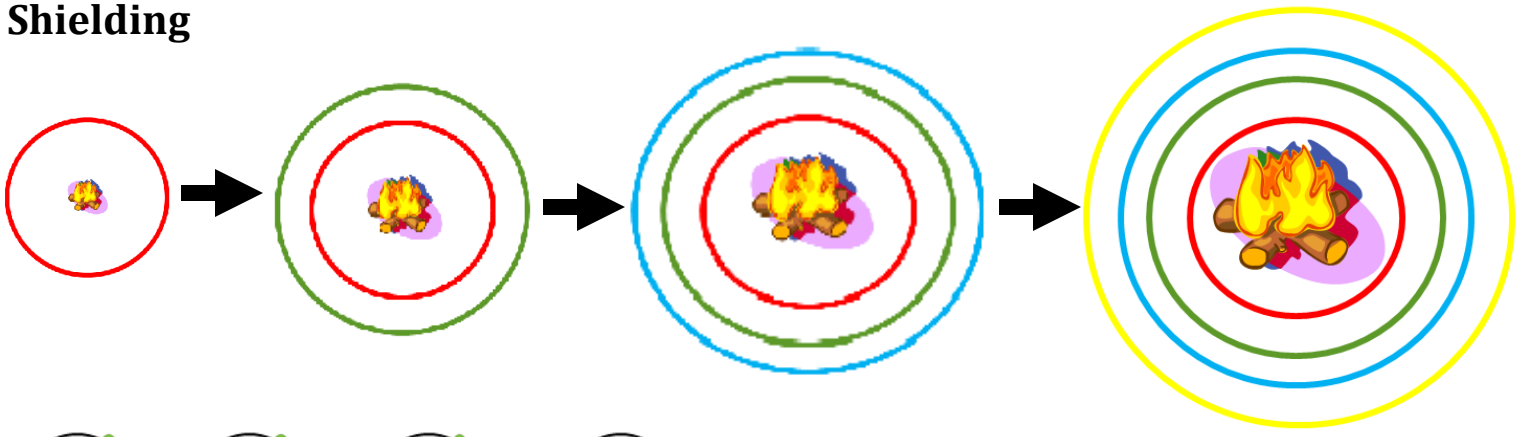
      _____

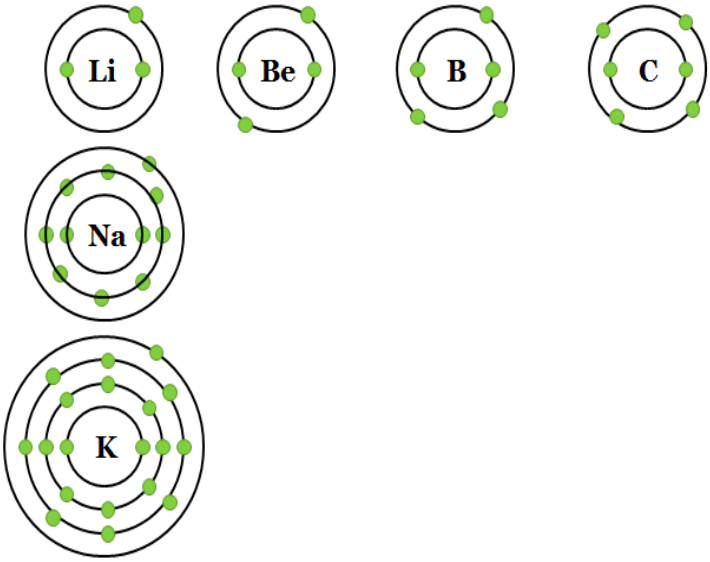
      _____

      _____

- Arrange each group from smallest to largest:
    - Mg, S, Si -- _____
    - As, N, P -- _____
    - As, Sb, Se -- _____

## Shielding






- What is happening to the shielding as you go across the period?

- What is happening to the shielding as you go down a group?

- **Group trend:**
  - The shielding effect _____ as you go down a group.
    - As more _____ are added to atoms, the _____ layers of electrons _____ the _____ electrons from the _____.
  - The _____ (enc) on those _____ electrons is _____, and so the outer electrons are _____.

- **Period Trend:**
  - The shielding effect _____ as you go across a period.
    - There _____ more energy levels being added to atoms within the _____ period.
    - The number of electrons in the _____ shielding those on the _____ does not change; therefore, _____ _____.

## Ionization Energy

- _____ from an atom requires _____ (in the form of a _____).
  - _____
- The atom has been "_____" or _____.
- The number of _____ and _____ is no longer _____.
- For example:
  - _____
  - _____

- _____can be defined as _____

  _____.

- _____, therefore, is the _____ required to _____ one electron from a _____ of an element.
  - Measured in _____
- Ionization energy is always _____, that is, energy is _____ to the _____ to remove the _____.
- **Group trend:**
  - The ionization energy _____ as you move down a group.
    - Electrons removed in _____ are _____ from the nucleus.
    - Therefore, there are _____ electrons between the inner and outer electrons _____ them from the _____ pull.
  - In general, the _____ the atom, the _____ electrons are to remove.

