SECOND COMMON HOUR EXAM

MONDAY, APRIL 7, 2014
PHYSICS 1A - ANALYTICAL PHYSICS

SIGN HERE:

(Your name with exam code)

ANSWERS

INSTRUCTIONS:

1. The exam will last from 10:00-11:20 pm. Use a #2 pencil to make all entries on the answer sheet. Enter the following ID information now:

2. In the section labeled NAME (Last, First) fill in your last name, first name, and middle initial.

3. Under 9-digit ROLE# or ID number, enter your student ID number. Another blank line labeled your middle initial.

4. Under 9-digit COURSE and your section number (see label above).

5. During the exam, you may use pencils, a calculator, and one 8.5 x 11-inch sheet (both sides) with formulas and notes.

6. Under CODE enter the exam code given above.

7. There are 15 multiple-choice questions on the exam. For each question, mark only one answer on the answer sheet. Leave no questions unmarked.

8. When you are asked to open the exam, make sure that your copy contains all questions. Place your hand if this is not the case, and Student ID ready to show to the proctor during the exam.

9. Please SIGN the cover sheet under your name sticker and have your proctor initial. If you have a question, a proctor will help you. Place your hand if this is not the case, and your student ID ready to show to the proctor during the exam.

SOME IMPORTANT NUMBERS:

9.8 m/s² = 1.101 x 10² Pa

1.3 m/s = 3.45 m/s²
4. A particle moving with a simple harmonic motion has its maximum displacements when the position of the particle is 10 cm. At a time $t = 0$, the displacement of the particle is +12 cm. At a time $t = 0$, the frequency of the motion is 5 Hz. The equation of the motion is:

$$x = A \cos (\omega t + \phi)$$

where $x$ is the displacement, $A$ is the amplitude, $\omega$ is the angular frequency, and $\phi$ is the phase angle.

5. Given the value of $A$, the particle is not moving at $t = 0.5$ s.

6. The particle is moving with a simple harmonic motion when the position of the particle is 10 cm.
9. A transverse periodic wave is established in a string. It is described by

\[ \lambda = \frac{v}{f} \]

where \( \lambda \) is the wavelength in meters and \( f \) is the frequency in Hz. \( v \) is the speed of the wave in meters per second.

12. A jet plane has a sound level of 130 dB. What is the intensity in

\[ \frac{W}{m^2} \]

13. Which of the following is correct?

\[ \frac{\omega}{\lambda} = \frac{1}{10} \]

14. The amplitude of a sound wave near a source is 0.25 mm. If the speed of sound is 343 m/s, what is the intensity of the sound wave?

15. There is a standing sound wave in a pipe of length L. The pipe is closed at one end and open at the other. If there are no nodes within the pipe, not including a node at either end, what is the distance between one end and an open end of the pipe?
Consider point A along the extension of the line connecting the two loudspeakers, A and B, are driven by the same amplifier and emit sinusoidal waves in phase. Speaker B is 2 m to the right of speaker A. The lowest frequency for which constructive interference occurs at point A is 6 Hz. The frequency f is given by:

\[ f = \frac{v}{\lambda} \]

where \( v = 340 \text{ m/s} \) is the speed of sound and \( \lambda \) is the wavelength. Substituting the values:

\[ f = \frac{340}{3} \approx 113.3 \text{ Hz} \]

Thus, the lowest frequency that results in constructive interference at point A is 113.3 Hz.