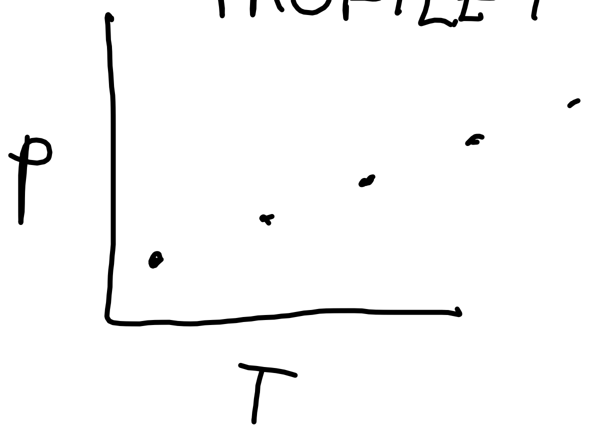
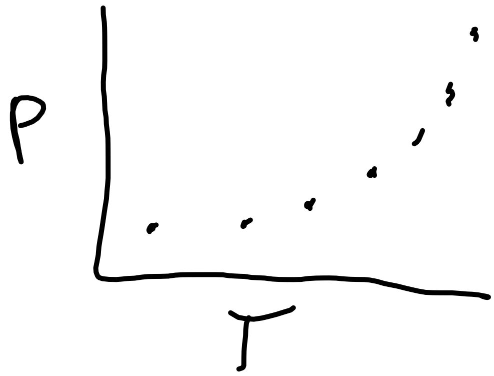
PROFILE 1




PROFILE 2




The observed pressure - temp. profile

$$P = B \cdot e^{-\frac{\Delta H_{vap}}{RT}}$$

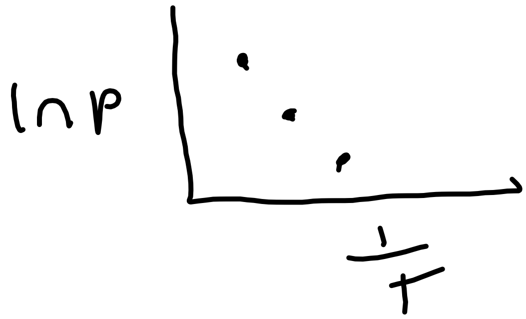
$$\ln P = \ln\left(B \cdot e^{-\frac{\Delta H_{vap}}{RT}}\right)$$

$$\ln P = \ln e^{-\frac{\Delta H_{vap}}{RT}} + \ln B$$

$$\ln P = -\frac{\Delta H_{vap}}{RT} + \ln B$$

$$\ln P = \frac{-\Delta H_{vap}}{R}\left(\frac{1}{T}\right) + \ln B$$

$$y = m \cdot x + b$$




$$\text{slope} = \frac{-\Delta H_{vap}}{R} \longrightarrow \Delta H_{vap} = -R \cdot \text{slope}$$

$$\ln P = \frac{-\Delta H_{vap}}{R}\left(\frac{1}{T}\right) + \ln B$$

Clausius-Clapeyron Equation

$(T_1 \quad P_1) \qquad (T_2, P_2)$

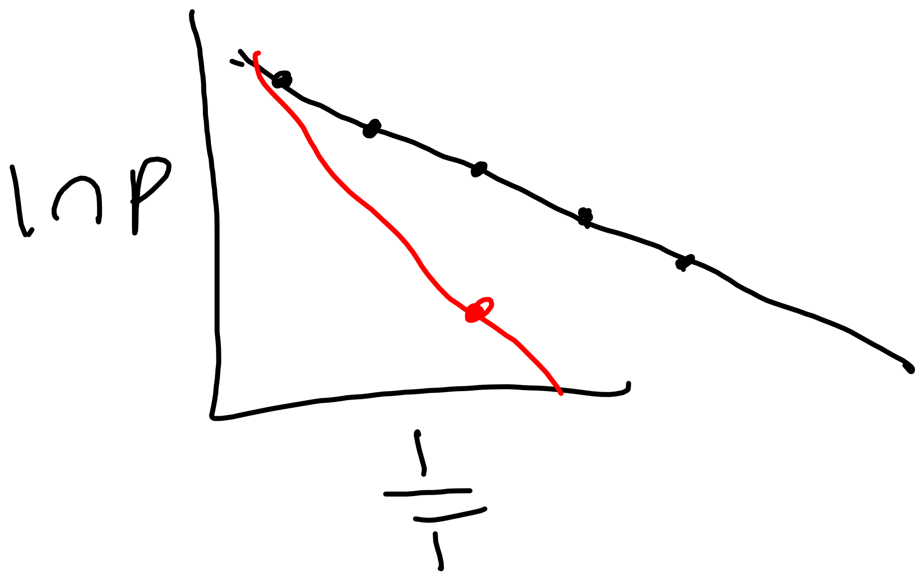
$$\ln P_2 = -\frac{\Delta H_{vap}}{R}\left(\frac{1}{T_2}\right) + \cancel{\ln B}$$

$$-\left[\ln P_1 = -\frac{\Delta H_{vap}}{R}\left(\frac{1}{T_1}\right) + \cancel{\ln B}\right]$$

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

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

2-point Clausius-Clapeyron Equation


ln p
1/T

The normal boiling point of $H_2O$ is 100°C and its heat of vaporization is 40.7 $\frac{kJ}{mol}$. Estimate the equilibrium vapor pressure of $H_2O$ at 50°C.

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

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

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

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

$$= 760\,\text{torr} \cdot e^{\frac{40700\ \text{J/mol}}{8.314\ \text{J/K mol}}\left(\frac{1}{373\text{K}} - \frac{1}{323}\right)}$$

$$= 99.8\ \text{torr}$$