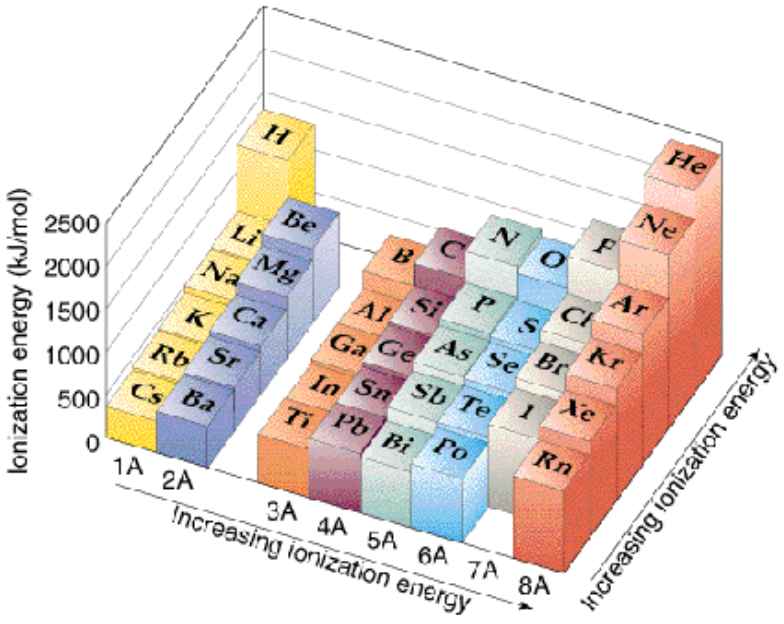
- **Period trend:**
  - The ionization energy _____ as you move across a period.
    - There is _____ in _____, therefore there is _____ in shielding.
    - As we know, the _____ across a period (MORE _____, MORE _____). The electrons are being _____ to the _____ and as a result are more _____ to remove.

- Factors affecting the Ionization Energy:
  - **1. _____**
    - The _____ the nuclear charge, the _____ the IE.
  - **2. _____**
    - The _____ the shielding effect, the _____ the IE.
  - **3. _____**
    - The _____ the distance between the nucleus and the outer electrons of an atom, the _____ the IE.

- **4. _____**

  - An electron from a sublevel that is _____

    requires additional _____ to be removed.



http://www.800mainstreet.com/4/0004-000-

## Electron Affinity

- Most atoms _____ when they _____ electrons.

  - _____

- The number of _____ and _____ is no _____.

- For example:

  - _____

  - _____

- _____ is the energy change that occurs when an _____ is _____ by a _____.
    - Measured in _____.
- Electron affinity is usually _____, that is, energy is _____ from the atom to _____ an electron; but _____.
    - It is _____ if there is an _____ or _____ _____ for an _____ to occupy.
    - If there are _____, a _____ or _____ must be _____, making its process _____.
        - This is true for the _____ _____.
- **Group trend:**
    - The trend for electron affinity down a group is _____ as that of _____.
    - As a general rule, the electron affinity _____ as you move down a group.
- **Period trend:**
    - The electron affinity _____ as you move across a period.

## Review!

- In your own words, explain the **shielding effect** including the trends.
    - _____
      _____
      _____
      _____
- **WHY** does the Ionization Energy **decrease** as you go **down** a group?
    - _____
      _____
      _____
- **WHY** does the Ionization Energy **increase** as you go **across** a period?
    - _____
      _____
      _____
- How do the trends (both group and period) for Ionization Energy **compare** to that of atomic radius?
    - _____
      _____

## Metallic Character

- A relative measure of how easily atoms _____ up electrons.
    - The "_____" it is to remove an electron, the more "_____" an atom is.
- _____ atoms have the _____ metallic character
    - Electrons are further from the nucleus and are therefore _____ _____.
- **Group trend**
    - The metallic character of an atom _____ as you go from top to bottom down a group on the periodic table.
- **Period trend**
    - The metallic character of an atom _____ as you go from left to right across a period on the periodic table.

