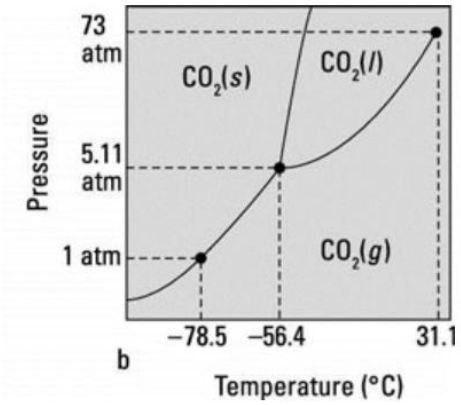
CHE1000 (IMF, Phase equilibrium, Colligative properties)

Practice Problems

No need to submit the answers.

Tutors will be discussing the questions from next week

1. Explain why the enthalpy of vaporisation, ΔH_{vap}, for water is much greater than the enthalpy of fusion, ΔH_{fus}. What does it reveal concerning changes in intermolecular forces going from solid to liquid to vapour?
2. Sketch the phase diagram for the substance that has a triple point at -15.0^{o}C and 0.3 atm, melts at -10^{o}C at 1 atm, and has a normal boiling point at 80^{o}C.
3. On dissolving 2.0 g of a non volatile solute in 100 g of water, the vapor pressure is lowered from 25 mm Hg to 24.85 mm Hg at 25^{o}C. Compute the molar mass of the solute. In a very dilute solution $n_A + n_B \approx n_A$
4. A mixture is prepared by dissolving 17.1 g sucrose (M_r. 342 g/mol) 9.0 glucose (M_r. 180 g/mol) and 6.0 g urea (M_r. 60 g/mol) in 3 L of water at 300 K. Calculate the osmotic pressure of the solution.
5. What is the degree of dissociation of 0.1 molal aqueous solution of NaCl if ΔT_f = 0.353 K and K_f (water) = 1.86 K kg/mol?
6. How would you expect the value of Vant Hoff's factor, i to change as the solution in the above question (Q 5) becomes concentrated?
7. Why is the enthalpy of solution/mixing, ΔH_{soln} of petrol and water very positive (endothermic)?
8. The vapor pressures of carbon disulphide and propanone are 39235 Pa and 23541 Pa respectively. What would be the vapour pressure of an ideal mixture of 0.2 mol CS_2 and 0.8 mol CH_3COCH_3. Does this mixture obey Raoults law? Sketch the variation in vapor pressure in solution form.
9. The vapor pressure of ice at 268 and 273 are 2.965 and 4.560 torr respectively, estimate heat of sublimation of ice, ΔH_{sub}?
10.



(i) Assuming we live at sea level (1 atm), how could CO_2 be liquified.

(ii) At what temperature and pressure does dry ice sublime?

(iii) Above what temperature is it impossible to liquify, no matter what the pressure?

(iv) At a **constant temperature**, what could you do to effect a phase change from liquid to solid state?