7.87 Remember trend table

7.89 a. Li b. P c. O^+ d. Cl e. Cu

7.95 d. See text E.A. table 7.7 Fig. 7.33

7.101 a. Table 7.5

EA. $Mg^{2+}(g) + e^- \rightarrow Mg^+(g)$

$-IE_2(Mg) = E_a(Mg^{2+})$

b.

EA. $Al^+(g) + e^- \rightarrow Al(g)$

$-IE_1(Al) = E_a(Al^+)$

7.121

Mg $[Ne]: \underbrace{3s^2}_{\text{2 valence } e^-}$ third e^- is from core

IE_1 groups 2A & 3A exception $Si > Mg > Al$ (6.9A, 6.2A, 6.3A)

7.125

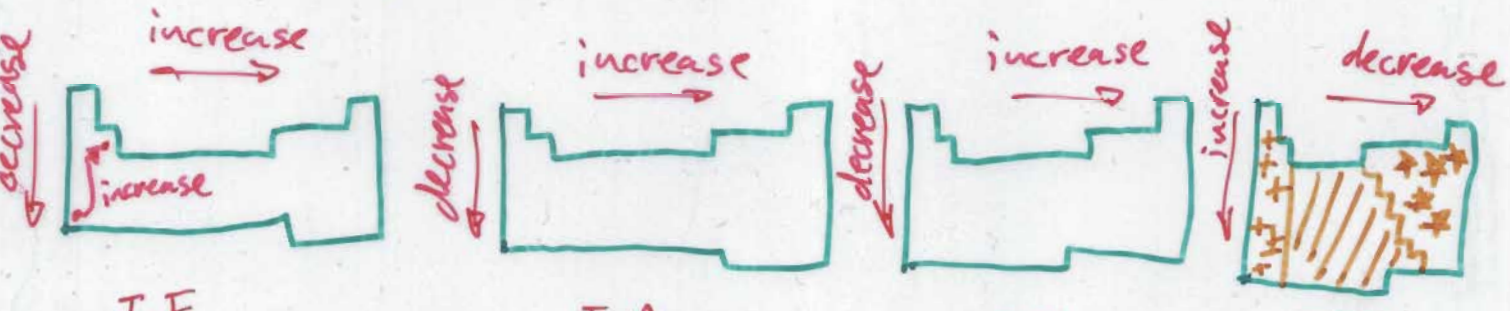
c. $Mg^+(g) + F(g) \rightarrow Mg^{2+}(g) + F^-(g) \Rightarrow \Delta H_r = ?$

$Mg^+(g) \rightarrow Mg^{2+}(g) + e^-$ $IE_2(Mg) = 1445\ kJ$

$e^- + F(g) \rightarrow F^-(g)$ $EA(F) = -327\ kJ$

$\Delta H_r = 1117\ kJ$

d. combine from parts b & c.



$O(g) \rightleftarrows O^+(g) + e$ $I.E._1(O)$

$O(g) + e^- \rightarrow O^-(g)$ $E.A.(O)$

$I.E._1(O) = -EA(O^+)$

trends work specially fine inside "groups" i.e. metals, transition metals, non-metals

Chemical Bonding

Interaction between ions (repulsive → positive / attractive → negative)

Coulomb's Law $E = K \frac{Q_1 Q_2}{r_{12}}$ $K = 2.31 \times 10^{-19}$ J·nm

r_{12} = bond length

- ionic (NaCl, KCl, KBr, KF)
- covalent (C=C, H-H, O=O)
- polar covalent (HF) charge distribution $\overset{\delta+}{H}—\overset{\delta-}{T}$

Electronegativities

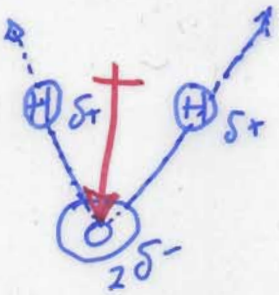
$$\Delta = (H\text{-}X)_{act.} - (H\text{-}X)_{exp.}$$

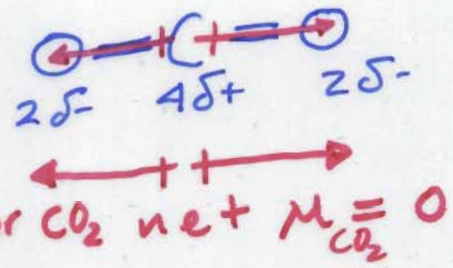
$\Delta(C\text{-}C) = (C\text{-}C)_{act} - (C\text{-}C)_{exp} = 0$ } covalent shared equally

$(O=O) = (O=O)_{act} - (O=O)_{exp} = 0$ }

$\Delta(MgCl) = (Mg\text{-}Cl)_{act} - (MgCl)_{exp} > 0$ } polar covalent shared unequally

Bond Polarity





for CO_2 net $\mu = 0$ (μ_{CO_2})

CO_2, SO_3, CCl_4 (cancells out)

Partial ionic character % ionic = $\frac{\text{measured } \mu \text{ X-Y}}{\text{calculated } \mu \text{ X-Y}} \times 100\%$

covalent: two non-metals share e^- complete valence e^- configuration of both atoms

ionic: non-metal and metal, non-metal noble gas e^- configuration, metal valence orbitals emptied

