

Name:

Date:

Period:

Seat #:

Show all work and/or explain using chemistry principles. Box your final numerical answer(s)

**#1:** At 333 K, substance A has a vapor pressure of 1.0 atm and substance B has a vapor pressure of 0.20 atm. A solution of A and B is prepared and allowed to equilibrate with its vapor. The vapor is found to have equal moles of A and B. What was the mole fraction of A in the original solution? [**x = 0.17**]

**#2:** 30.0 mL of pentane ( $C_5H_{12}$ ,  $d = 0.626$  g/mL, v.p. = 511 torr) and 45.0 mL of hexane ( $C_6H_{14}$ ,  $d = 0.655$  g/mL, v.p. = 150. torr) are mixed at 25.0 ° C to form an ideal solution.

- a) Calculate the vapor pressure of this solution. [**307 torr**]  
b) Calculate the composition (in mole fractions) of the vapor in contact with this solution. [**Pentane: 0.724, hexane: 0.276**]

**#3:** What is the vapor pressure (in mmHg) of a solution of 4.40 g of  $Br_2$  in 101.0 g of  $CCl_4$  at 300 K? The vapor pressure of pure bromine at 300 K is 30.5 kPa and the vapor pressure of  $CCl_4$  is 16.5 kPa. [**128 mmHg**]

**#4:** A solution has a 1:3 ratio of cyclopentane to cyclohexane. The vapor pressures of the pure compounds at 25 °C are 331 mmHg for cyclopentane and 113 mmHg for cyclohexane. What is the mole fraction of cyclopentane in the vapor above the solution? **[0.494]**

**#5:** Acetone and ethyl acetate are organic liquids often used as solvents. At 30.0 °C, the vapor pressure of acetone is 285 mmHg and the vapor pressure of ethyl acetate is 118 mmHg. What is the vapor pressure at 30.0 °C of a solution prepared by dissolving 25.0 g of acetone in 22.5 g of ethyl acetate? **[223 mmHg]**

>> **Special bonus question:** determine the composition (expressed in mole fraction) of the vapor above this solution [**acetone: 0.8028, ethyl acetate: 0.1972**]

**#6:** A solution containing hexane and pentane has a pressure of 252.0 torr. Hexane has a pressure at 151.0 torr and pentane has a pressure of 425.0 torr. What is the mole fraction of pentane? **[0.3686]**

**#7:** The vapor pressure above a solution of two volatile components is 745 torr and the mole fraction of component B ( $\chi_B$ ) in the vapor is 0.59. Calculate the mole fraction of B in the liquid if the vapor pressure of pure B is 637 torr. [**0.69**]