Physics 160

Extra Credit #27

14.1

a) $f = 460\,Hz$, $T = ?$, $\omega = ?$

$T = \frac{1}{f} = \frac{1}{460\,Hz} = 0.00215\,s$

$\omega = 2\pi f = 2\pi(460) = 2930\,rad/s$

b) $T = 50\mu s = 50\times10^{-6}\,s = 5\times10^{-5}\,s$, $F = ?$, $\omega = ?$

$f = \frac{1}{T} = \frac{1}{5\times10^{-5}\,s} = 20000\,Hz$

$\omega = 2\pi f = 2\pi(20\,000) = 125663.7\,rad/s = 126\,000\,rad/s$

c) $\omega = 2.7\times10^{15}\,rad/s$ to $4.7\times10^{15}\,rad/s$, $T = ?$

$\omega = 2\pi f = \frac{2\pi}{T}$ $\rightarrow$ $T = \frac{2\pi}{\omega} = \frac{2\pi}{2.7\times10^{15}\,rad/s} = 2.327\times10^{-15}\,s$

$= 2.33\times10^{-15}\,s$

$T_{MAX}$ ↑

$T = \frac{2\pi}{4.7\times10^{15}\,rad/s} = 1.34\times10^{-15}\,s$

↑ $T_{MIN}$

d) Frequencies for previous

$$f = \frac{1}{T} \Rightarrow f_{MIN} = \frac{1}{T_{MAX}} = \frac{1}{2.327 \times 10^{-15}\,s} = 4.3 \times 10^{14}\,Hz$$

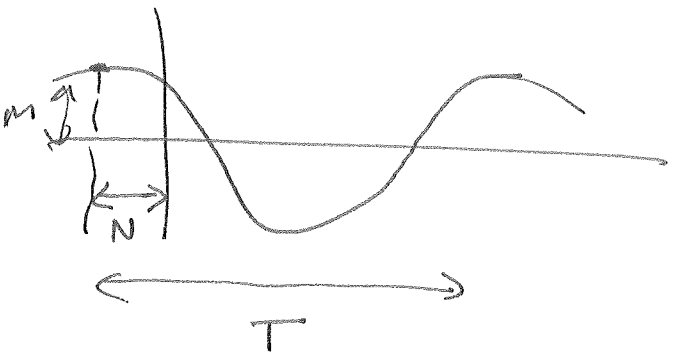
$$f_{MAX} = \frac{1}{T_{MIN}} = \frac{1}{1.34 \times 10^{-15}\,s} = 7.48 \times 10^{14}\,Hz$$

e) $f = 5.10\,MHz = 5.1 \times 10^{6}\,Hz$, $T = ?$, $\omega = ?$

$$T = \frac{1}{f} = \frac{1}{5.1 \times 10^{6}\,Hz} = 1.96 \times 10^{-7}\,s$$

$$\omega = 2\pi f = 2\pi (5.1 \times 10^{6}\,Hz) = 3.2 \times 10^{7}\,rad/s$$

# Cosine Wave




What is Amplitude?

M gives max distance from 0

What is $\omega$? T is period since it's from peak to peak

$\Rightarrow \omega = \frac{2\pi}{T}$

What is $\phi$?

When $t = -N$, $X = M$

$X = A\cos(\omega t + \phi) \Rightarrow M = M\cos(\omega(-N) + \phi)$

$\Rightarrow \cos(-N\omega + \phi) = 1 \quad \Rightarrow -N\omega + \phi = \cos^{-1}(1) = 0$

$\Rightarrow \phi = N\omega = \frac{N2\pi}{T}$

MASS & SPRING

a) What does Removing mass Do to Amplitude?

Amplitude occurs at MAXimum displacement ⇒ Speed = 0

Energy = $\frac{1}{2}mv^2 + \frac{1}{2}kx^2$ ⇒ Energy = $0 + \frac{1}{2}kA^2 = \frac{1}{2}kA^2$

A lighter Cart has less Kinetic Energy ⇒ less total Energy

⇒ A gets smaller

b) Dropping SAND BAG at EQUILIBRIUM? ...

I think Mastering Physics has All the explanations I would Use myself, so go READ their ANSWERS!