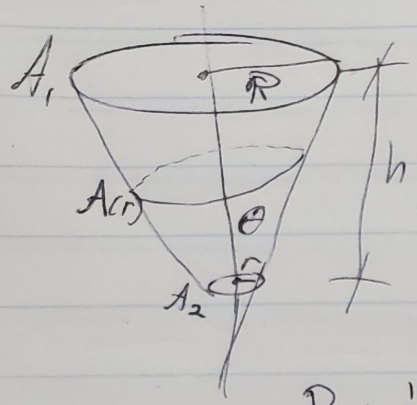
1. 

$h = 0.4m$ How long till $h/2$?

$g = 9.8 m/s^2$

$R = 0.5m$ $P_B = 101,300 Pa$

$A_2 = 0.0003 m^2$

$$P_1 + \frac{1}{2}\rho V_1^2 + \rho g h = P_2 + \rho g h + \frac{1}{2}\rho V_2^2$$

$A_2 = \pi r^2 = 0.0003 m^2$

$\pi \quad \pi$

$r = \sqrt{\frac{0.0003}{\pi}} = 0.097 \approx 0.1m$

$\tan\frac{0.5}{0.4} = 51.3° = \theta$

$$\frac{dh}{dt}\pi h^2 \tan^2\theta = 0.0003\sqrt{2gh}$$

$$\int_0^{H/2} h^{3/2}\,dh = \frac{0.0003\sqrt{2g}}{\pi \tan^2\theta}\,t$$

$$\frac{2}{5}\frac{\left(\frac{H}{2}\right)^{\frac{5}{2}}(\pi \tan^2\theta)}{0.0003\sqrt{2g}} = t = \frac{4.9}{0.4 \cdot 0.2^{5/2}(\pi \tan^2 51.3)}$$

$0.0003\sqrt{19.6}$

$\frac{0.035}{0.00329} = 26.3$ seconds $\quad 4.43$

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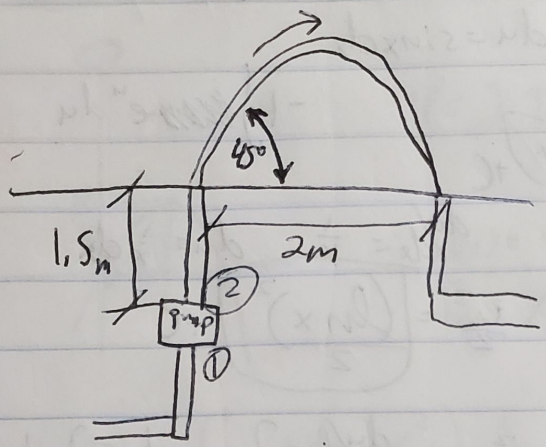
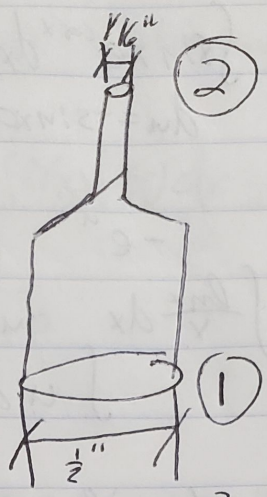
2.





$V_1 \pi r_1^2 = V_2 \pi r_2^2$

$V_2 = 6.25 V_1$

$r_1 = 0.0127\,m$ $A_1 = 0.00005\,m^2$

$r_2 = 0.0016\,m$ $A_2 = 0.000008\,m^2$

-2.01 0.45

$0 = -4.9t^2 + V_2 \cos 45 t$

$2 = V_2 \sin 45 t$

$V_2 = 4.47\,m/s$

$V_2 = \frac{t \sin 45}{2} = 6.25 V_1$

V_1

$0 = -4.9t^2 + \frac{t \sin 45}{2} \cos 45 t$

$P_2 = P_1 + \rho g h$

$4.9t^2 = V_2 \cos 45 t$ $V_2 = \frac{4.9t^2}{t \cos 45}$

$h_2 = 1.5 + 2.01$

$101,300 + 1000 \cdot 9.8 \cdot 3.51$

$= 135,698\,Pa$

$= 19.687\,psi$

$2 = \frac{4.9t^2}{t \cos 45} \cdot t \sin 45 \Rightarrow 2 = 4.9t^2 \tan 45$

$t = 0.64\,s$ $y = -4.9t^2$

$P_1 + \frac{1}{2}\rho V_1^2 + \rho g h_1 = P_2 + \frac{1}{2}\rho V_2^2 + \rho g h_2$

3. replace the current nozzle with a larger one

4. $A = 1\text{mm}$ $\lambda = 2\text{m}$ $v = 4\text{m/s}$

0.001m

$D(x,t) = A\sin\left(\frac{2\pi}{\lambda}x + 2\pi\frac{v}{\lambda}t + \frac{\pi}{6}\right)$ $f = \frac{v}{\lambda}$

$0.0005 = 0.001\sin\phi$

$$0.001\sin\left(\frac{2\pi x}{\lambda} + \frac{2\pi v t}{\lambda} + \frac{\pi}{6}\right)$$

5. $A = 2\text{mm}$ $v = 4\text{m/s}$ $f = 0.2$ $\lambda = 20\text{m}$

0.002m

$-0.002 = 0.002\sin\phi = -\pi/2$

$$D(x,t) = 0.002\sin\left(\frac{2\pi x}{\lambda} + \frac{2\pi v t}{\lambda} - \frac{\pi}{2}\right)$$

6. D

7. B