Chemistry 236 -- Quiz 3

Lab Day ____

February 25, 2014 — Experiments 3 and 4

Pledge and signature:

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

A. (8) Bomb Calorimetry — practical.

1. (3) A 0.893 g tablet of phenol (C_6H_5OH, M = 94.12) is completely burned in a bomb calorimeter having C_K = 13.22 kJ K^{-1}, producting a temperature increase of 2.192°C. Calculate (a) the combustion heat, and (b) the specific and molar heats of combustion of phenol.

2. (5) Write a balanced reaction for the complete combustion of phenol at room *T*. Use this to calculate $\Delta H^\circ - \Delta E^\circ$ for this reaction at 25°C [R = 8.3145 J mol^{-1} K^{-1}.]

B. (7) Bomb Calorimetry — conceptual.

1. (3) Combustion of 1.170 g of substance A raises the temperature of 0.931 kg of water by 2.44 K. Therefore, combustion of 1.510 g of A will raise the *T* of 1.190 kg of water by how much?

2. (4) Taking the first two masses and the first ΔT given above as exact, and the 3rd and 4th masses (1.510 g and 1.190 kg) as uncertain by 0.026 g and 0.033 kg, respectively, calculate (a) the % uncertainty, and (b) the absolute uncertainty in your computed ΔT. (c) Use the latter to state your result correctly.

C. (12) Phase Equilibria and the Triple Point.

1. (5) For water near its triple point, I. B. Allwette determines $\Delta H_{m,fus} = 6.2 \pm 0.7$ kJ mol^{-1} and $\Delta H_{m,vap} = 44.9 \pm 0.5$ kJ mol^{-1}. Calculate ΔH_m for the sublimation process, $H_2O(s) \rightarrow H_2O(g)$, and its uncertainty, and report the result correctly.

2. (7) Consider the accompanying figure, which shows the natural log of the vapor pressure of Br_2 as a function of $1/T$, for both solid and liquid phases. Using this figure, estimate (a) the triple point T and P; (b) the normal boiling point T; and (c) $\Delta H_{m,vap}$. (R is on p. 1)