

## Exam 2- PHS 203- 2009

---

### PART 1

1) A small loudspeaker driven by an audio oscillator and amplifier is adjustable in frequency between 500Hz and 1000Hz sends sound waves into a cylindrical tube 1.0m long and closed at both ends the speed sound in air is 343m/s. At what frequencies will resonance occur in the pipe when the frequency emitted by the speaker is varied from 500Hz to 1000Hz?

- a) 514.5Hz
- b) 1029Hz
- c) 343Hz
- d) 171.5Hz
- e) None of the above my answer is \_\_\_\_\_

2) A sound wave has a frequency of 610 Hz and travels in air at a speed of 346m/sec. How far apart are any two adjacent wave compressions?

- a) 0.57m
- b) 9.40m
- c) 1.14m
- d) 1.75m
- e) None of the above my answer is \_\_\_\_\_

3) A loudspeaker produces a musical sound by means of the oscillation of a diaphragm. If the amplitude of the oscillation is limited to  $1.0 \times 10^{-3}$  mm, what frequencies will result in the magnitude of the diaphragm's acceleration exceeding  $g$ ?  $g = 9.8 \text{ m/s}^2$

- a) 50 Hz
- b) 100Hz
- c) 500Hz
- d) 1000Hz
- e) None of the above my answer is \_\_\_\_\_

## Exam 2- PHS 203- 2009

4) The end of the prongs of a tuning fork that executes simple harmonic motion of frequency 1000Hz has an amplitude of 0.40mm. The speed of the end of the prong when the end has a displacement of 0.20mm is:

- a)  $\pm 2.5\text{m/s}$
- b)  $\pm 2.2\text{m/s}$
- c)  $2.2\text{m/s}$
- d)  $2.5\text{m/s}$
- e) None of the above my answer is \_\_\_\_\_

5) A particle has a displacement  $x = 0.5 \cos(3t + \frac{\pi}{4})$  where  $x$  is in meters and  $t$  is in seconds. At what time does the maximum velocity occur for the second time?

- a) 1.31s
- b) 2.37s
- c) 2.09s
- d) 3.40s
- e) None of the above my answer is \_\_\_\_\_

6) A commuter train passes a passenger platform at a constant speed of 0.040 Km/s. The train horn is sounded at its characteristic frequency of 320Hz. The change in frequency detected by a person on the platform as the train passes is:

- a) 362.24Hz
- b) 1.132Hz
- c) 362.24 cycles/h
- d) 320.04 s
- e) None of the above my answer is \_\_\_\_\_

7) A search ship equipped with Sonar technology detects a sunken submarine 12 seconds after the first signal was emitted from the sonar exactly when the ship was above the submarine. Considering that speed of sound in seawater is 1552m/s, the depth at which the submarine has sunken is:

- a) 18264m
- b) 9132m
- c) 17Km
- d) 10Km
- e) None of the above my answer is \_\_\_\_\_

## Exam 2- PHS 203- 2009

---

8) A source emits  $10^4 \text{W/m}^2$  of sound isotropically. A small microphone locates at 100 m from the source intercepts the sound in an area of  $0.500 \text{cm}^2$ . The power of sound at the microphone's location is:

- a) 5 nW
- b) 13kW
- c) 12.57W
- d) 5W
- e) None of the above my answer is \_\_\_\_\_

9) In the certain ranges of piano keyboard more than one string is tuned to the same note to provide extra loudness. For instance, the note at 110Hz has two strings (with the same mass per unit length  $\mu$ ) that vibrate at this frequency. If one string slips from its normal tension of 600N to 540N, and if  $\lambda$  is the same on both strings, the beat frequency heard when the hammer strikes the two strings simultaneously is:

- a) 8beats/s
- b) 8cycles/s
- c) 104.36Hz
- d) 5.64Hz
- e) None of the above, my answer is \_\_\_\_\_

10) A jet plane passes over you at a height of 5000m and a speed of Mach 1.5. After the jet passes directly overhead, the time taken by the shock wave to reach you is (use 331m/s for the speed of sound):

- a) 16.78s
- b) 16s
- c) 22.58s
- d) 15.05s
- e) None of the above, my answer is \_\_\_\_\_

## Exam 2- PHS 203- 2009

---

### **PART 2**

#### Problem 1

Two loudspeakers S1 and S2 are located 2.00m apart in the vertical  $y$  axis. It is important to mention that S1 is at the origin and S2 on the positive  $y$  values. A listener is located at the horizontal  $x$  axis 3.75 m from S1. The interference of the two sound waves emitted by S1 and S2 result in a transmitted frequency swept through the audible range (20Hz to 20 KHz). The speed of the sound in air is 343 m/s

- a) What are the lowest  $f_{\min 1}$  and second lowest  $f_{\min 2}$  frequencies that give minimum signal at the listener's location?
- b) What the lowest  $f_{\max 1}$  and second lowest  $f_{\max 2}$  frequencies that give maximum signal at the listener's location?

THE DEBATE CLUB

## Exam 2- PHS 203- 2009

---

### Problem 2

The scale of a spring balance that reads from 0 to 15.0Kg is 12cm long (i.e. , the maximum displacement of the simple harmonic motion is 12cm, when the balance reads 15.0Kg). A package suspended from the balance is found to oscillate vertically with a frequency of 2.00Hz

- a) What is the spring constant?
- b) What is the mass of the package and how much does it weigh?



THE DEBATE CLUB