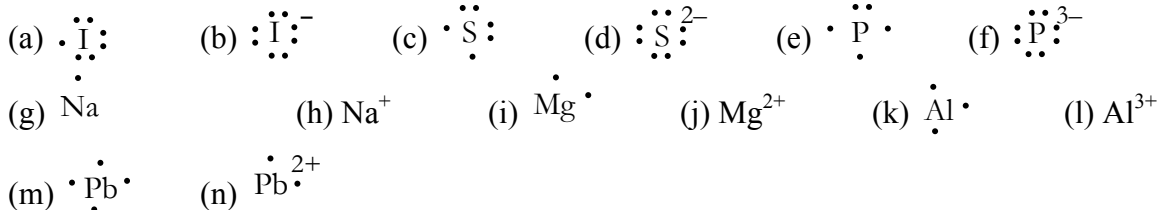


Chem 2 AP Homework #9-1: Problems pg. 378-379 #5, 7, 11, 13, 15, 16, 18, 23, 24

5 Write Lewis dot symbols for the following atoms and ions:



7 Explain how ionization energy and electron affinity determine whether atoms of elements will combine to form ionic compounds.

The ionization energy must be low enough and the electron affinity large enough (or not too negative) so that the lattice energy of the resulting compound stabilizes the compound.

11 Explain why ions with charges greater than 3 are seldom found in ionic compounds.

The ionization energy to create ions with charge greater than 3+ is generally so large that it is difficult to have a large enough lattice energy to stabilize the ion.

13 In which of the following states would NaCl be electrically conducting? (a) solid, (b) molten, (c) aqueous.

NaCl would be conductive when (b) molten and (c) dissolved in water. This is because in these states the ions are free to move, and conductivity requires mobile charge carriers.

15 An ionic bond is formed between a cation A^+ and anion B^- . How would the energy of the ionic bond be affected by the following changes?

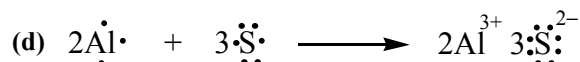
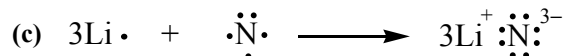
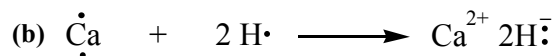
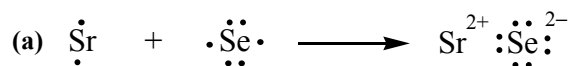
We use Coulomb's law to answer this question: $E = k \frac{Q_{\text{cation}}Q_{\text{anion}}}{r}$

- (a) **Doubling the radius of the cation** would increase the distance, r , between the centers of the ions. A larger value of r results in a smaller energy, E , of the ionic bond. Is it possible to say how much smaller E will be?
- (b) **Tripling the charge on the cation** will result in tripling of the energy, E , of the ionic bond, since the energy of the bond is directly proportional to the charge on the cation, Q_{cation} .
- (c) **Doubling the charge on both the cation and anion** will result in quadrupling the energy, E , of the ionic bond.
- (d) **Decreasing the radius of both the cation and the anion to half of their original values** is the same as halving the distance, r , between the centers of the ions. Halving the distance results in doubling the energy.

16 Give the empirical formulas and names of the compounds formed from the following pairs of ions.

- (a) Rb^+ and I^- RbI, rubidium iodide (b) Cs^+ and SO_4^{2-} Cs_2SO_4 , cesium sulfate
(c) Sr^{2+} and N^{3-} Sr_3N_2 , strontium nitride (d) Al^{3+} and S^{2-} Al_2S_3 , aluminum sulfide

18 Write Lewis dot symbols of the reactions and products in the following reactions. Balance the reactions.



23 Specify which compound in the following pairs of ionic compounds has the higher lattice energy:

(a) **MgO or KCl:** MgO because its charges are twice as big as KCl

(b) **LiF or LiBr:** LiF because the ionic radius of F^- is smaller than that of Br^-

(c) **Mg_3N_2 or NaCl:** Mg_3N_2 because the charges are greater ($2 \times 3 = 6$ times) than in NaCl

24 Compare the stability (in the solid state) of the following pairs of compounds:

(a) **LiF and LiF_2 (containing the Li^{2+} ion):** LiF is more stable than LiF_2 because the energy required to create the Li^{2+} ion is very large

(b) **Cs_2O and CsO (containing the O^- ion):** Cs_2O is more stable than CsO because the lattice energy is larger (more exothermic) than for CsO (assuming O^-)

(c) **CaBr_2 and CaBr_3 (containing the Ca^{3+} ion):** CaBr_2 is more stable than CaBr_3 because the energy required to create the Ca^{3+} ion is very large.