Chemistry 236 -- Quiz 3

September 24, 2003 — Bomb Calorimetry

Pledge and signature:

Note: If you want your paper returned folded (*i.e.*, score concealed), please print your name on the back.

1. (2) Combustion of 1.00 g of substance A raises the temperature of 1.000 kg of water by 2.00 K. Therefore combustion of 2.00 g of A will raise the temperature of 2.000 kg of water by

   a. 0.50 K b. 1.00 K c. 2.00 K d. 4.00 K e. none of these

2. (2) Combustion of 1.00 g of substance A raises the temperature of 1.000 kg of water by 2.00 K. Suppose the water is replaced by 1.000 kg of a liquid having exactly half the specific heat capacity of water and the experiment is repeated (again, combustion of 1.00 g of A). The observed ΔT will be

   a. 0.50 K b. 1.00 K c. 2.00 K d. 4.00 K e. none of these

3. (2) Substance A has specific heat of combustion $q_{\text{spec,A}}$, while substance B has specific heat of combustion $q_{\text{spec,B}}$ that is exactly half the value for A. Thus, compared with the amount of heat produced by combusting 1.00 mol of A, the amount produced by combusting 2.00 mol of B will be

   a. less b. the same c. more d. This cannot be determined w/o additional information.

4. (2) Two calorimetry experiments are done using the same calorimeter, filled with the same amount of water both times. In the first, 0.75 g of A yields ΔT = 1.50 K. In the second 1.00 g of B yields ΔT = 1.75 K. Therefore

   a. $q_{\text{spec,A}} < q_{\text{spec,B}}$ b. $q_{\text{spec,A}} = q_{\text{spec,B}}$ c. $q_{\text{spec,A}} > q_{\text{spec,B}}$
   d. This cannot be determined without additional information. e. none of these

5. (2) Ina Hurry carelessly does only one calibration run with benzoic acid and accidently fills the water jacket with only 1.8 L of water instead of the 2.0 L called for in the standard procedure. Assuming she properly fills with water in the run for her unknown, her determined value of the specific heat of combustion for the unknown will be

   a. too low b. correct c. too high d. This cannot be determined w/o additional information.

6. (2) Calculate the value of $\Delta H° - \Delta E°$ at 25°C for the combustion of 1.00 mol of benzene (C_6H_6) to produce $CO_2(g)$ and $H_2O(\ell)$. (R = 8.3145 J mol^{-1} K^{-1}.)