



first two letters of last name

Physics 7B - Winter 07 - Quiz 6

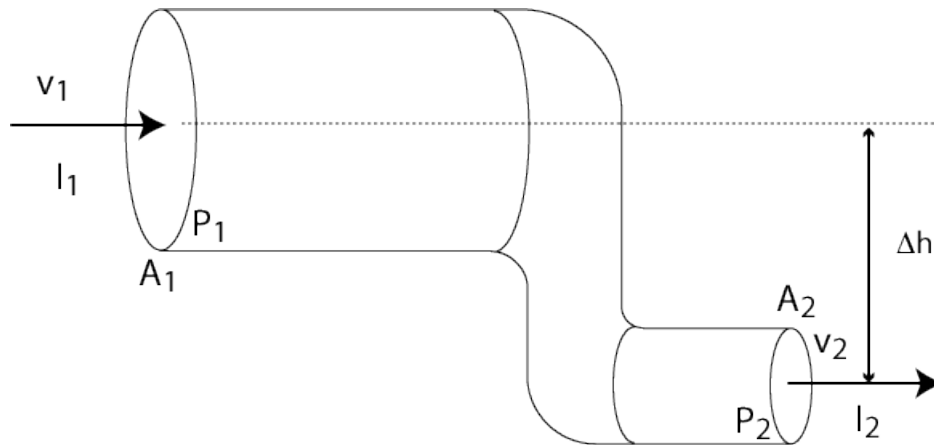
Name _____ Student ID _____

DL section number _____

I certify by my signature that I will abide by the code of academic conduct of the University of California

Signature _____

No books or notes. Calculators OK. Show all of your work below - answers alone do not receive credit!



The above diagram shows a section of a water circuit in which there is no resistance. Suppose that $A_2 = A_1/4$, and $A_1 = 0.4 \text{ m}^2$. The input flow rate I_1 is $0.2 \text{ m}^3/\text{s}$, and the input pressure is 200 Pa (recall $1 \text{ Pa} = 1 \text{ N/m}^2$). The change in height $\Delta h = 1 \text{ m}$.

1. (2.5 pts) Find an algebraic expression for the output velocity v_2 in terms of I_1 , A_1 , and P_1 and then find the value of v_2 .

2. (1.5 pts) Use Bernoulli's equation to find an algebraic expression for the pressure P_2 .

3. (0.5 pts) Find the value of the pressure at the outflow, P_2 .

Bernoulli's equation: $\Delta P + \Delta(1/2 \rho v^2) + \Delta(\rho gh) = \Delta E_{\text{pump}}/\text{vol} - IR$ flow rate $I = Av = \text{const.}$ $\rho_{\text{water}} = 10^3 \text{ kg/m}^3$

Question 1 (2.5):

Sum the points whose associated contents are shown on your paper:

Item	contents	points
1	$I_1=I_2$ or $A_1V_1 = A_2V_2$	1.5
2a	$V_2 = A_1V_1/A_2$ or I_1/A_2	0.2
b	$V_2 = 4 \cdot I_1 / A_1$	0.5
3a	$V_2 = 2$ m/s	0.5
b	= 2 no unit or different value	0.3

B (2.5) – Complete answer (1 + 2b + 3a)

D (2.3) – (1 + 2b + 3b)

E (2.2) – (1 + 2a + 3a)

G (2.0) – (1 + 3a) or (1 + 2b)

I (1.8) – (1 + 3b)

J (1.7) – (1 + 2a)

K(1.5) - (1)

S (0.2) - (3b)

Z(0) - blank or no show all work

Question 2 (1.5):

Sum the points whose associated contents are shown on your paper:

Item	contents	points
1	Bernoulli's eq. (a = b + c)	
a	$\Delta p + \Delta(\frac{1}{2}\rho v^2) + \Delta(\rho gh)$	0.3
b	$\Delta E_{\text{pump}} / \text{vol}$	0.05
c	$-IR$	0.05
2 a	$\Delta E_{\text{pump}} / \text{vol} = 0$ (no pump)	0.05
b	$-IR = 0$ (no resistance)	0.05
3 a	$\Delta p \rightarrow P_2 - P_1$	0.3
b	$\Delta(\frac{1}{2}\rho v^2) \rightarrow \frac{1}{2}\rho(v_2^2 - v_1^2)$	0.3
c	$\Delta(\rho gh) \rightarrow \rho g \Delta h$ or $\rho gh_2 - \rho gh_1$	0.3
4	$P_2 = P_1 - \frac{1}{2}\rho(v_2^2 - v_1^2) - \rho g \Delta h$	0.1

A -> 1.5 (Complete answer: 1 + 2 + 3 + 4)

B ->1.45, C -> 1.40, D -> 1.35, E ->1.30, G -> 1.20, H -> 1.15,

I ->1.10, J -> 1.05, K -> 1.00, L ->0.90, M -> 0.85, N -> 0.80,

P ->0.75, Q -> 0.70, R -> 0.60, S ->0.55, T -> 0.50, U -> 0.45,

V ->0.40, W -> 0.30, X->0.20, Y->0.10, Z -> 0.00

Question 3 (0.5):

$$\begin{aligned} P_2 &= P_1 - \frac{1}{2}\rho(v_2^2 - v_1^2) - \rho g \Delta h \\ &= 200 - 0.5 \cdot 1000 \cdot (4 - .25) - 1000 \cdot 10 \cdot (-1) \\ &= 8,325 \text{ Pa} \end{aligned}$$

Q (.5) - correct input data and answer

S (.4) - correct input data but incorrect answer/correct value with no unit

/no P_2 value

T (.3) - incorrect input data ($\Delta h / v_1$).

U (.2) - T + incorrect v_1 data

V (.1) - U + others (no answer/wrong unit/...)

Z (0) - Blank or no show work or don't use Q2 result