Problem 1

(a) An ideal gas (let's say O_2) exerts a pressure of 1.5 MPa when its temperature is 27^oC and volume is 0.01 m^3. What is the mass density of the gas? (b) A partially inflated balloon, near the surface of the earth, contains 600 m^3 of helium gas at 300K. What is the volume of the gas at an altitude of 15,000 ft, where the pressure is 0.5 atm and the temperature is 0^o C. (c) An air bubble released at the bottom of a pond expands four times its original by the time it reaches the surface. If atmospheric pressure is 100 kPa, what is the pressure at the bottom of the pond? Assume temperature is constant.

Problem 2

Consider an ideal gas at a fixed temperature of 20^oC undergoing volume contraction by 5 times. Assume the system undergoing a quasi-static process, calculate the work done on the system.

Problem 3

Consider a piece of Copper undergoing a change in pressure from 0 to 1000 atm at constant temperature in a quasi-static process. Calculate work done on the system. Compare the values of work done on ideal gas in Problem 2 and on solids like Copper in Problem 3.

Problem 4

Show that for a PVT system, $(\frac{\partial P}{\partial T})_V = \frac{\beta}{\kappa}$, where β and κ are volume expansion co-efficient and iso-thermal compressibility, respectively.

Practice problems (below) will not be discussed in the tutorial

Problem 5

Solve problems 3.2 to 3.5 from the book by Dittman and Zemansky.

Problem 6

Solve problems 1.10-1 and 1.10-2 from the book by Callen.