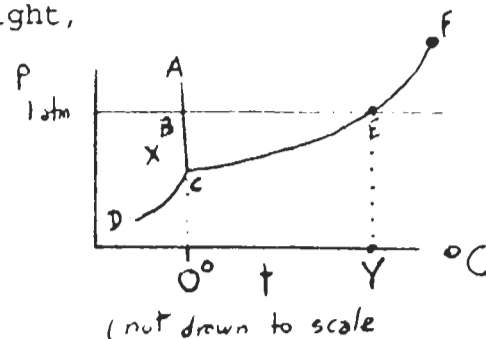


- ① From the phase diagram for water, to the right,
(A) identify by letter from the diagram

12 pts.

- (a) the normal freezing point _____
 (b) the triple point _____
 (c) the normal boiling point _____
 (d) the critical point _____



- (B) determine the phase change(s) which would occur when water at point X

- (a) is heated to 95°C at constant pressure.

- (b) has its pressure lowered at constant temperature.

- 6 pts. ② Calculate the molar mass of a solute if 3.00 g of the solute in 44.0 g of benzene freezes at 2.1°C. ($k_f = 5.1^\circ\text{C}/m$; f.p. = 5.5°C) Hint: First calculate the molality of the solution.

- 8 pts. ③ Calculate the vapor pressure of a solution of 2.00 mol of CH_3OH and 4.00 mol of H_2O at 25°C. The vapor pressures of the pure compounds at that temperature are 75 torr and 24 torr, respectively. *Note: both liquids are volatile and contribute to the vapor pressure.

- 4 pts. ④ In going from ice to water to steam, the *entropy* (which is related to the molecular disorder).... a) decreases b) doesn't change c) increases (circle correct choice)

For water, the molar heat (*enthalpy*) of fusion is 6.0 kJ/mol, while the molar heat (*enthalpy*) of vaporization is 40.8 kJ/mol. Calculate the molar heat (*enthalpy*) of sublimation for ice.

- ⑤ Which would have the strongest intermolecular forces in each group? (Circle the correct choice for questions 1, 2, and 3)

- 6 pts. 1- a) H_2O b) H_2S c) H_2Te d) H_2Se

- 2- a) He b) Ne c) Ar d) Xe

- 3- a) H_2 b) He c) HCl d) Ne