PHY 201 Quiz #9 **Name** _____

Score _____

Instructions:
1. Do all of your work on this sheet.
2. **Show all of your steps** in problems for full credit.
3. **Be clear and neat** in your work. Any illegible work, or scribbling in the margins, will not be graded.
4. Place your **answers in a box**. Do not forget **units**!
5. If you need more space, you may use the back of the page and write **On back** in the problem space.

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1. **Multiple Guess (3 pts)** Find the answer which best fits the question and write it in the space provided.

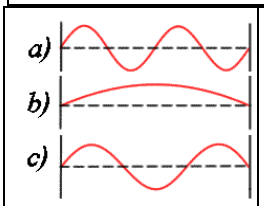
a. For simple harmonic motion of a mass-spring system the acceleration of the mass will be maximum when its
a) displacement is maximum b) velocity is maximum
c) displacement is minimum d) potential energy is minimum
e) kinetic energy is maximum . _____

b. The displacement *y(x,t)* of a particular traveling wave has the form $y(x,t) = A\sin(x + \frac{\pi}{2}t)$. What is the speed of this wave?
(a) π/2 (b) 2π (c) 4 (d) 8π (e) none of these _____

c. Decreasing the mass at the end of a simple pendulum will
a) increase the frequency. b) decrease the period.
c) increase the period. d) have no effect on either the period or frequency. _____

2. **Definition/Principle (5 pts)**

a. Consider the below three harmonics of a vibrating string.



i. Which has the highest frequency? ____

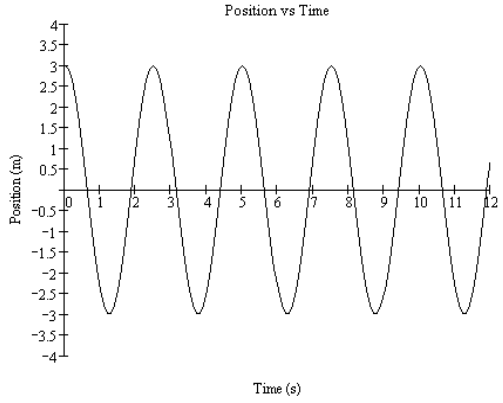
ii. Which is the fundamental mode? ____

iii. What is the wavelength for a) in terms of the string length L? ____

b. For the graph below of position (m) vs time (s), give the

i. Amplitude. _____

ii. Frequency of oscillation. _____



3. **Problems (12 pts)**

a. An oscillator consists of a block of mass 0.400 kg connected to a spring. When set into oscillation with amplitude of 25.0 cm, it is observed to repeat its motion every 0.333 s. Find the spring's

i. frequency of oscillation. _____

ii. maximum speed. _____

iii. spring constant. _____

b. How long should a simple pendulum be to have a period of one second?

c. $y(x,t) = 5.00\sin(6.28x - 9.42t)$ describes a wave, where x is in meters, y is in centimeters, and t is in seconds. Find the
i. wavelength _____

ii. wave speed _____

iii. transverse speed of the string at $x = 0.50$ m and $t = 1.00$ s.

d. A piano string with a mass per unit length of 0.0025 kg/m is put under a tension of 350 N. What is the wave speed on the string?

e. A string with a wave speed of 42 m/s can vibrate at 62 Hz, 93 Hz, and 124 Hz. What is the length of the string?

Bonus: A 14-cm-long wrench swings on a hook with a period of 0.90 s. When the wrench hangs from a spring of spring constant 380, it stretches the spring 2.8 cm. What is the wrench's moment of inertia about the hook?