1. . Which of the following exhibit simple harmonic motion? I. A pendulum II. A mass attached to a spring III. A ball bouncing up and down, in the absence of friction (A) I only (B) II only (C) III only (D) I and II only (E) I, II, and III

2. . If a wave has frequency and speed v = 100 m/s, what is its wavelength? (A) m (B) m (C) m (D) m (E) m

3. . Two strings of equal length are stretched out with equal tension. The second string is four times as massive as the first string. If a wave travels down the first string with velocity v, how fast does a wave travel down the second string? (A) v (B) v (C) v (D) 2v (E) 4v

4. . A piano tuner has a tuning fork that sounds with a frequency of 250 Hz. The tuner strikes the fork and plays a key that sounds with a frequency of 200 Hz. What is the frequency of the beats that the piano tuner hears? (A) 0 Hz (B) 0.8 Hz (C) 1.25 Hz (D) 50 Hz (E) 450 Hz

5. .How is the lowest resonant frequency, , for a tube with one closed end related to the lowest resonant frequency, , for a tube with no closed ends? (A) (B) (C) (D) (E)

6. . Two pulses travel along a string toward each other, as depicted above. Which of the following diagrams represents the pulses on the string at a later time?  (A)  (B)  (C)  (D) 

7. . What should a piano tuner do to correct the sound of a string that is flat, that is, it plays at a lower pitch than it should? (A) Tighten the string to make the fundamental frequency higher (B) Tighten the string to make the fundamental frequency lower (C) Loosen the string to make the fundamental frequency higher (D) Loosen the string to make the fundamental frequency lower (E) Find a harmonic closer to the desired pitch

8. . A police car with its siren on, traveling at a velocity vs toward a person standing on a street corner. As the car approaches, the person hears the sound at a frequency of fd . Take the speed of sound to be v. What is the frequency produced by the siren? (A) (B) (C) (D) (E)

9. . A police car with its siren on, traveling at a velocity vs toward a person standing on a street corner. As the car approaches, the person hears the sound at a frequency of fd . Take the speed of sound to be v. What is the wavelength of the sound produced by the siren? (A) (B) (C) (D) (E)

10. .An ambulance driving with velocity where is the speed of sound, emits a siren with a frequency of . What is the frequency heard by a stationary observer toward whom the ambulance is driving? (A) (B) (C) (D) (E)