Physics 301

Homework due 23 October 2024

1) Stowe Chapter 13 Section C includes a variety of examples of problems that use Maxwell's Relations. Invent another example that uses at least 2 of the relations. You may, but are not required to, base your example on one of the Stowe examples.

2) Stowe problem 13.12.

3) Stowe problem 14.6.

4) Stowe problem 14.9

5) (See attached figure.) A cylindrical container 80 cm long is separated into two compartments by a thin piston, initially clamped into position 30 cm from the left end. The left compartment is filled with 1 mole of helium gas at a pressure of 5 atm. The right compartment is filled with argon gas at pressure 1 atm. Both of these gases may be treated as ideal. The cylinder is submerged in 1 liter of water, and the entire system is initially at the uniform temperature of $25°C$. The heat capacities of the cylinder and piston may be neglected. After the piston is unclamped, a new equilibrium is reached with the piston in a new position.

(a) What is the increase in temperature of the water?

(b) How far from the left end of the cylinder will the piston come to rest?

He

5 atm

Ar

1 atm

Water

30 cm

50 cm