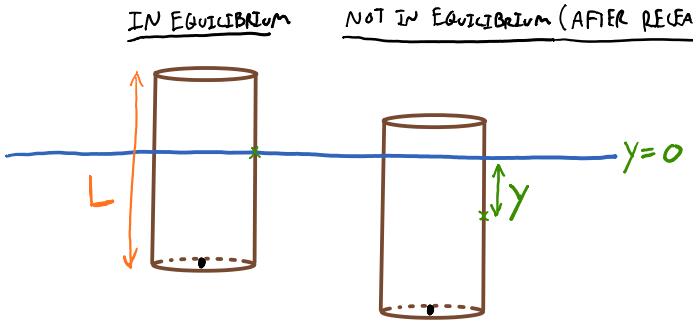
HIP 05

COMMENTS:

- Problem 1 is a list of suggested Student Workbook Volume 1 problems to practice in your spare time. You do not need to turn these in, they will not be graded. I recommend working through theses before attempting problem 2, or if you get stuck while working on problem 2.
- Problem 2 will be graded based off of the HIP rubric.

(1) CH 14: 1, 2, 3, 4, 5, 6, 7, 8, 11, 12, 13

(2) A long cylindrical tube of length **L**, and density $\boldsymbol{\rho_o}$, is very slightly weighted on one end so that it floats upright in a fluid hoaving density $\boldsymbol{\rho_f}$. Assume the tube is constant density and the slight weighing on one end is very small (negligible), with the only purpose to stablize the cylinder vertically in the fluid. The tube is pushed down a distance **y** from its equilibrium position and released.



a. Draw a FBD for the cylinder in the equilibrium condition, be sure to scale your vectors relative to each other and label them clearly.
b. Draw a FBD for the cylinder when it is displaced a distance **y** downwards, (when it is not in equilibrium after it is released). Be sure to scale your vectors relative to each other and relative to your FBD in part a. Label all vectors clearly and consistent with your part a FBD. *Hint: break up the buoyant force in the non-equilibrium condition into 2 separate buoyant forces; what might be a good choice to let the magnitude of one of these two buoyant forces be?*
c. Apply Newton's 2nd law to your FBD from part a to construct an equation.
d. Apply Newton's 2nd law to your FBD from part b to construct an equation.
e. Use your two equations from part c and d to show that the cylinder will undergo simple harmonic motion assuming the resistive effects of the fluid are neglected.
f. Determine the period of oscillation in terms of **L**, $\boldsymbol{\rho_o}$, and $\boldsymbol{\rho_f}$.