84. a. Be < Na < Rb  
   b. Ne < Se < Sr  
   c. O < P < Fe  
   (All follow the general radii trend.)

85. a. Rb < Na < Be  
   b. Sr < Se < Ne  
   c. Fe < P < O  
   (All follow the general IE trend.)

86. a. Cs  
   b. Ga  
   c. Tl  
   d. O²⁻  
   e. When comparing ions of the same element, the ion with the most electrons will have the 
   largest amount of electron-electron repulsions. This makes it the largest ion with the 
   smallest ionization energy.

90. a. Uus will have 117 electrons. [Rn]7s²5f⁶6d⁴⁷p⁷⁻

   b. It will be in the halogen family and most similar to astatine, At.

   c. Uus should form -1 charged anions like the other halogens.

   NaUus, Mg(Uus)₂, Ca(Uus)₃, O(Uus)₂

   d. Assuming Uus is like the other halogens: UusO-, UusO₂⁻, UusO₃⁻, UusO₄⁻

92. P(g) + e⁻ → P⁺(g)

94. Al (-13.4), Si (-19.6), P (-14.6), S (-34.6), Cl (-34.5); Based on the increasing nuclear charge, we 
   would expect the electron affinity (EA) values to become more exothermic as we go from left to 
   right in the period. Phosphorus is out of line. The reaction for the EA of P is:

   P(g) + e⁻ → P⁺(g)

   [Ne]3s²3p⁶⁻ [Ne]3s²3p⁶⁺

   The additional electron in P⁺ will have to go into an orbital that already has one electron. There 
   will be greater repulsions between the paired electrons in P⁺, causing the EA of P to be less 
   favorable than predicted based solely on attractions to the nucleus.

96. a. More favorable EA: K and Cl; Mg has a positive EA value and F has a more positive EA 
   value than expected from its position relative to Cl.

   b. Higher IE: Mg and F  
   c. Larger radius: K and Cl

98. a. N < O < F, F is most exothermic.  
   b. Al < P < Si; Si is most exothermic.

100. O²⁻: The electron-electron repulsions will be much more severe for O⁺ + e⁻ → O²⁻ than for O⁺ + e⁻ → O⁺.

102. a. IE of Cl⁺ is ΔH for: Cl(g) → Cl⁺(g) + e⁻  
   IE(Cl⁺) = -IE(Cl) = 348.7 kJ/mol (Table 7.7)

b. Cl(g) → Cl⁺(g) + e⁻  
   IE = 1255 kJ/mol (Table 7.5)

c. Cl⁺(g) + e⁻ → Cl(g)  
   ΔH = -IE₁ = -1255 kJ/mol = EA(Cl⁺)