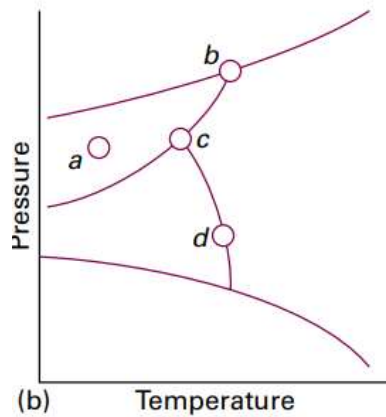


## 〈화학계몽운동 #1〉

1. How many phases are present at each of the points a - d indicated in Fig. 4.1b?

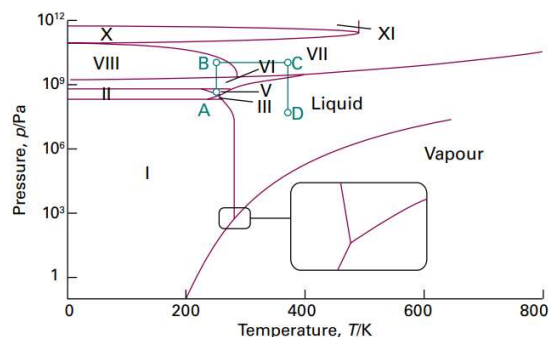


2. The difference in chemical potential of a particular substance between two regions of a system is  $-8.3 \text{ kJ/mol}$ . By how much does the Gibbs energy change when  $0.15 \text{ mmol}$  of that substance is transferred from one region to the other?

3. What is the maximum number of phases that can be in mutual equilibrium in a four-component system?

4. In a one-component system, is the condition  $P = 2$  represented on a phase diagram by an area, a line or a point? How do you interpret this value of  $P$ ?

5. Refer to Fig. 4A.9. Which phase or phases would you expect to be present for a sample of H<sub>2</sub>O at: (i) 100K and 1 atm; (ii) 300K and 10 atm; (iii) 273.16K and 611Pa?



7. By how much does the chemical potential of benzene change when the pressure exerted on a sample is increased from 100 kPa to 10MPa? Take the mass density of benzene to be  $0.8765 \text{ g cm}^{-3}$ .

6. Iron is heated from 100 °C to 150 °C. By how much does its chemical potential change? Take  $S_m^\ominus = 53 \text{ J/K mol}$  for the entire range.

8. Pressure was exerted with a piston on molten naphthalene at 95 °C. The vapour pressure of naphthalene when the applied pressure is 1.0bar is 2.0 kPa. What is its vapour pressure when the pressure on the liquid is 15MPa? The mass density of naphthalene at this temperature is  $1.16 \text{ g cm}^{-3}$ ?
9. The molar volume of a certain solid is  $142.0 \text{ cm}^3 \text{ mol}^{-1}$  at 1.00 atm and 427.15K, its melting temperature. The molar volume of the liquid at this temperature and pressure is  $152.6 \text{ cm}^3 \text{ mol}^{-1}$ . At 1.2MPa the melting temperature changes to 429.26K. Calculate the enthalpy and entropy of fusion of the solid.

**10.** The vapour pressure of a liquid in the temperature range 200 - 260K was found to fit the expression

$$\ln(p/\text{Torr}) = 18.361 - (3036.8\text{K})/T.$$

What is the enthalpy of vaporization of the liquid?

**12.** The normal boiling point of hexane is 69.0 °C. Estimate (i) its enthalpy of vaporization and (ii) its vapour pressure at 25 °C and at 60 °C. (Hint: You will need to use Trouton's rule.)

**11.** The vapour pressure of a liquid between 15 °C and 35 °C fits the expression  $\log(p/\text{Torr}) = 8.750 - (1625\text{K})/T$ . Calculate (i) the enthalpy of vaporization and (ii) the normal boiling point of the liquid.