HomeWork Ch-1

1–23C What is the difference between intensive and extensive properties?

intensive : independent on the size of the system or the amount of matter

extensive : depend on the total mass or the size of system (system weight, volume

1–24C The specific weight of a system is defined as the weight per unit volume (note that this definition violates the normal specific property-naming convention). Is the specific weight an extensive or intensive property?

$$\text{Specific} = \frac{\text{Extensive}}{\text{mass}}$$

$$\gamma = \frac{\text{Weight}}{V} \Rightarrow \text{intensive}$$

$$\text{intensive} \leftarrow \frac{\text{Extensive}}{\text{mass, volume}}$$

specific weight $\Rightarrow$ intensive property

1–27C What is a quasi-equilibrium process? What is its importance in engineering?

*process that occur very slowly, so the system remains almost in equilibrium at every instant

* makes thermodynamic analysis easier
* allow properties (P, T) well defined through the process.

Ex: Very slow expansion of gas inside a piston-cylinder

1–28C Define the isothermal, isobaric, and isochoric processes.

* isothermal process: Process occurs at constant Temperature
T = Constant
State 1 ⇒ State 2 at T = Constant

*isobaric Process: process occurs at constant Pressure
P = Constant

*isochoric Process: Process occurs at constant specific volume v = constant.

1–29C What is specific gravity? How is it related to density?

SG : the ratio between the density of fluid to

the density of water at 4°C ($\rho_w = 1000\ kg/m^3$)

$$SG = \frac{\rho_f}{\rho_{H_2O(4°C)}}$$

1–40C What is the difference between gage pressure and absolute pressure?

* gage Pressure : the difference between the absolute Pressure and the atmospheric Pressure

$$P_{gage} = P_{abs} - P_{atm}$$

* abs Pressure : the actual Pressure at a given position, and it is measured relative Zero Vaccum (Zero absolute)

$$P_{abs} = P_{gage} + P_{atm}.$$

1–41C Explain why some people experience nose bleeding and some others experience shortness of breath at high Elevations

$$P_{atm} = \rho_{air}\, g\, h_{air}$$

$h_{air} \Rightarrow$ decrease $\Rightarrow$ $P_{atm} \Rightarrow$ decrease.

Partial Pressure of $O_2 \Rightarrow$ decrease.

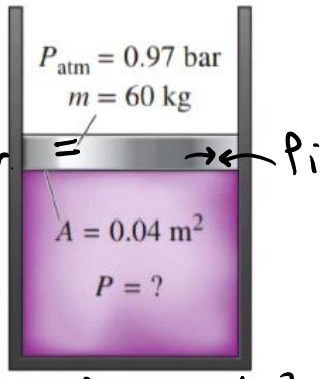
1–60 The piston of a vertical piston–cylinder device containing a gas has a mass of 60 kg and a cross-sectional area of 0.04 m^2, as shown in Fig. P1–60. The local atmospheric pressure is 0.97 bar, and the gravitational acceleration is 9.81 m/s^2. (*a*) Determine the pressure inside the cylinder. (*b*) If some heat is transferred to the gas and its volume is doubled, do you expect the pressure inside the cylinder to change?

$m = 60\ kg$

$g = 9.81\ m/s^2$

$P = 0.97\ bar$

$1\ bar = 100\ kPa$



cylinder = Piston

$A = 0.04\ m^2$

$P_{atm} = 0.97 * 100 = 97\ kPa$

a) $P_{gage} = \frac{F}{A} = \frac{W}{A} = \Leftrightarrow P_{abs} = \frac{W}{A} + P_{atm}$

$P_{gage} = \frac{W}{A} \Rightarrow W = mg = 60 * 9.81 = 588.6\ N$

$P_{gage} = \frac{588.6}{0.04} = 14715\ Pa = 14.715\ kPa$

$*P_{abs} = P_{gage} + P_{atm}$

$P_{abs} = 14.715 + 97 = 111.715\ kPa.$

b) $V_2 = 2V_1 \quad P_2 \Rightarrow$ change ?

$P \Rightarrow$ intensive Property

$P = \frac{W}{A} = \quad P_2 = P_1 \Rightarrow P$ remains constant

$P = \frac{W}{A} =$ $\quad P_2 = P_1 \Rightarrow P$ remains constant $=$