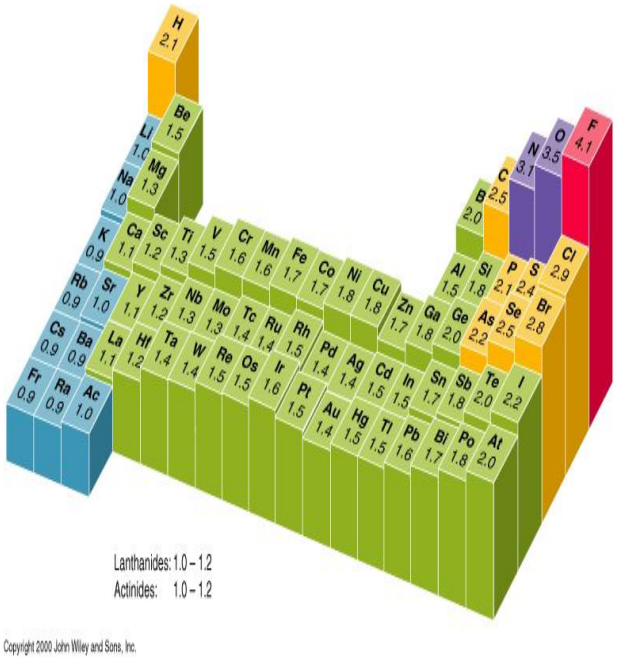
## Electronegativity

- A measure of the _____

  _____

  _____

  _____.




- Linus Pauling, an American chemist,

  developed an arbitrary scale that ranges

  _____.

  - The units of electronegativity are _____.
  - _____, the most electronegative element has a value of _____.

- **Group trend**

  - Going from top to bottom down a group, the electronegativity _____

    _____.

    - The _____, however there is another

      energy level added which means the _____

      and the electrons are _____.

        - It is therefore _____ to attract an electron and the electronegativity value is _____.

- **Period trend**
    - Going from left to right across a period, the electronegativity _____.
        - There is _____ because the number of inner electrons remains the same.
        - The _____ which means there is a _____ from the nucleus.
        - Because the electrons are closer to the nucleus, it is _____ for an electron to be pulled in.
- _____ are electron _____ and have _____ electronegativity values.
- _____ are electron _____ and have _____ electronegativity values.

- What about the _____?
    - Some noble gases are _____ to form compounds and therefore have _____.
    - When they _____ form compounds, their electronegativity values are _____.

## Review!

- How is electronegativity different from electron affinity?
    - _____
      _____
      _____
      _____
- **WHY** does the electronegativity **decrease** as you go **down** a group?
    - _____
      _____
      _____
      _____

- **WHY** does the electronegativity **increase** as you go **across** a period?
    - _____

      _____

      _____

      _____

## Overall Reactivity

- Combines all of the previous trends
- But, metals and nonmetals must be considered _____…
- The _____ are the _____ since they are the best electron _____.
- The _____ are the _____ ones, the best electron _____.

## The Octet Rule

- The "_____" of most atoms (except _____) is to have an _____ or group of _____ electrons in their _____.

- To do this, they either _____ electrons.
- _____ generally _____ electrons, _____ them from other atoms.
- Atoms that have _____ electrons are called _____.

## Ions

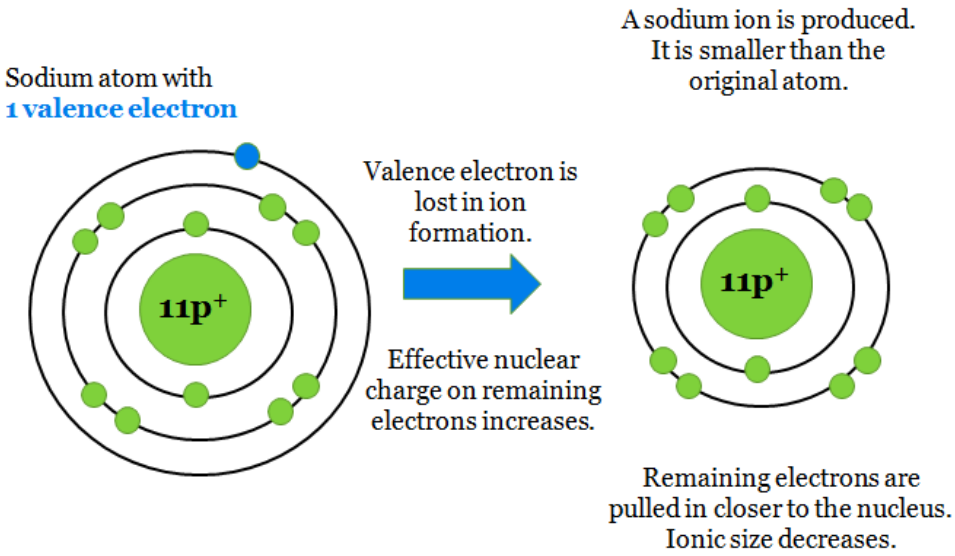
- When an atom _____ an electron, it becomes _____ charged (_____).
    - It has more _____ than electrons.
    - It is called a _____.
- When an atom _____ an electron, it becomes _____ charged (_____).
    - It has more _____ than protons.
    - It is called an _____.

