1. The vapor pressure of dichloromethane at 24.1°C is 400. Torr and its enthalpy of vaporization is 28.7 kJ/mol. Estimate the temperature at which its vapor pressure is 500. Torr. (e6.4(a)A7)

2. The vapor pressure of benzene between 10.°C and 30.°C fits the expression log(p/Torr) = 7.960 - 1780/(T/K). Calculate (a) the enthalpy of vaporizarion and (b) the normal boiling point of benzene. (e6.7(a)A7)

3. When benzene freezes at 5.5°C its density changes from 0.879 g/cc to 0.891 g/cc. Its enthalpy of fusion is 10.59 kJ/mol. Estimate the freezing point of benzene at 1000 atm. (e6.8(a)A7)

4. Naphthalene, $C_{10}H_8$, melts at 80.2°C. If the vapor pressure of the liquid is 10. Torr at 85.8° and 40. Torr at 119.3°C, use the Clausius-Clapeyron equation to calculate (a) the enthalpy of vaporization, (b) the normal boiling point, and (c) the entropy of vaporization at the boiling point. (e6.11(a)A7)

5. The temperature dependence of the vapor pressure of solid sulfur dioxide can be approximately representated by the relation log(p/Torr) = 10.5916 - 1871.2/(T/K) and that of liquid sulfur dioxide by log(p/Torr) = 8.3186 - 1425.7/(T/K). Estimate the temperature and pressure of the triple point of sulfur dioxide. (p6.1A7)

6. The partial molar volumes of acetone (propanone) and chloroform (trichloromethane) in a mixture in which the mole fraction of $CHCl_3$ is 0.4693 are 74.166 cc/mol and 80.235 cc/mol, respectively. What is the volume of a solution of mass 1.0000 kg? (e7.4(a)A7)

7. At 300. K, the partial vapor pressures of HCl (that is, the partial pressure of the HCl vapor) in liquid $GeCl_4$ are as follows:

| | | | |
|---|---|---|---|
| $x_{HCl}$ | 0.005 | 0.012 | 0.019 |
| $p_{HCl}$/kPa | 32.0 | 76.9 | 121.8 |

Show that the solution obeys Henry's law in this range of mole fractions, and calculate Henry's law constant at 300 K. (e7.6(a)A7)

8. Predict the partial pressure of HCl above its solution in liquid germanium tetrachloride of molality 0.10 mol/kg. For data see problem 6.7 (above). (e7.7(a)A7)

9. The vapor pressure of benzene is 400. Torr at 60.6°C but it fell to 386 Torr when 29.0 g of an involatile organic compound was dissolved in 500 g of benzene. Calculate the molar mass of the compound. (e7.9(a)A7)

(2 points)
10. The addition of 100. g of a compound to 750. g of $CCl_4$ lowered the freezing point of the solvent by 10.5 K. Calculate the molar mass of the compound. (e7.10(a)A7)

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