1. **Bubble Point (10 points)**. Consider a stream of 30% n-hexane, 10% n-heptane, 20% n-octane, and 40% n-nonane. Find the bubble point of this stream at 1 atm pressure.

2. **Batch Distillation (2 sub-problems, 10 points each)**. Consider batch distillation of ethanol and water with a still pot and a column with an unknown amount of additional equilibrium stages. The initial feed is 3000 kgmol of 40 mol% ethanol and the rest is water.

   a) If the column operates with \(L/D = 1\), and if \(x_D = 0.70\), how many stages are there in the column? Use the attached diagram.

   b) When your experiment is over, the still pot contains 1300 kgmol at an ethanol concentration of 10%. Determine the composition of the ethanol in the distillate.
Answers below (no peaking!)

#1 = 101 °C, #2 3 stages; x₀ = 0.63