Physics 133, 3:30pm Spring 2006, Quiz 1 Name: KEY

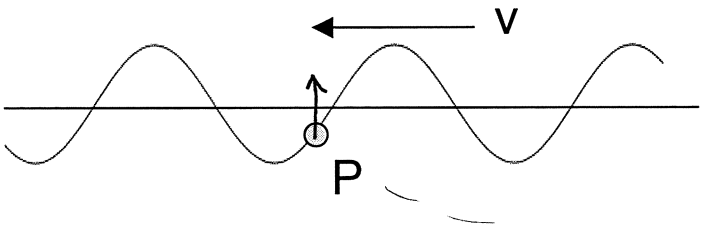
TA: _____

$$k = 2\pi/\lambda \quad \omega = 2\pi f \quad f = 1/T \quad v = \lambda f \quad v = \sqrt{\frac{F_s}{\mu}}$$

CHOOSE ONE ANSWER

1) A wave is traveling to the left on the string shown. The instantaneous velocity of point P is:

(A.) Upwards
B. Downwards
C. To the right
D. 45° (right and upwards)
E. No direction since its speed is zero



SHOW WORK

2) A wave on a string under tension is generated by a oscillating source, and is described by the equation: $y = y_m \sin(kx - \omega t)$

$y_m = 1.2 \sin[0.2x + 0.5t]$

$k = 0.2 \frac{rad}{m}$ $\omega = 0.5 \frac{rad}{s}$

where all of the units are in seconds and meters (or their inverse), as appropriate. Don't forget units in your answers below.

a) What is the wavelength?
b) What is the period of the wave?
c) What is the speed of the wave?
d) The tension is then increased by a factor of 4, but the source frequency remains the same. What is the new wavelength of the wave?

a) $\lambda = \frac{2\pi}{k} = \frac{2\pi}{0.2}$

b) $f = \frac{\omega}{2\pi} = \frac{0.5}{2\pi}$ $T = \frac{1}{f} = \frac{2\pi}{0.5} = 4\pi$

c) $v = \lambda f = \left(\frac{2\pi}{0.2}\right)\left(\frac{0.5}{2\pi}\right) = \frac{0.5}{0.2}$

d) $v_{old} = \sqrt{\frac{F_a}{\mu}}$ $v_{new} = \sqrt{\frac{4F_a}{\mu}} = 2\sqrt{\frac{F_a}{\mu}} = 2v = 2(\lambda_{old})(f_{old}) = \lambda_{new} f_{new}$

equal

$\lambda_{new} = 2\lambda_{old}$