- Representative Elements
  - Atoms lose or gain valence electrons to gain a noble gas electron configuration.
    - O: 1s2 2s2 2p4

      O^{2-} : 1s2 2s2 2p6

      Al: [Ne] 3s2 2p1

      Al^{3+} : [Ne]

    Al3+ and N3- are isoelectric with Ne.
  - Isoelectric - same number of electrons
- Transition Metals:
  - **Form cation by removing electrons first "s" then "d" electrons**
    - Mn^{2+} , Fe^{2+} , Fe^{3+}
  - Fe: [Ar] 4s2 3d6

    Fe^{2+}: [Ar] 3d6

    Fe^{3+}: [Ar] 3d5

Preview from Notesale.co.uk
Page 6 of 31

Lecture 3 30.17

- Same group → same # and type of valence electrons.
- Periodic law - if arrange elements by Z, their chemical and physical properties vary periodically.
- Electrons are both attracted to the nucleus and repelled by other electrons.
  - Effective nuclear charge (Z_{eff}) - "positive charge" felt by an electron.
    - $Z_{eff} \cong Z$ (#pt) - # of inner core e-
      - $Z_{eff} = Z - \sigma$
  - Effective nuclear charge increases as you go upper right diagonally on the periodic table.
- Atomic radius (atomic size) - one-half the distance between the 2 nuclei in 2 adjacent atoms.

    - Exactly the opposite of effective nuclear charge, and it increases as you go lower left diagonally.
    - Larger Z_{eff} → stronger hold of nucleus on e- → smaller the atomic radius
    - ↓ across a period
        - ↑ # of protons but small shell of e-
- Put in order of decreasing atomic radius
    - P, Si, N
        - Si > P > N
    - C, Li, Be
        - Li > Be > C
- Ionic Radius
    - Size of an ion.
    - Cation (+) is smaller than the corresponding atom from which it came.
        - Often loses its outer shell
        - Nuclear charge remains the same but fewer electrons (atom shrinks)
    - Anion (-) is larger than the corresponding atom from which it came.
        - Nuclear charge remains the same but more e- (weaker so expands)
    - Summary: cation < atom < anion
- Comparing Ions to each other
    - Ions in the same group (family)
        - Increases down a group (if same charge)
            - Size of shell increases as you go down a group.
    - Isoelectronic ions
        -

	Z (#pt)	**#e-**
S^{2-}	16	**18**
Cl^{-}	17	**18**

Preview from Notesale.co.uk
Page 7 of 31

- Ionization energy and metallic character
  - Metallic character based is IE
  - More metallic character, more the element exhibits physical and chemical properties of metals.
  - Reactive metal → loses e- to form cation
  - Lowest IE → more metallic character
- Practice Ionization Energy
  - Which has the larger 1st IE?
    - K, Ca : **Ca**
    - I, F : **F**
  - Which has the larger 2nd IE?
    - Li, Be : **Li (its harder to destroy a noble gas as Li is already at Li^+ from the 1st IE** $I_2 + X^+_{(g)} \rightarrow X^{2+}_{(g)} + e^-$ $I_2 = 2^{nd} IE$
  - Order the elements from smallest 2nd IE to largest
    - Na, Mg, Al
      - Na: [Ne]
      - Mg^+: [Ne] 3s1
      - Al^+: [Ne] 3s2
    - Mg < Al < Na

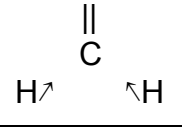
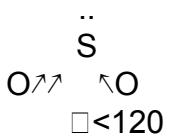
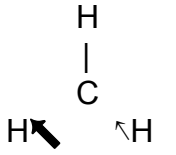
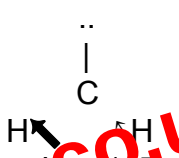
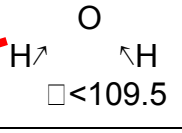
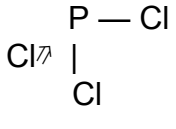
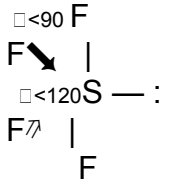
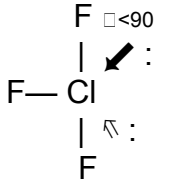
Preview from Notesale.co.uk
Page 9 of 31

- Electron affinity (EA) - how strongly an atom gains electrons
  - Energy change that occurs when an e- is added to a gaseous atom
    - ΔH = EA = -energy
  - EA increases as you go upper right diagonally.
  - Low EA = hard to gain e-
  - High EA = easy to gain e-
- Electronegativity (EN) - the ability to attract electrons in a covalent bond
  - Closer to Fluorine, more EN.
  - EN increases as you go upper right diagonally

- FONCl BrICS PH

  Most EN Less En
- Noble gases aren't included: they are stable with REALLY high IE, low EA

Preview from Notesale.co.uk
Page 10 of 31

		planar	Planar		
3	1	Trigonal planar	Bent		<120
4	0	Tetrahedral	Tetrahedral		109.5
4	1	Tetrahedral	Trigonal Pyramidal		<109.5
4	2	Tetrahedral	bent		<109.5
5	0	Trigonal bipyramidal	Trigonal bipyramidal		90 Between Axial and equatorial 120 Equatorial
5	1	Trigonal bipyramidal	seesaw		<90 <120
5	2	Trigonal bipyramidal	T-shaped		<90

Preview from Notesale.co.uk
Page 20 of 31