國立東華大學
Department of Physics
National Dong Hwa University, 1, Sec. 2,
Da Hsueh Rd., Shou-Feng, Hualien, 97401, Taiwan

General Physics I, Quiz 4
PHYS1000AA, Class year104/2015
2015-12-01, Thursday

Quiz-4 Solution

1. Solution :

(a) The absolute pressure is

$P = P_0 + h\rho g$,Where $P_0$is the air pressure and $h = 2.0km, \rho = 1000kg/m^3,\ g\ = 9.8m/s^2$

$\therefore P = 100000Pa + (2000m \times 1000kg/m^3 \times 9.8m/s^2) = 1.97 \times 10^7\, Pa$

(*b*)The gauge pressure is the difference in pressure between the water outside and the air inside the submarine, which we suppose is at 1.00 atmosphere.

$\therefore P_{gauge}\ =\ P\ -\ P_0\ =\ h\rho g = 1.96 \times 10^7\, Pa$

The resultant inward force on the window is then

$F = P_{gauge}A = 1.96 \times 10^7\, Pa \times \pi r^2 = 1.96 \times 10^7\, Pa \times 3.14 \times (2.0)^2 = 2.5 \times 10^8\, N$

2. Solution:

(*a*) Since the object in motion , we can use the equation of motion as

$x = v_0 t + \frac{1}{2}gt^2$, where at initial time $v_0 = 0$

$\therefore x = \frac{1}{2}gt^2 \Rightarrow 4m = \frac{1}{2} \times 9.8m/s^2 \times t^2,$ where $x = A = 4m$

$\therefore\ t = \sqrt{\frac{8}{9.8}} = 0.9s$

This is needed to cover half of a full oscillation , So for a full oscillation time is called the period of a oscillation

$\therefore T = 2t = 2 \times 0.9 = 1.8\text{sec}$

(*b*) The frquency if undamped will be $\omega_0 = \sqrt{\frac{k}{m}} = \sqrt{\frac{2.0 \times 10^4}{10}} = 44.7/s$

If we consider damping , then the frequency is defined by

$\omega = \sqrt{\omega_0^2 - \frac{b^2}{2m}} = \sqrt{(44.7)^2 - (\frac{3.0x10^4}{2 \times 10})^2} = \sqrt{2000 - (\frac{3.0x10^4}{2 \times 10})^2} = 1499.3i/s,\ where\ i = \sqrt{-1}$

3. Solution:

(*a*)The distance will be covered by the string for down and back in four trips

$d_{total} = 4(1.5\ m\ + 1.5\ m)\ \ = 4 \times 3\ m = 12m$

Then we cna find the speed of wave is $v = \frac{d_{total}}{t}$

$\therefore v = \frac{12m}{0.8s} = 15m/s$

Now we know that $v = \sqrt{\frac{T}{\mu}}$, Where $T =$ String Tension produced at the edge

and $\mu =$ Mass per unit length of string

$\therefore\ \ v = \sqrt{\frac{T}{\mu}}\ \ \Rightarrow\ T = \mu v^2 = (\frac{50}{1000 \times 1.5} kg/m) \times (15)^2 = 0.03 \times 225N = 7.5N$

(*b*)Longitudinal wave will be produced