## Ionic Radius

- **Cation trends**
    - Cations are always _____ than the neutral atom from which they were formed.

- Removal of the highest-energy level electrons results in a _____ electron cloud.
- Furthermore, the _____ during ionization.

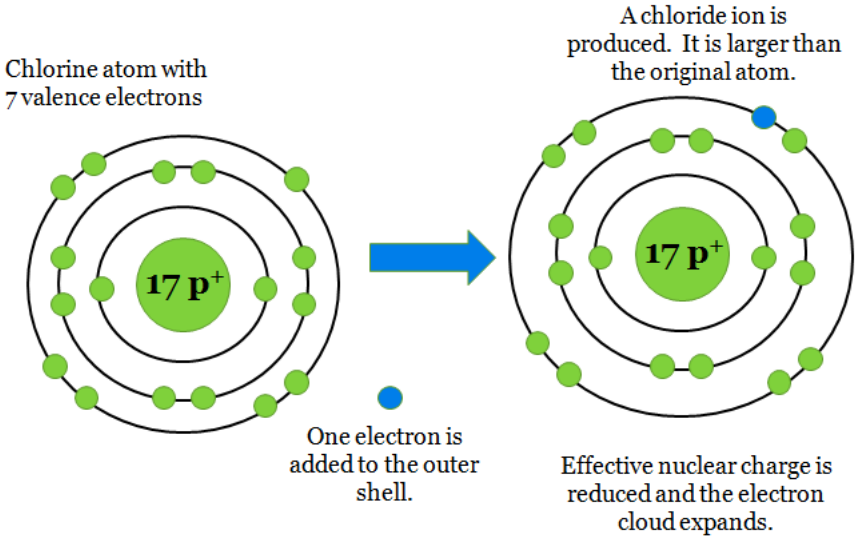
- **Cation formation**




- **Anion trends**
  - Anions are always _____ than the neutral atom from which they were formed.
    - Electrons are _____ to the outer energy level.

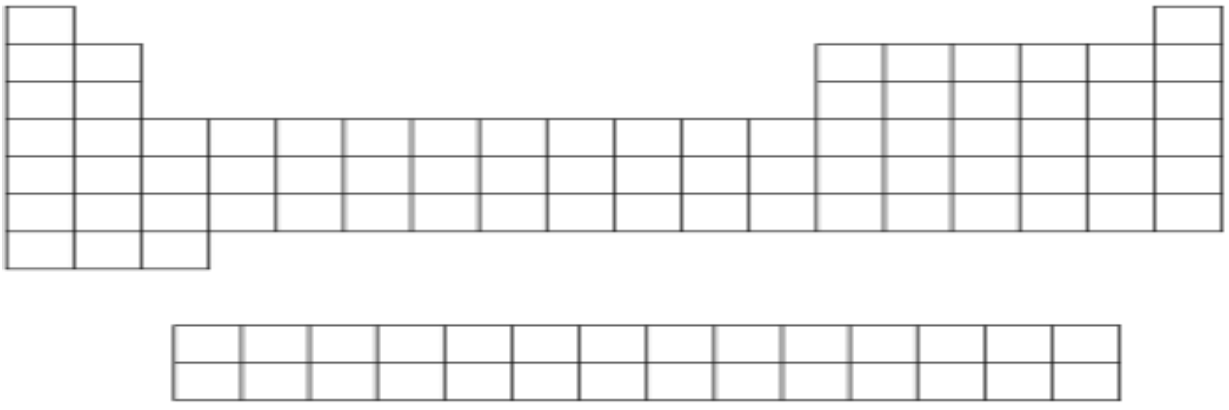
- The _____ of the nucleus remains _____, so the electrons are _____ to the nucleus as they were before.
- The electron cloud also spreads out because of _____ between increased number of electrons.

