**Work through the ChemCAL modules *"States of Matter"*,
and *"Solubility Equilibria"*.**

1.   Consider the phase diagram on the right.

(a)   Which point lies at the critical point?
(b)   Which point lies at the triple point?
(c)   Which point corresponds to conditions where
       the solid and gas phases are in equilibrium?
(d)   What phase transition accompanies moving
       from point G to point C?
(e)   What phases coexist at point B?
(f)   What phases coexist at point F?
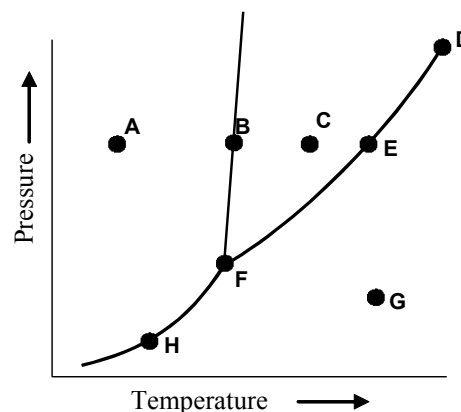
2.   A phase diagram of a pure compound has a triple point at 13 °C and 205 mmHg, a
      normal melting point at 17 °C, and a normal boiling point at 87 °C. Draw a phase
      diagram for this compound. Which of the following statements regarding this
      compound are correct?

      (a)   The density of the solid is greater than that of the liquid.
      (b)   If the pressure is reduced from 835 mmHg to 85 mmHg at a constant
             temperature of 11 °C, sublimation occurs.
      (c)   At a constant pressure of 835 mmHg, evaporation occurs if the temperature is
   raised from 13 °C to 81 °C.

3.   Which intermolecular force or bond is responsible for the density of $H_2O(s)$ being less
      than that of $H_2O(l)$?

4.   What percentage of the space within the unit cell is occupied by atoms in:

      (a)   a face-centred cubic unit cell
      (b)   a body-centred cubic unit cell
      (c)   a simple cubic unit cell

5.   If a metal crystallizes in a face-centred cubic lattice, how many "nearest" neighbours
      does each metal atom have?

6.   In the unit cell to the right, element X is within the cell and
      element Y is at the corners.
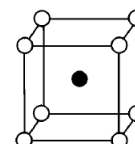
      (a)   What is the formula for this compound?
      (b)   Assuming that the Y atoms are touching along the edges of the cube and have
             radii = y, what is the size of the hole in the centre of the cube occupied by X?

7.   The solubility of $CaSO_4$ is 2.1 g L^{-1}. What is the K_{sp} of $CaSO_4$?

8.   Will 2.0 g of $Mg(OH)_2$ dissolve in 1.0 L of a solution buffered to a pH of 7.00.
      (K_{sp} $Mg(OH)_2$ = 7.1 × 10^{-12} M^3)