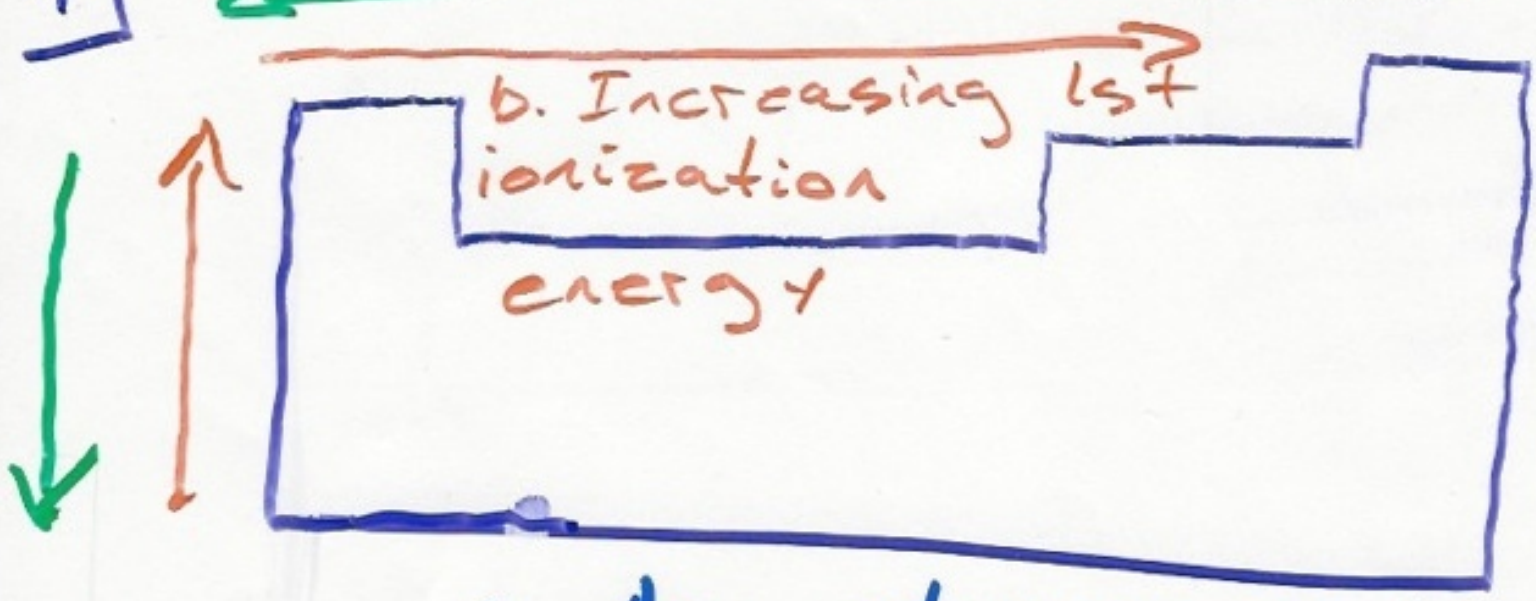
4

a. smallest to largest atomic radius



c. As atomic radius increases, 1st ionization energy decreases.

5 $Cl + 1e^- \longrightarrow Cl^-$

$-\Delta H$: Electron Affinity

$Na \longrightarrow Na^+ + 1e^-$

$+\Delta H$: Ionization Energy

11 a. Effective nuclear charge (Z_{eff}) represents of hard an atom pulls on its valence electrons.

b. Effective nuclear charge increases going across a period.
- more protons pulling
- no change in core electrons