- **Anion formation**

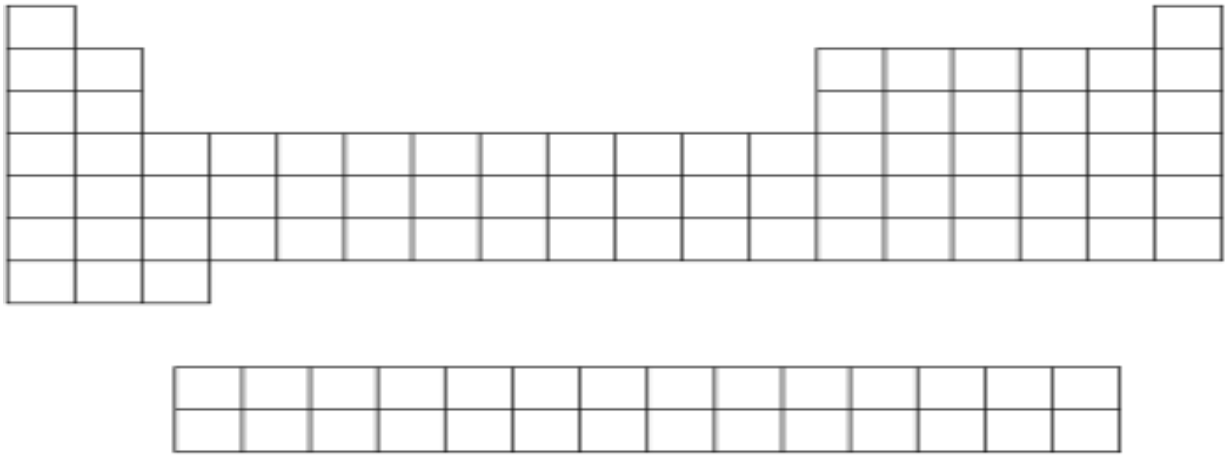



# Periodic Trends Review

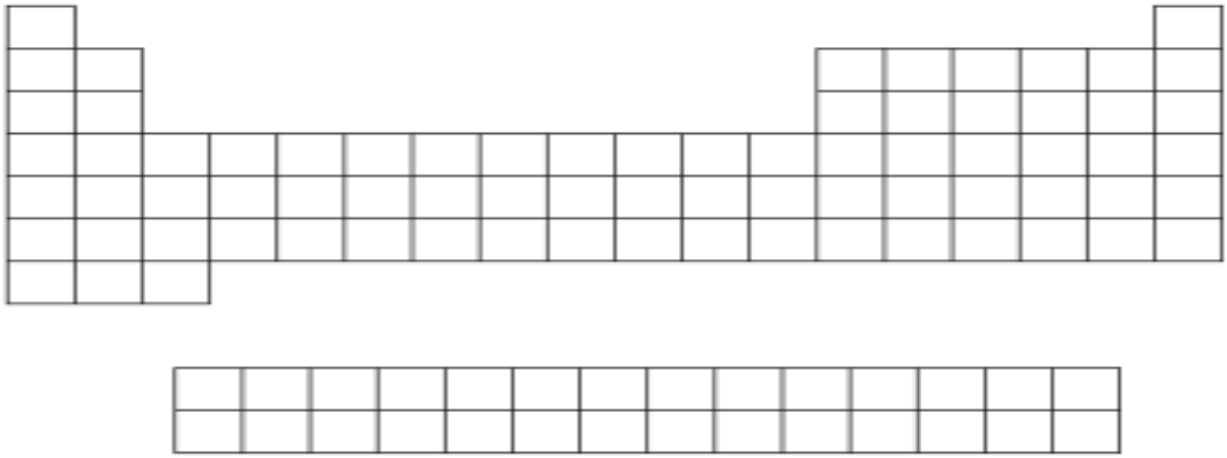
**Atomic Radius:** Across a period: _____ Down a group: _____



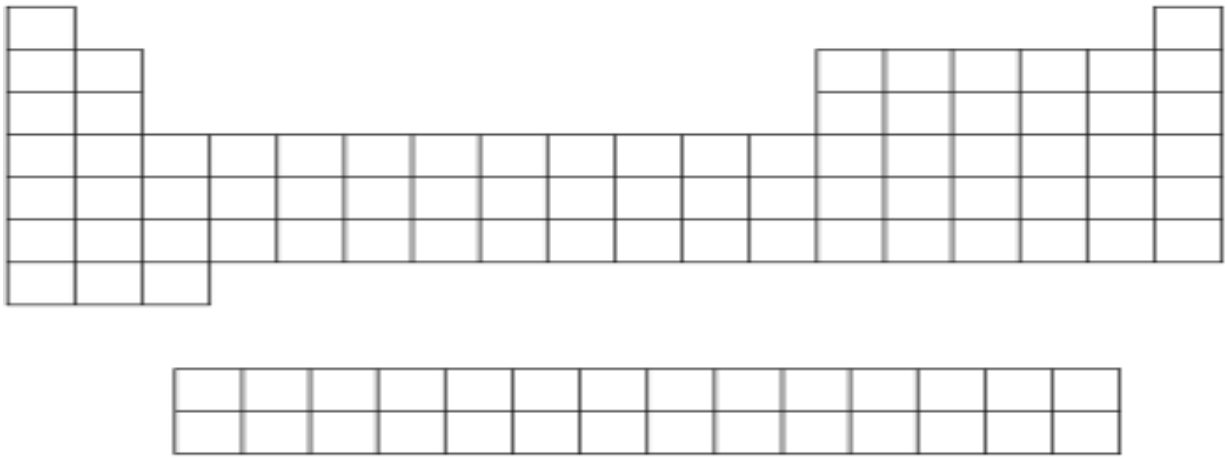
**Shielding Effect:** Across a period: _____ Down a group: _____



