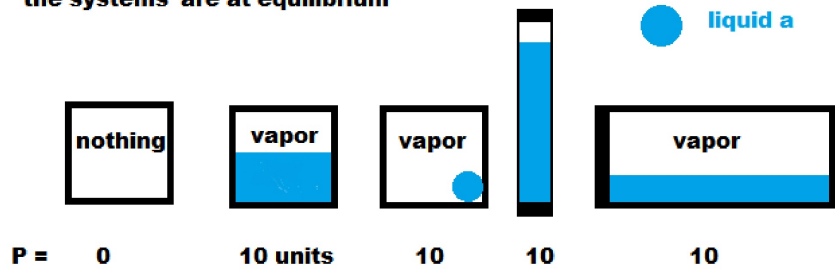


## Experiment 7: Distillation

the systems are at equilibrium



the pressure of a vapor in equilibrium with its own liquid is *saturated vapor pressure*



if you heat this system the svp will rise. The temp at which it reaches 1 atm is the *normal boiling point*

now we come to mixtures of miscible (mixable) liquids



The total pressure (at a given temperature) is the sum of the contributions each component makes

$$P_{\text{total}} = P^{\circ} X_a + P^{\circ} X_b \quad (P^{\circ} \text{ is the vp of the pure liquid})$$

$X_a$  is the mole fraction of 'a'

this is Raoult's Law

$$X_a = \frac{\text{mol of a}}{\text{mol of a} + \text{mol of b}}$$

What is  $X_a + X_b$  ??????

Like the octet rule, there are only 2 exceptions to Raoult's Law

1. When the total pressure is greater than the sum
2. When the total pressure is less than the sum

The mixture we will be working with is ethanol/water, and this system (sigh) does not obey Raoult's Law.

There is a 'positive deviation'..... the total vapor pressure is higher than the sum of the two contributions. This has a big effect when we distill an ethanol water mixture.