15

$_{18}Ar$ $[Ne]\,3s^2 3p^6$

18 electrons held by 18 protons

$_{36}Kr$ $[[Ne]\,3s^2 3p^6]\,3d^{10}4s^2 4p^6$

The 18 core electrons are held by 36 protons

23

a.  left to right atom size decreases

b.  Top to bottom atom size increases

c. O Si Ge I

Increasing

25

a. Cs K Li c. F O N

b. Pb Sn Si

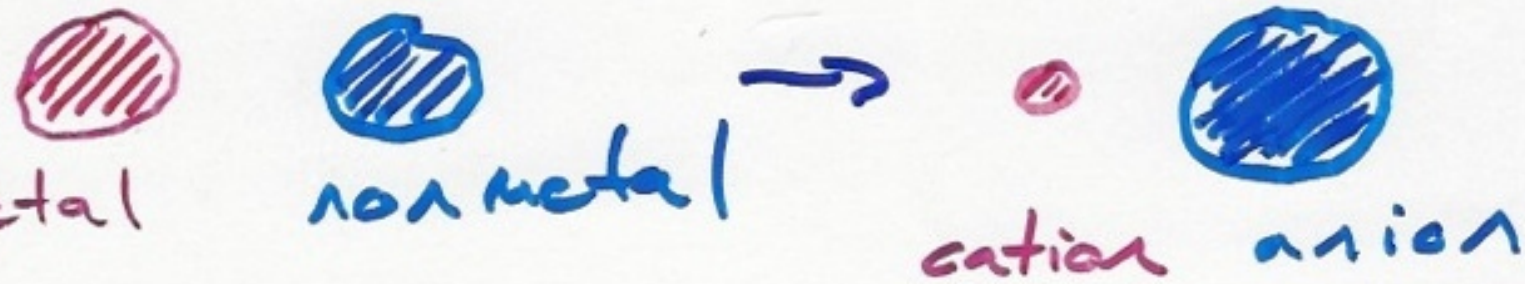
27

a. False Cations are smaller less electron-electron repulsion

b. True Li^+ is smaller than Li

c. False Cl^- is smaller than I^- greater shielding with I^-

29



Metals lose electrons in chemical reactions and become cations. when a cation is formed the size of the atom decreases.

31 a. An isoelectronic series are a group of atoms and ions with the same electron configuration.

b. Ga^{3+} Ar

Zr^{4+} Kr

Mn^{7+} Ar

I^- Xe

Pb^{2+} Hg

33

a. Cl^- Ar

b. Sc^{3+} Ar

c. Fe^{2+} Not isoelectronic with any neutral atom

$[Ar]\,3d^6$

The valence electrons for all transition metals are always the outer s level. Those s electrons are lost first.

d. Zn^{2+} $[Ar]\,3d^{10}$ none

e. Sn^{4+} $[Kr]\,4d^{10}$ none

37 a. $Se < Se^{2-} < Te^{2-}$

b. $Co^{3+} < Fe^{3+} < Fe^{2+}$

c. $Ti^{4+} < Sc^{3+} < Ca$

d. $Be^{2+} < Na^{+} < Ne$

39 $Al \rightarrow Al^{+} + 1e$

$Al^{+} \rightarrow Al^{2+} + 1e$

$Al^{2+} \rightarrow Al^{3+} + 1e$

41 a. False - It requires energy to remove an electron.

$\Delta H_{ionization} = (+)$

b. False - Fluorine has a greater 1st ionization energy due to a greater effective nuclear charge (Z_{eff}).

c. True. Less electron - electron repulsion leads to higher ionization energy

42 a. There is less shielding with Li so its harder to remove an electron.

Li [He] $2s^1$

Na [Ne] $3s^1$

b. After the 3rd ionization of Sc you are removing core electrons. Core electrons are <u>much</u> less shielded than valence electrons.

Sc [Ar] $4s^2 3d^1$

c. After the 1st ionization of Li you are removing core electrons.

Li [He] $2s^1$

45 a. Cl c. K e. Sn

b. Ca d. Ge

47 a. Fe^{2+} [Ar] $3d^6$

b. Hg^{2+} [Xe] $4f^{14} 5d^{10}$

c. Mn^{2+} [Ar] $3d^{10}$

d. Pt^{2+} [Xe] $4f^{14} 5d^8$

e. P^{3-} [Ne] $3s^2 3p^6$

54 $F^- \rightarrow F + 1e^-$ ΔH (+) Ionization

$F + 1e^- \rightarrow F^-$ ΔH (−) electron affinity

The energies are the reverse of each other. Therefore energies are equal in magnitude but opposite in sign.

61

SnO_2 Ionic

Al_2O_3 Ionic

CO_2 Molecular

LiO_2 Ionic

Fe_2O_3 Ionic

H_2O Molecular

63 a. When dissolved in water an acidic oxide produces an acidic solution. pH < 7

b. Oxides of nonmetals are acidic.

Oxides of metals are basic.

$$SO_3 + H_2O \rightarrow H_2SO_4$$

$$CaO + H_2O \rightarrow Ca(OH)_2$$

65 a. dichlorine heptoxide

b. $Cl_2 + \frac{7}{2} O_2 \rightarrow Cl_2O_7$

c. large molecules have larger boiling Pt's. not unexpected

d. Cl_2O_7 is an acidic oxide. It will be more reactive with a base.

$Cl_2O_7 + OH^- \rightarrow 2\,ClO_4^- + H_2O$

e. Cl_2O_7

7+ 2-

[Ne] core

71 Ca is more reactive because its valence electrons are more shielded.

ie lower ionization energy

Ca [Ar] $4s^2$

Mg [Ne] $3s^2$

73 a. $2K + Cl_2 \rightarrow 2KCl$

b. $SrO + H_2O \rightarrow Sr(OH)_2$

c. $4Li + O_2 \rightarrow 2Li_2O$

d. $2Na + S \rightarrow Na_2S$