

CHEM441-001/002
 College of Charleston
 Fall 1999
 Exam I

1(15). By what factor will the pressure of an ideal gas sample change if the temperature is increased from 25 °C to 75 °C and the volume is increased from 5.00 ft³ to 10.00 ft³?

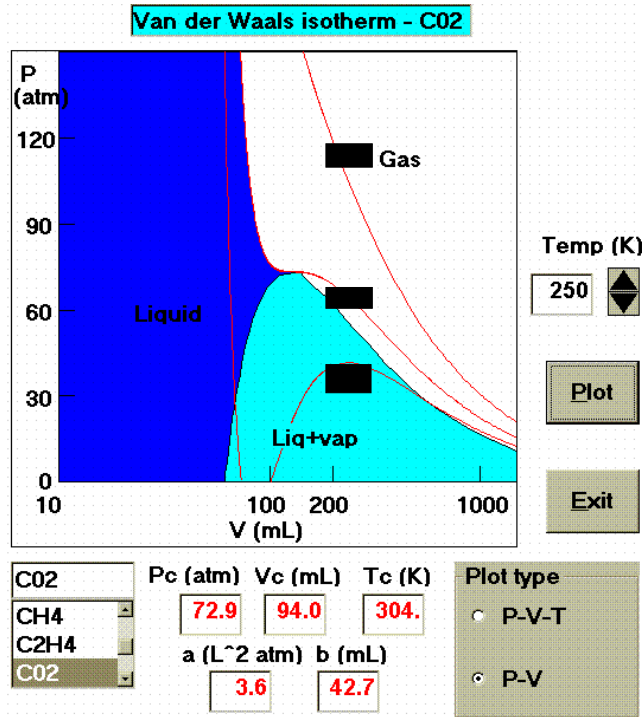
2(20). The density of gaseous oxygen at exactly 1 atm and 3000 K is 0.1298 g/L. The gaseous sample is a mixture of molecular and atomic oxygen. Calculate the mole fraction of atomic oxygen in the mixture. (Use 16.00 u for the atomic mass of O.)

3(25). Calculate the molar volume of steam at the normal boiling point of water assuming ideal gas behavior.

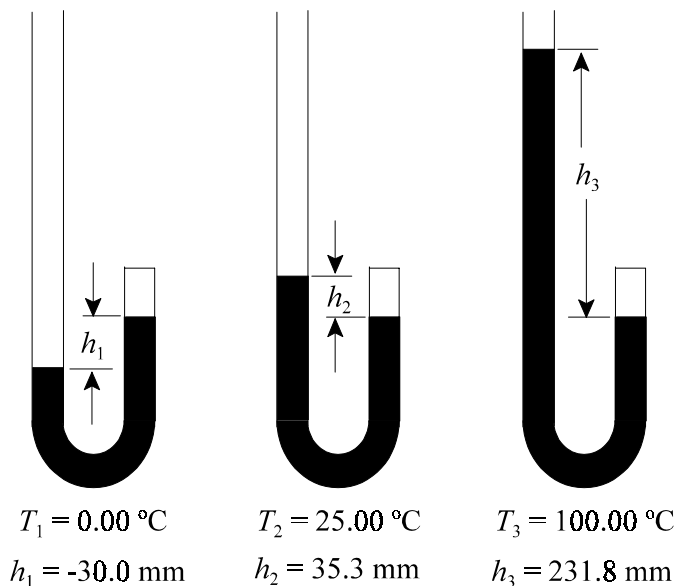
Based on your value of the molar volume and the actual value of 30.113 g/L given in various steam tables for these conditions, predict whether the second virial coefficient is positive or negative.

Why does the actual value of the molar volume deviate from the ideal value?

4(10). On the diagram for CO₂ shown below, clearly indicate and label the critical point, the 250 K isotherm, and the 400 K isotherm.



5(30). The validity of Amonton's law can be investigated in the laboratory using a manometer in which a fixed amount of gas is always contained at the same volume by adjusting the height of mercury h . The diagrams show three different measurements made in a laboratory in which the atmospheric pressure is 746.2 torr. State Amonton's law and show that the three sets of data confirm the law.



Express $(\partial P/\partial T)_{n,V}$ in terms of P and T .