CM3230, Fall 2011
Quiz 4a
Name _____

Answer 5 items for full 100 points. The 6th correct answer will be considered a 20 point bonus.

1. A saturated liquid having a critical temperature $T_c = 400K$ and $\omega = 0$, was found to have a departure enthalpy function, $\Delta h_{T,P}^{dep} = -4.5RT_c$ at a given pressure P. Then the saturation temperature at this pressure will be closest to
   a) $T_{sat} = 120K$
   b) $T_{sat} = 220K$
   c) $T_{sat} = 320K$
   d) $T_{sat} = 420K$
   e) None of the above

2. Based on the virial equation of state given as: $\frac{Pv}{RT} = 1 + Bv$, the quantity
$$\mu_{JT} c_P = T\left(\frac{\partial v}{\partial T}\right)_P - v$$
   will then be given by
   a) $\mu_{JT} c_P = vBRT$
   b) $\mu_{JT} c_P = vB$
   c) $\mu_{JT} c_P = vRT$
   d) $\mu_{JT} c_P = vBRT/(P + BRT)$
   e) None of the above

3. A real gas with $C_P = 2.5R$ is compressed from the critical point to reduced temperature $T_{r2} = 1.2$ and reduced pressure $P_{r2} = 2$. The departure entropy functions were found to be $\Delta s_{T_c,P_c}^{dep} = -2.17R$ and $\Delta s_{T_{r2},P_{r2}}^{dep} = -1.3R$. Then the change in molar entropy is closest to
   a) $\Delta s = -0.6R$
   b) $\Delta s = -0.3R$
   c) $\Delta s = 0R$
   d) $\Delta s = 0.3R$
   e) $\Delta s = 0.6R$

4. A stream that is 20% liquid enters a condenser at a reduced temperature $T_r = 0.8$, then the departure enthalpy function of the gas at the entrance is closest to
   a) $\Delta h_{entrance}^{dep} = -4.5\ RT_c$
   b) $\Delta h_{entrance}^{dep} = -3.7\ RT_c$
   c) $\Delta h_{entrance}^{dep} = -1.3\ RT_c$
   d) $\Delta h_{entrance}^{dep} = -0.5\ RT_c$

5. A gas at T_1 and P_1 is passed through a porous plug and undergoes an isenthalpic expansion, leaving at T_2 and $P_2 (< P_1)$. If the Joule-Thomson coefficient $\mu_{JT} < 0$ for the expansion process, then
   a) $T_2 < T_1$
   b) $T_2 = T_1$
   c) $T_2 > T_1$
   d) Not enough information to determine relationship

6. A fluid expands isothermally at $T = 480K$ from $P_1 = 300\ bars$ to $P_2 = 120\ bars$. With $T_c = 400\ K$, $P_c = 60\ bars$ and $\omega = 0$, then the change in enthalpy will be
   a) $\Delta h > 0$
   b) $\Delta h = 0$
   c) $\Delta h < 0$
   d) Not enough information to determine the sign