1. This is a variation of the Stefan flow problem. Here the liquid in the container is a low-molecular weight, volatile, alcohol that tends to absorb water. Hygroscopic chips are placed in the alcohol to absorb the dissolved water such that the water vapor concentration at the alcohol surface is zero. A moist air with water vapor concentration $Y_{W,l}$ breezes over the container. Because of the high volatility of alcohol, it vaporizes with f_A and also maintains a low temperature T_o. The water vapor in the air, then, will tend to condense onto the alcohol surface with a rate f_W because of the low T_o and the presence of the chips. Determine f_A, f_W and T_o. Discuss the conditions determining whether $f_A + f_W > 0$ or < 0. Assume $Le = 1$ for simplicity.

2. For a water droplet vaporizing in dry air with $T_\infty = 372K$ and $Y_{f,\infty} = 0$, what is the droplet temperature T_s and the nondimensional vaporization rate $\tilde{\dot{m}} \equiv \dfrac{\dot{m}}{4\pi\rho D r_s}$ if the pressure is 1 atm? Take $q_l = 540 cal/gm$, $c_p = 0.3 cal/(gm \cdot K)$, and $W_{air} = 29$.