Physics 3C

Quiz 1

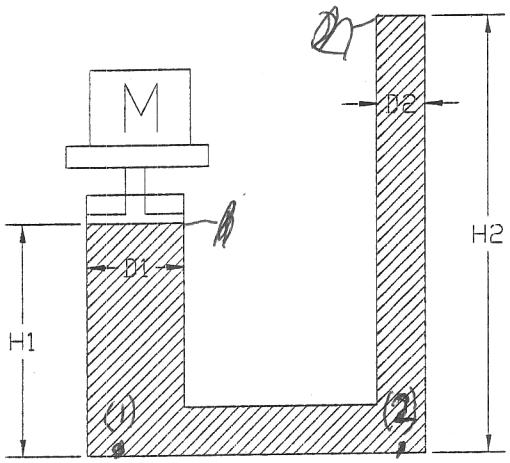
Name:

ID:

TA:

Problem 1:

The system below is formed with two circular pipes of diameters D1 and D2 connected together. A mass M sits on a piston at height H1 so that fluid of density ρ is just level with the top of the pipe at H2. Solve for the Mass in terms of ρ, H1, H2, D1 and D2. Assume that the piston is massless.



Using Bernoulli's equation

at (1) $P_{ATm} + \frac{Mg}{A_1} + \rho g H_1 = \text{Constant}$

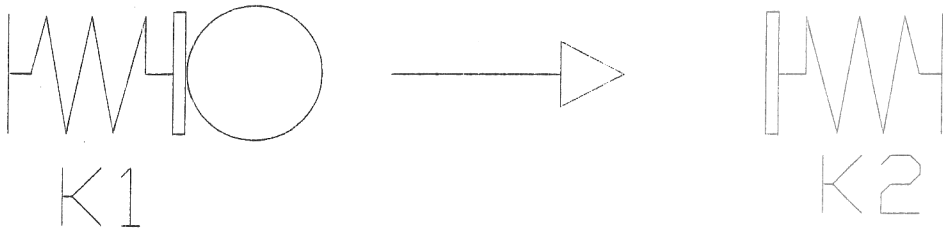
at (2) $P_{ATm} + \rho g H_2 = \text{Constant}$

so $P_{ATm} + \frac{Mg}{A_1} + \rho g H_1 = \rho g H_2 + P_{ATm}$

$M = \rho (H_2 - H_1) A_1$

$= \rho \pi \frac{D^2}{4} (H_2 - H_1)$

Problem 2:
A massless spring with spring constant K1 is depressed a distance X1 and used to fire a ball towards a second massless, uncompressed spring of spring constant K2. Find the distance X2 that the second spring will be compressed. Energy is conserved.



$E_i = E_f$

$E_i = \frac{1}{2} K_1 X_1^2$

$E_f = \frac{1}{2} K_2 X_2^2$

so $\frac{1}{2} K_1 X_1^2 = \frac{1}{2} K_2 X_2^2$

$X_2 = \sqrt{\frac{K_1}{K_2}} X_1$