1. In Eq. (4.20) [Eq. (4.24) in 1st edition] – and in the equation at the top of page 2 in LECTURE #9 – the sum is over all reactants and products, whereas in Eq. (4.8) [Eq. (4.12), 1st edition] the sum is over only those reactants and products that are not elements in their standard states (i.e., the stable forms of the elements at standard temperature [298K] and pressure [1atm]).
   WHY?


3. The molar constant-pressure heat capacities for O$_2$(g), H$_2$O(g), and CO$_2$(g) are 3.53R, 4.04R, and 4.46R, respectively.
   EXPLAIN.
   HINT: Consider the numbers of rotational degrees of freedom involved, and the extents to which the vibrations of the molecules are able to take up (store) energy.

4. The combustion of a 4.76 g mass of solid, elemental, potassium is carried out in a constant-volume (“bomb”) calorimeter like the one considered in the book; the inner water bath consists of 1.45 kg of water, and the value of the “calorimeter constant”, i.e., its heat capacity, is 1.85 kJ/K. Upon conversion of the 4.76 g of potassium to K$_2$O (g), the temperature of the inner water bath is observed to increase by 5.82K. Calculate the standard energies and enthalpies of formation of K$_2$O.

5. Write the expression that allows you to calculate the standard enthalpy change – at an arbitrary temperature T – for the reaction H$_2$(g) + 1/2 O$_2$(g) $\rightarrow$ H$_2$O(g).

6. Estimate the value of the standard enthalpy of formation of gaseous atomic oxygen [O(g)] from the bond dissociation of gaseous diatomic oxygen [O$_2$(g)].

7. Calculate the standard enthalpy and energy of reaction, at 298K, for the reaction $4$NH$_3$(g) + $6$NO(g) $\rightarrow$ $5$N$_2$(g) + $6$H$_2$O(g).

8. Calculate the standard enthalpy of reaction, at 720K, for the same reaction as in the preceding problem. First use temperature-dependent heat capacities, and then compare the result you get with what you’d find using constant heat capacities.