Chemistry 230 -- Quiz 3

September 19, 2001 — Tellinghuisen

Pledge and signature:

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

1. (5) A mole of He gas initially at 155˚C and 1.11 atm undergoes a cyclic process for which q = 129 J. Determine as many of the following as possible: ΔU, ΔH, ΔP, ΔT, w.

2. (5) Briefly describe a possible process for taking liquid water from 25˚C and 1.0 atm to 30˚C and 1.0 atm, with $q < 0$.

3. (7) A hypothetical substance obeys the equation of state $PV_m = BT$, where B is a constant. The substance undergoes a change of state from (T_1, V_1) to (T_2, V_2), along a path where T varies quadratically with V, in accord with $T = c_1V^2 + c_2$ (where c_1 and c_2 are constants). Calculate the work w in terms of B, c_1, c_2, V_1, V_2, and the number of moles n.

4. (10) Suppose that the thermal expansivity of ethanol can be expressed as $\alpha = a + b\theta$ over the Celsius temperature range $0 \le \theta \le 40.0$˚C, where a and b are constants. Further suppose that an ethanol thermometer has been calibrated to be correct at 0.0˚C and at 40.0˚C. Obtain an expression (in terms of the constants a and b) for the apparent temperature on this thermometer when the true temperature is θ = 25.0˚C.