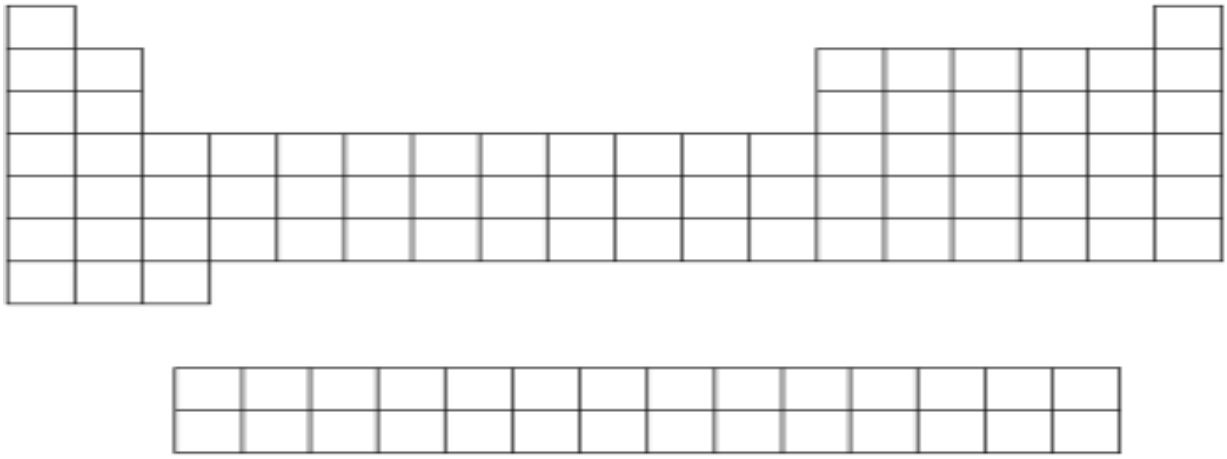
**Ionization Energy:** Across a period: _____ Down a group: _____



**Electron Affinity:** Across a period: _____ Down a group: _____

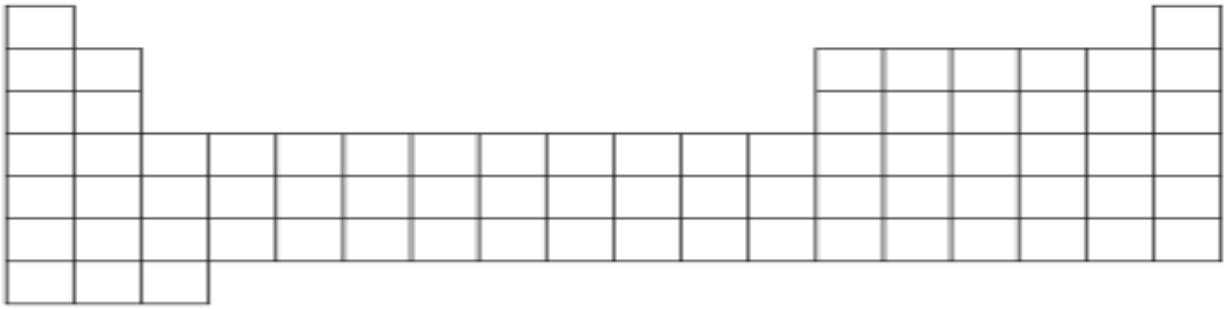


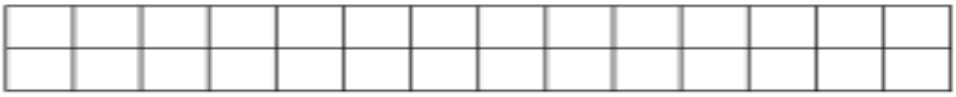
**Metallic Character:** Across a period: _____ Down a group: _____



