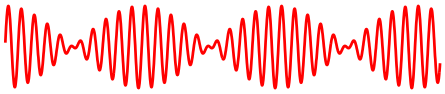
April 17 - 23, 2012 Physics 132 midterm 1 Schwartz Name_____

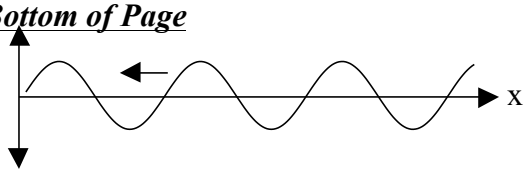
Part I, Multiple Choice – *Choices Supplied at Bottom of Page*



Name____

Equation____

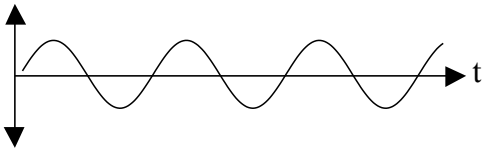
Description____



Name____

Equation____

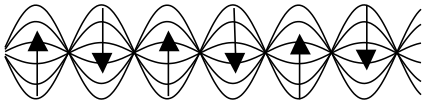
Description____



Name____

Equation____

Description____



Name____

Equation____

Description____

1) For the blank next to NAME: fill in one of the corresponding **letters**.
a) standing waves
b) beats
c) Correspondence Principle
d) Doppler Shifting
e) Critically Damnped Resonance
f) motion of a simple harmonic oscillator
g) traveling wave

2) For the equation, put in the letter of the appropriate equation from the following:
a) $y = A\sin(kx+\omega t)$
b) $y = A\sin(\omega t + \varphi)$
c) $y = A\sin(kx -\omega t)$
d) $y = A\sin(kx+\omega t) + A\sin(kx-\omega t)$
e) $y = A\sin(\omega t)\sin(kx+\varphi)$
f) $y = A\sin(\omega_o t)\sin(20\omega_o t)$

For FULL Credit, TWO of the above formulas are correct for one of the above wave forms. Please put both correct formulas in the space provided.

3) For the description, put in the letter of the appropriate description from below:
a) velocity of a particle as a sinusoidal wave goes by
b) Is transmitting power.
c) Is the result of a laser passing through a single slit
d) The result of two identical waves coming from opposite directions
e) The result of two waves of slightly different frequencies.

4) Put a star on the pictures of the wave form(s) above that are the result of interference.

Part II, Short Answers. Put answers on line provided.

1) Below, you see a tube that is open at only one end (open on the left). The tube is 1 m long. I resonate it at the **second lowest** frequency possible.

a) Please draw the wave function in the above drawing.
b) Briefly explain how you know to draw the function as you did above

c) Please find the frequency of the sound that results.

f = _____

2) A mass, m_o is oscillating on a spring, K_o with amplitude, A_o. It presently has frequency, ω_o, Energy, E_o, maximum velocity V_o, and maximum acceleration, a_o. If I double the mass, and keep K, and A the same, what will be the new (for Full Credit: supply an answer for each):

a) Frequency, ω…(answer with a number multiplied by ω_o)

ω = ____ ω_o

b) Energy, E

E =_____E_o

c) Maximum acceleration, a

a = _____a_o

3) On the axis below, you see a wave on the ocean at time t=0.
The equation is of the wave is: $y= 3m \sin (0.2x/m + 2t/s - \pi/4)$. On the image below "x" is horizontal distance (not time).

a) At point "C", indicate with an arrow, the direction of the *wave's* velocity.
b) A person is floating (not surfing) on the water at Point B; draw an arrow at pt. B to indicate the direction of the person's acceleration.
c) A person is floating on the water at Point A; draw an arrow at pt. A to indicate the direction of the *person's* velocity.
d) Mark with an "X" one place where a person floating in the water would achieve maximum velocity.
e) ** If the picture was taken at t=0, indicate with a vertical line, where the origin is. What I'm asking you to do here is draw the y axis in one of the correct places.

f) Find this maximum velocity of a person floating on the water's surface.

V_{max} = _____

g) Find the period of oscillation of a person.

T = _____

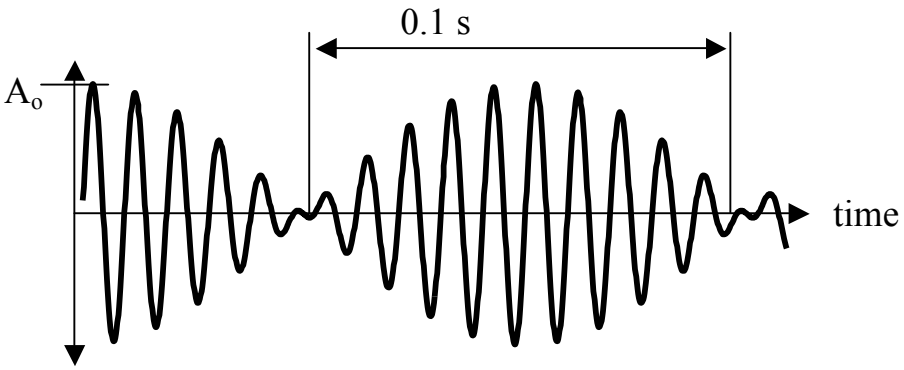
h) Find the wavelength.

λ = _____

i) Find the speed of the wave.

v_w = _____

Part III, Thoughtful answers



1) If you were given a box of tuning forks of every possible frequency, how would you create the above exact (sound) wave? If possible, name the exactfrequencies of the tuning forks used.

2) I'm playing my guitar. I pluck the string directly in the middle and then I pluck the string close to one of the ends of the string.
    a) Why do the tones sound different? Draw a picture, use words like "mode" and "Fourier".

    b) Show in a picture where I should pluck the string to get a lot of sound from the first overtone (one octave higher than the fundamental frequency)

3) I see an F15 fighter coming directly at me. I can hear the jets screaming at a frequency of 300 Hz when I know that they normally have a frequency of only 100 Hz.

a) Is the plane flying faster than sound? How do you know?

b) What is the wave length of the sound wave at your ears?

λ = _____

c) * How fast is the plane flying?

v = _____

d) Why do I hear a different frequency than I know the plane makes? (a good picture would be helpful!)

e) *My friend was flying by me in a plane at the same time and reported hearing a pitch of 200 Hz. How fast was she flying and in which direction? <u>explain your answer.</u>

v = _____, Direction _____