

Chemistry 230 -- Quiz 5
October 10, 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. (18) Do just **ONE** of the following two derivations (a or b): Be sure to show all steps.
 - (a) Starting from $dH = TdS + VdP$, show that $(\partial H / \partial V)_T = (T - 1)P$.
 - (b) Verify that $[\partial(G/T) / \partial T]_P = -H/T^2$.

2. (12) We showed in one of the homework problems that, for a gas that obeys the equation of state, $PV_m = RT(1 + bP)$, $(\partial U / \partial V)_T = bP^2$. Let us consider a Joule expansion for such a gas.
 - (a) State the conditions on q , w , and ΔU for a Joule expansion.
 - (b) Give the fundamental definition of the Joule coefficient μ_J , and then express it in terms of C_V and $(\partial U / \partial V)_T$.
 - (c) Thus, obtain a differential equation in terms of dT and dV (*i.e.*, no P dependence), which could be used to determine ΔT in a Joule expansion of a gas following the equation of state given above.
 - (d) Finally, make a judicious approximation to achieve a separation of variables with all T dependence on the left-hand side and all V dependence on the right.