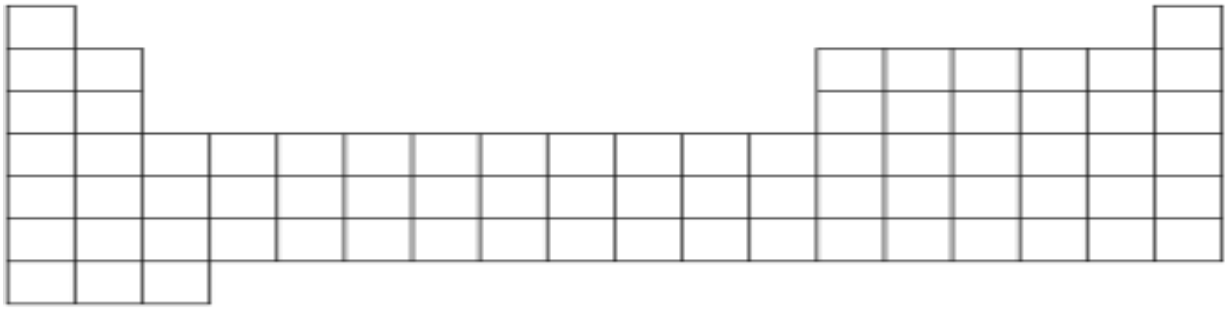


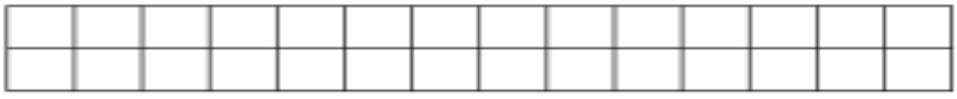
**Electronegativity:** Across a period: _____ Down a group: _____





**Overall Reactivity:** Depends on _____





# Summary of Periodic Trends

## The Periodic Table of the Elements

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 H Hydrogen 1.00794 | | | | | | | | | | | | | | | | | 2 He Helium 4.003 |
| 3 Li Lithium 6.941 | 4 Be Beryllium 9.012182 | | | | | | | | | | | 5 B Boron 10.811 | 6 C Carbon 12.0107 | 7 N Nitrogen 14.00674 | 8 O Oxygen 15.9994 | 9 F Fluorine 18.9984032 | 10 Ne Neon 20.1797 |
| 11 Na Sodium 22.989770 | 12 Mg Magnesium 24.3050 | | | | | | | | | | | 13 Al Aluminum 26.981538 | 14 Si Silicon 28.0855 | 15 P Phosphorus 30.973761 | 16 S Sulfur 32.066 | 17 Cl Chlorine 35.4527 | 18 Ar Argon 39.948 |
| 19 K Potassium 39.0983 | 20 Ca Calcium 40.078 | 21 Sc Scandium 44.955910 | 22 Ti Titanium 47.867 | 23 V Vanadium 50.9415 | 24 Cr Chromium 51.9961 | 25 Mn Manganese 54.938049 | 26 Fe Iron 55.845 | 27 Co Cobalt 58.933200 | 28 Ni Nickel 58.6934 | 29 Cu Copper 63.546 | 30 Zn Zinc 65.39 | 31 Ga Gallium 69.723 | 32 Ge Germanium 72.61 | 33 As Arsenic 74.92160 | 34 Se Selenium 78.96 | 35 Br Bromine 79.904 | 36 Kr Krypton 83.80 |
| 37 Rb Rubidium 85.4678 | 38 Sr Strontium 87.62 | 39 Y Yttrium 88.90585 | 40 Zr Zirconium 91.224 | 41 Nb Niobium 92.90638 | 42 Mo Molybdenum 95.94 | 43 Tc Technetium (98) | 44 Ru Ruthenium 101.07 | 45 Rh Rhodium 102.90550 | 46 Pd Palladium 106.42 | 47 Ag Silver 107.8682 | 48 Cd Cadmium 112.411 | 49 In Indium 114.818 | 50 Sn Tin 118.710 | 51 Sb Antimony 121.760 | 52 Te Tellurium 127.60 | 53 I Iodine 126.90447 | 54 Xe Xenon 131.29 |
| 55 Cs Cesium 132.90545 | 56 Ba Barium 137.327 | 57 La Lanthanum 138.9055 | 72 Hf Hafnium 178.49 | 73 Ta Tantalum 180.9479 | 74 W Tungsten 183.84 | 75 Re Rhenium 186.207 | 76 Os Osmium 190.23 | 77 Ir Iridium 192.217 | 78 Pt Platinum 195.078 | 79 Au Gold 196.96655 | 80 Hg Mercury 200.59 | 81 Tl Thallium 204.3833 | 82 Pb Lead 207.2 | 83 Bi Bismuth 208.98038 | 84 Po Polonium (209) | 85 At Astatine (210) | 86 Rn Radon (222) |
| 87 Fr Francium (223) | 88 Ra Radium (226) | 89 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 (269) | 111 (272) | 112 (277) | 113 | 114 | | | | |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 58 Ce Cerium 140.116 | 59 Pr Praseodymium 140.90765 | 60 Nd Neodymium 144.24 | 61 Pm Promethium (145) | 62 Sm Samarium 150.36 | 63 Eu Europium 151.964 | 64 Gd Gadolinium 157.25 | 65 Tb Terbium 158.92534 | 66 Dy Dysprosium 162.50 | 67 Ho Holmium 164.93032 | 68 Er Erbium 167.26 | 69 Tm Thulium 168.93421 | 70 Yb Ytterbium 173.04 | 71 Lu Lutetium 174.967 |
| 90 Th Thorium 232.0381 | 91 Pa Protactinium 231.03588 | 92 U Uranium 238.0289 | 93 Np Neptunium (237) | 94 Pu Plutonium (244) | 95 Am Americium (243) | 96 Cm Curium (247) | 97 Bk Berkelium (247) | 98 Cf Californium (251) | 99 Es Einsteinium (252) | 100 Fm Fermium (257) | 101 Md Mendelevium (258) | 102 No Nobelium (259) | 103 Lr Lawrencium (262) |

