

Bomb Calorimetry Pre-Lab Assignment

(reprint from lab handout – you don't need to do twice!)

Pre-lab Exercises: Do 2-5 on a separate sheet of paper to be turned in at the start of lab

1. Read Experiment 5 and 6, Halpern – available on Moodle as Bomb Calorimetry 1 and 2 (another source, not specific for this experiment, but describing the thermodynamics, is McQuarrie and Simon, Ch 19).
2. Use the NIST Webbook, <http://webbook.nist.gov/chemistry/>, to find the heat of vaporization ($\Delta_{\text{vap}}H$) for gas phase benzene, cyclohexane, and CDDT. Also tabulate the heat of combustion ($\Delta_{\text{c}}H$) for the three compounds.
3. Use the thermodynamic cycle discussed above to find E_{res} of benzene with your values from #2.
4. In a few sentences, discuss how you would find E_{res} of benzene without the use of the NIST webbook (or any other tabulated sources of $\Delta_{\text{vap}}H$ and $\Delta_{\text{c}}H$). Why are we not doing this experiment in lab this week?
5. A student combusts 1.0 g benzoic acid in a bomb calorimeter and finds the length of wire has decreased 2.7 cm and that 5 mL 0.1 M NaOH is needed to neutralize the liquid in the bomb. The initial temperature was 20.00 °C and the final temperature was 25.59 °C. What is C_s ? (See the procedure below for more information on this calculation.)
6. Obtain a piece of candy of your choice to combust in the bomb calorimeter. Those with a small water content and containing only carbohydrates work best. Some that have been run successfully in the past include chocolate bars, M&M's, Reese's Pieces, hard peppermint candies, and Lifesavers. You only need one sample per group.