Cracking AP Ch. 8 MC Solutions

APB

(1) D

(2) C

(3) $E_{max} = \frac{1}{2}kA^2$

at $A/2$ the $PE = \frac{1}{2}k\left(\frac{A}{2}\right)^2 = \frac{1}{2}kA^2 / 4$

so $KE = E_{TOT} - PE$

$= \frac{1}{2}kA^2 - \frac{1}{4}\left(\frac{1}{2}kA^2\right)$

$= \frac{3}{4}\left(\frac{1}{2}kA^2\right)$

$$\frac{KE}{E_{TOT}} = \boxed{3/4} \quad \text{(E)}$$

(4) $\omega_0 = \sqrt{\frac{k}{m}}$ same spring so k same, but double mass

Method I: so $\omega' = \sqrt{\frac{k}{2m}} = \frac{1}{\sqrt{2}}\omega_0$ $\quad v_{max} = (\omega')A = \frac{1}{\sqrt{2}}\omega_0 A$

Method II:

Also $E_{TOT} = \frac{1}{2}kA^2$ doesn't change $\quad \frac{1}{2}kA^2 = \frac{1}{2}(2m)v_2^2$

$\frac{1}{2}kA^2 = \frac{1}{2}mv_1^2$

$\frac{1}{2}\cancel{m}v_1^2 = \frac{1}{2}(2\cancel{m})v_2^2$

$\frac{1}{2}v_1^2 = v_2^2$

$v_2 = \frac{1}{\sqrt{2}}v_1$

(C)

(5) D

(6) $f = \frac{1}{2\pi}\sqrt{\frac{k}{m}}$ $\quad f^2 = \frac{1}{4\pi^2}\left(k/m\right)$ $\quad \left[\omega = \sqrt{k/m} \rightarrow 2\pi f = \sqrt{\frac{k}{m}}\right]$

slope of f^2 vs. $1/m$

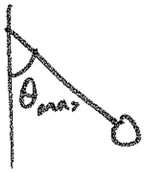
is $k/4\pi^2$ (D)

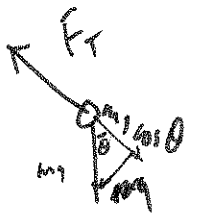
APD

7. N.A.

8. A

9. c

10. 

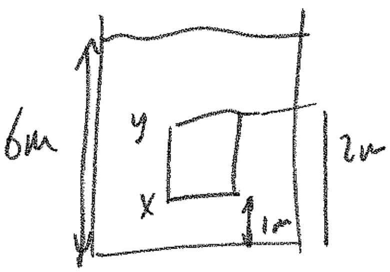


$v=0$, so no a_c

$F_T - mg\cos\theta_{max} = m\cancel{a}^{0}$

$F_T = mg\cos\theta_{max}$ (B)

Chapter 18 MC

1. 

$P_x = \rho g h_x \quad P_y = \rho g h_y$

$P_x = \rho g(5) \quad P_y = \rho g\, y$

2. $P_{top} = P_{atm} + \rho g(D-z)$ (C)

$F = PA = (P_{atm} + \rho g(D-z))\,xy$

3. $P_Y = P_{gas(x)} + \rho g(1) = 13000 \rightarrow \rho g = 13000 - P_{gas(x)}$

$P_Z = P_{gas(x)} + \rho g(3) = 29000 \rightarrow P_{gas(x)} + (13000 - P_{gas(x)})(3) = 29000$

$P_{g(x)} + 39000 - 3P_{gas(x)} = 29000$

$2P_{gas(x)} = 10000$

$P_{gas(x)} = 5000\ Pa$

(C)

APB

(4) $\rho = \frac{m}{V} = \frac{100}{0.5^3} = 800 \ kg/m^3$

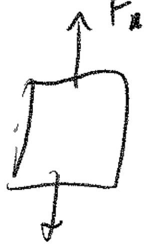
ratio gives fraction under water $\frac{800}{1000} = 0.8$

so 0.2 above

(1/5)