**Electronegativity decreases**
**Shielding effect increases**
**Ionization energy decreases**
**Electron affinity decreases**
**Atomic radius increases**
**Metallic character increases**

**Electronegativity increases**
**Shielding effect is constant**
**Ionization energy increases**
**Electron affinity increases**
**Atomic radius decreases**
**Metallic character decreases**

# Periodic Trends Review

Using a periodic table to decide, answer each of the following.

1. Which of the following has the **largest** 1st ionization energy?

    a. Strontium, silver, tin, or iodine _____

    b. Bismuth, arsenic, or nitrogen _____

2. Which of the following has the **largest** electron affinity?

    a. Lead, tin, carbon, or silicon _____

    b. Cesium, tungsten, or bismuth _____

3. Which of the following has the **lowest** electronegativity?

    a. Beryllium, barium, calcium, or magnesium _____

    b. Sulfur, magnesium, or silicon _____

4. Which of the following has the **largest** atomic radius?

    a. Fluorine, oxygen, lithium, or beryllium _____

    b. Aluminum, gallium, or boron _____

5. Which of the following has the **lowest** 1st ionization energy?

    a. Magnesium or sodium _____

    b. Bromine or chlorine _____

6. Which of the following has the **lowest** ionic radius?

    a. Sulfur or chlorine _____

    b. Potassium or rubidium _____

    c. Nitrogen or phosphorus _____

7. Which of the following has the **highest** shielding effect?

    a. Xenon, neon, or argon _____

    b. Silicon, sulfur, phosphorus, or aluminum _____

8. Which of the following has the **lowest** atomic radii?

    a. Neon, radon, or argon _____

    b. Chlorine, sodium, or silicon _____

9. Which of the following has the **lowest** electron affinity?

a. Rubidium or sodium _____

b. Sulfur or oxygen _____

10. Circle the **more reactive** of the pair.

a. K, Ga b. Ne, Br c. Mg, Ba d. F, Br

e. S, Ar f. N, F

11. Circle the **larger** atom.

a. K, Ga b. Rb, Si c. Mg, Ba d. P, Ra

12. Circle the **larger** of the pair.

a. Li, $Li^{+}$ b. B, $B^{+3}$ c. F, $F^{-}$ d. P, $P^{-3}$

13. Circle the **more** electronegative element of the pair.

a. K, Se b. N, As c. F, Ne d. Se, Ne

14. Circle the element with the **greater** ionization energy.

    a. Rb, I  b. N, Sb  c. N, O

15. Circle the element with a **more negative** electron affinity.

    a. C, F  b. C, Ne

16. What is the trend in atomic radius moving down a group? Explain why this is so.

17. What is the trend in atomic radius moving left in a period? Explain why this is so.

18. Are anions larger or smaller than their respective atoms? Explain why this is so.

19. Are cations larger or smaller than their respective atoms? Explain why this is so.

20. What are the four factors affecting the Ionization Energy?

Identify the group #, period #, block, and element with the following valence electron/group configuration:

| Configuration | Group # | Period # | Block | Element |
|---|---|---|---|---|
| 1. | | | | |
| 2. | | | | |
| 3. | | | | |
| 4. | | | | |
| 5. | | | | |
| 6. | | | | |
| 7. | | | | |
| 8. | | | | |
| 9. | | | | |
| 10. | | | | |

Write the valence electron/group configuration for the following elements:

| Element | Configuration |
|---|---|
| 1. | |
| 2. | |
| 3. | |
| 4. | |
| 5. | |
| 6. | |
| 7. | |
| 8. | |
| 9. | |
| 10. | |

**Exam Date: _____**

- **The Periodic Law (Chapter 5)**
  - ✓ Periodic table (Canizzaro/Berzelius/Prout/Dobereiner/Newlands/Mendeleev/Moseley)
  - ✓ Periodic law / groups / periods / blocks
  - ✓ Valence electron / group configuration
  - ✓ Metals / Nonmetals / Metalloids
  - ✓ Periodicity for atomic radius / ionic radius / ionization energy / electron affinity / electronegativity / shielding effect / metallic character / overall reactivity