Name:_____________________________

**Break-out 14: Solutions**

You have a mixture of chloroform (CHCl₃) and acetone (CH₃COCH₃). Plot the Pressure of the mixture as a function of the mole fraction of CHCl₃. In order to guide you, first address the following questions.

(a) Draw the structures of CHCl₃ and CH₃COCH₃.

(b) What intermolecular interactions occur between CHCl₃ and CHCl₃? What intermolecular interactions occur between CH₃COCH₃ and CH₃COCH₃?

CHCl₃: dipole-dipole
CH₃COCH₃: dipole-dipole, dipole-induced dipole

(c) What interactions occur between CHCl₃ and CH₃COCH₃? Do you think these interactions are stronger than the interactions between CHCl₃ - CHCl₃ and CH₃COCH₃ - CH₃COCH₃?

In addition to dipole-dipole interactions, now you can have H-bonding. These additional interactions should make the interactions between CHCl₃ and CH₃COCH₃ stronger than the self-self interactions. Note, normally H-bonds require that the H be bonded to an electronegative atom. C is not more electronegative than H, but the chlorides are extremely electron withdrawing (think of the inductive effect), and this helps to activate the C-H bond for H-bonding.

(d) Plot \( P_{\text{mix}}, P_{\text{CHCl₃}}, \) and \( P_{\text{CH₃COCH₃}} \) as a function of the mole fraction of CHCl₃. In what region of the graph does \( P_{\text{CHCl₃}} \) obey Raoult’s Law? Henry’s Law?

Because the intermolecular interactions in the mixture are stronger than in the individual solutions, molecules will be *less likely* to escape into the gas phase in the mixture.