Exercises Ch. 8

19. P_2O_5 only covalent others mixed How?

21. Remember trend table.

23. Again from trend table & thinking of Δ's

25. Difference in trend and actual numbers.

27. E.N. order H P < C < N < O < F
F-H > O-H > N-H > C-H > P-H polarity order.

29. Rb^+: $[Ar]4s^2 3d^{10} 4p^6$ Ba: $[Kr]5s^2 4d^{10} 5p^6$ I^-: $[Kr]5s^2 4d^{10} 5p^6$
called iso-electronic series

37. a. Li^+ N^{3-} Li_3N d. Ba^{2+}, S^{2-} BaS

39. lattice energy $\propto \frac{Q_1 Q_2}{r_{12}}$

a. NaCl; because Na^+ is smaller than K^+

b. length

c. charge

d. charge

e. charge

f. ion length

t.

Predict Ionic Compound Formulas

8.37

Li: [He] $2s^1$

N: [He] $2s^2\ 2p^3$

So N a non-metal, needs 3 electrons to reach the noble gas [Ne] configuration, & Li a metal loses $1e^-$ to reach the [He] configuration.

Li^+ & N^{3-}

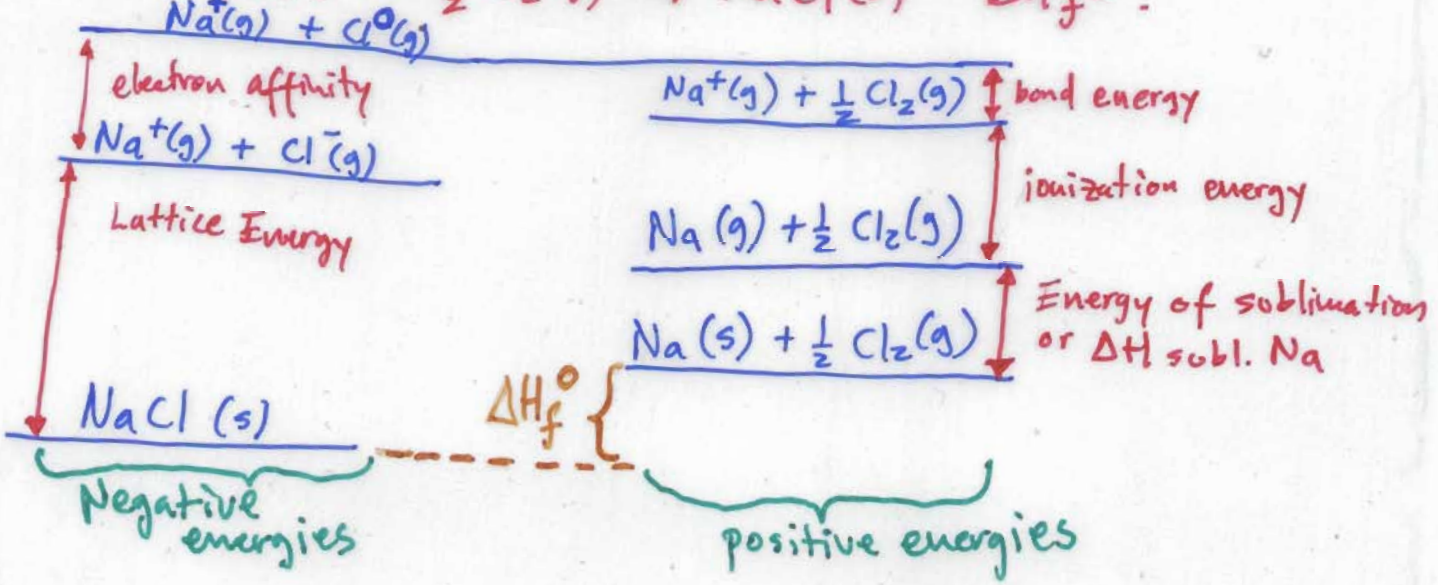
Li_3N

So we get

Isoelectronic Series: O^{2-}, F^-, Na^+, Mg^{2+}, Al^{3+} $10e^-$ all have [Ne] configuration, but their # of protons or nuclear charge Z is different, the more nuclear charge is, relative to the same electronic charge (iso-e^-), the lesser the atomic radii.

Lattice Energy:

8.41 $Na(s) + \frac{1}{2}Cl_2(g) \rightarrow NaCl(s)$ $\Delta H_f^\circ = ?$



$$\Delta H_f^\circ = -786 - 349 + \frac{239}{2} + 495 + 109 = -412\ kJ/mol$$

8.43 See page 364

$$\frac{(+2)(-2)}{(+1)(-1)} = 4$$

The energy changes alone do not take into account lattice energies.

8.45 lattice energy $= K \frac{Q_1 Q_2}{r_{12}}$

charge difference weighs more than r_{12}, do the numbers.

CaSe → $(99 + 198/2) \times 10^{-12}$ m $K = 2.31 \times 10^{-19}$ J·nm

Na_2Se

CaTe

Na_2Te