A

(5)



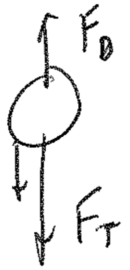
$$\Sigma F = ma = \rho_w V_s g - \rho_s V_s g$$

$$\rho_s V_s (a) = V_s g(\rho_w g - \rho_s g)$$

$$a = \frac{\cancel{V_s}(\rho_w - \rho_s)}{\cancel{V_s}} g$$

A

(6)



specific grav $= \rho_L / \rho_{water} = 0.4$

$$\Sigma F = m\cancel{a}^{0} = F_B - mg - F_T$$

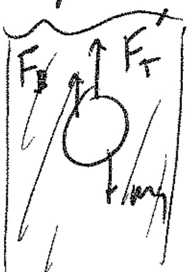
$$F_T = F_B - mg = \rho_w V g - \rho_L V g$$

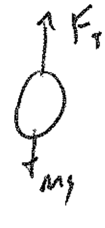
$$= 1000(5\times10^{-3})(10) - 400(5\times10^{-3})(10)$$

$$= \boxed{30N}$$

B

(7) specific grav. $= \rho_L / \rho_W = 2$





$F_T' = F_T - 100 = mg - 100$

$F_T' + F_B = mg \rightarrow F_T' = mg - F_B$

~~$F_T = mg - 100$~~

$-100 = mg - F_B$

$F_B = 100 = \rho_w V g$

$V = 0.01 m^3$

$mg = 200N$ A

$mg = \rho V g$

$= 2000(\ )g$

(8) continuity eqn

$$A_x V_x = A_y V_y$$

$$\cancel{\pi}\left(\frac{d_x}{\cancel{2}}\right)^2 V_x = \cancel{\pi}\left(\frac{d_y}{\cancel{2}}\right)^2 V_y$$

$$V_y = \frac{d_x^{\,2}}{d_y^{\,2}} V_x = \frac{3^2}{9^2}(6) = 2/3$$

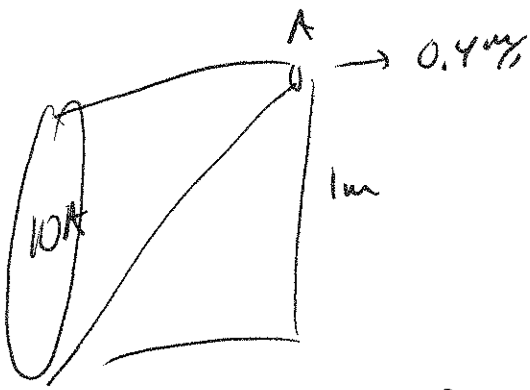
(A)

(9) $A_{TOP} V_{TOP} = A_{BOT} V_{BOT}$

$$V_{BOT} = \frac{A_{TOP}}{A_{BOT}} V_{TOP} = \frac{\cancel{12}^{\,2}(\cancel{24}^{\,8})}{\cancel{(6)}\cancel{(3)}}(v) = 16v$$

(E)

(10)



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

$$A_1 V_1 = A_2 V_2$$

$$V_1 = \frac{A_2}{A_1} V_2$$

$$V_1 = \frac{1}{10} V_2$$

$$P_{pump} + \tfrac{1}{2}\rho\left(\tfrac{1}{10} V_2\right)^2 = P_{atm} + \rho g(1) + \tfrac{1}{2}\rho V_2^2$$

$$P_{pump} = P_{atm} + \rho g(1) + \tfrac{1}{2}\rho\left(V_2^2 - \left(\tfrac{1}{10}\right)^2 V_2^2\right)$$

$$= P_{atm} + \rho g(1) + \tfrac{1}{2}(1000)\left(0.4^2 - \frac{0.4^2}{10^2}\right)$$

$$= 100000 + 10000$$

$$= 110079 \sim 108\ kPa$$

(A)