

CENG411: HOMEWORK 7

Please write down at the top of the page how many hours you spent on this homework.

(You will find it useful to study Example 6.6 first.)

1. (10 points) Problem 6.30 in Smith and Van Ness.
2. (10 points) Problem 6.36 in Smith and Van Ness.
3. (10 points)

Use the Clausius-Clapeyron equation to derive an approximate equation for the pressure of a vapor in equilibrium with the liquid at a temperature T . This pressure is known as the “vapor pressure” of the liquid at this temperature. Assume that the vapor is much less dense than the liquid, that you can treat the vapor as an ideal gas and that the latent heat of vaporization is approximately temperature independent. Sketch the temperature dependence of the vapor pressure.

4. (10 points) The vapor pressure p (in mm of mercury) of solid ammonia is given by $\ln p = 23.03 - 3754/T$ and that of liquid ammonia by $\ln p = 19.49 - 3063/T$.
 - a) What is the temperature of the triple point?
 - b) What are the latent heats of sublimation and vaporization at the triple point?
 - c) What is the latent heat of melting at the triple point?

5. (10 points)

Calculate the change in volume for a liquid which undergoes a temperature change from T_1 to T_2 , and a pressure change from P_1 to P_2 . Use the fact that for real liquids the volume expansivity and isothermal compressibility are weak functions of temperature and pressure, and can be regarded as being approximately constant. A more stringent, commonly used assumption in fluid mechanics is that α and κ are in fact zero- what would the volume change be in this case?

6. Summarize what you learnt from problems 1, 2, 3, 4 and 5. (4 points)