Further Exercises

Chapter 5

W1. For uranium hexafluoride, the vapour pressures (1 torr = 133.32 Pa) of the liquid and solid phases are given by:

solid: $\ln (p / \text{torr}) = 24.518 - 5895 / (T /\text{K})$

liquid: $\ln (p / \text{torr}) = 17.361 - 3479 / (T /\text{K})$

Calculate the enthalpies of evaporation, sublimation and fusion.

Calculate the pressure and temperature of the triple point

Can the liquid phase exist at 1 atmosphere pressure?

W2. Diamonds can be prepared by applying high pressures to graphite. The Gibbs energy of formation for diamond and graphite are + 1.9 kJ mol^{-1} and 0 kJ mol^{-1} and their densities are 3.51 and 2.25 g cm^{-1} respectively. What is the minimum pressure required to convert graphite to diamond at 25 °C?

W3. At what temperature will a 0.200 mol dm^{-3} solution of sucrose freeze? K_f for water is 1.86 K kg mol^{-1}

W4. At what temperature will a 0.10 mol dm^{-3} aqueous solution of sodium chloride boil? $K_b = 0.51$ K kg mol^{-1}.

W5. The vapour pressures of benzene and methylbenzene are 12.6 kPa and 3.88 kPa. What is the total vapour pressure of a mixture of 2 mol benzene and 8 mol methyl benzene?

W6. The vapour pressure of ethyl ethanoate was measured at several temperatures as shown. Use the data to determine the enthalpy and entropy changes of vaporization for ethyl ethanoate and its normal boiling point.

Temperature / °C	25.0	34.9	38.8	48.4	68.0	76.0
Pressure / kPa	12.14	18.71	23.78	36.71	76.11	100.50

W8. A pressure cooker is set to a pressure of 2.0 atm. What is the boiling temperature of water at this pressure? ($\Delta_{vap}H$ for water is +40.7 kJ mol^{-1}.)

W9. The normal boiling point of water is 100 °C and it has a vapour pressure of 12.3 kPa at 50 °C. Calculate the entropy and enthalpy of vaporization.

OXFORD
UNIVERSITY PRESS

W10. Following the method in Section 5.5, derive an expression to show which properties of a liquid determine the value of the cryoscopic constant, K_f.