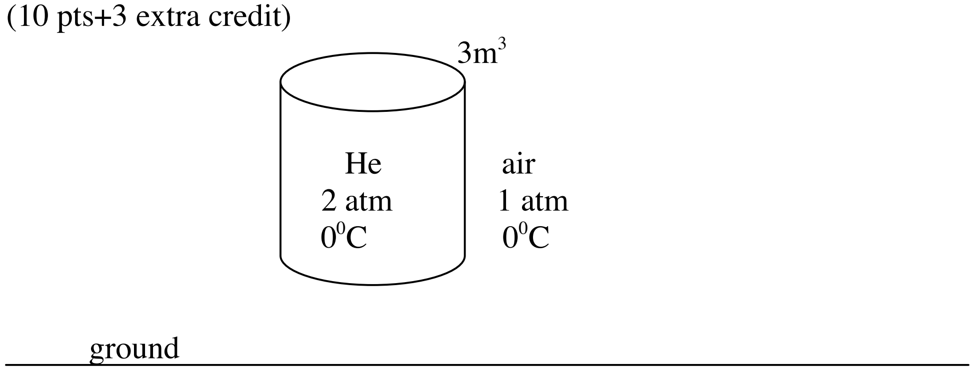
PHYSICS 4B QUIZ 3 SPRING QUARTER 2014
PROF. HIRSCH 3 Problems May 5th

Problem 1 (10 pts)
A string has length 49.9 cm when not under tension. When it is put in a guitar under tension of 200N its length increases to 50 cm, and its fundamental frequency is 500Hz at temperature 10^0C.
(a) What is the mass of this string, in g?
(b) When the temperature increases to 110^0C the fundamental frequency decreases to 353.55Hz. What is the string tension in that case?
(c) What is the thermal expansion coefficient (coefficient of linear expansion) for this string? Assume the dimensions of the body of the guitar don't change with temperature. Give your answer in $^0C^{-1}$.

Problem 2 (10 pts)
You are driving your car at speed 85 m/s (fast!) and hear the siren of a police car approaching you. The frequency of the siren is 1200Hz when at rest, you hear a frequency of 1800 Hz.
(a) What is the speed of the police car? (with respect to the ground)
(b) Fortunately the police car was not chasing you but somebody going even faster than you. After the police car passes you, what is the frequency of the siren you hear? Assume the speed of sound is 340m/s.

Problem 3 (10 pts+3 extra credit)



A container of volume $3m^3$ filled with He gas at pressure 2 atm floats in air at atmospheric pressure. The temperature is 0^0C both inside and outside the container. The density of air is 1.29 kg/m^3, the molecular mass of air and He are 29u and 4u respectively.
(a) How many mols of He are there in the container?
(b) What is the mass of He gas in the container, in kg?
(c) What is the mass of the container, in kg?
(d) (for extra credit) If the speed of sound is 340 m/s outside the container, what is it inside the container?