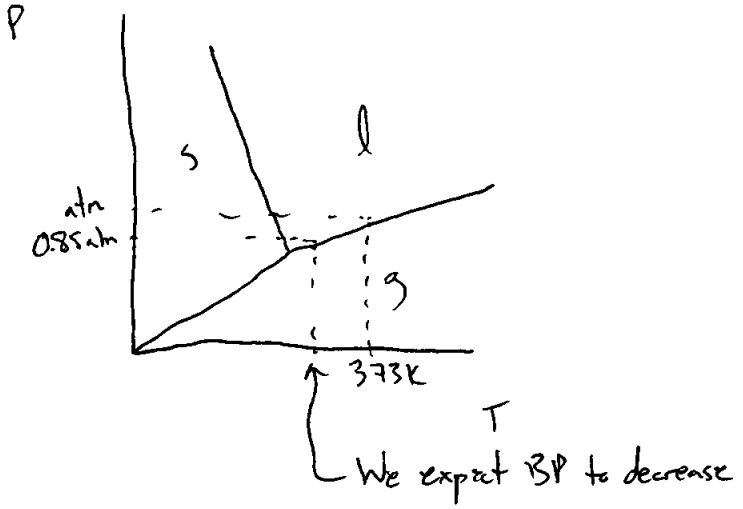
**CH353 – Physical Chemistry I**
Spring 2015, Unique 51170

Key

**Quiz 4, 31 March 2015**

Austin, TX is slightly above sea level, and water in Austin boils at very close to its standard boiling point at 1 atm. What temperature does water boil at in Denver, CO, where atmospheric pressure is approximately 85% of its value at sea level? The molar enthalpy of vaporization of water is 40.65 kJ $mol^{-1}$ at its standard boiling point.




B/c l → g transition we can use Clausius-Clapeyron

$P_1 = 1\ atm$

$T_1 = 373K$

$\Delta H_{vap} = 40650\ J/mol$

$P_2 = 0.85\ atm$

$T_2 = ?$

$$\ln\left(\frac{P_2}{P_1}\right) = \frac{-\Delta H_{vap}}{R}\left(\frac{1}{T_2} - \frac{1}{T_1}\right)$$

$$\frac{1}{T_2} = \frac{-R}{\Delta H_{vap}} \ln\left(\frac{P_2}{P_1}\right) + \frac{1}{T_1}$$

$$\frac{1}{T_2} = \frac{-8.314\ J/molK}{40650\ J/mol} \ln\left(\frac{0.85\ atm}{1\ atm}\right) + \frac{1}{373K}$$

$$1/T_2 = 0.0027$$

$$\boxed{T_2 = 368K}$$