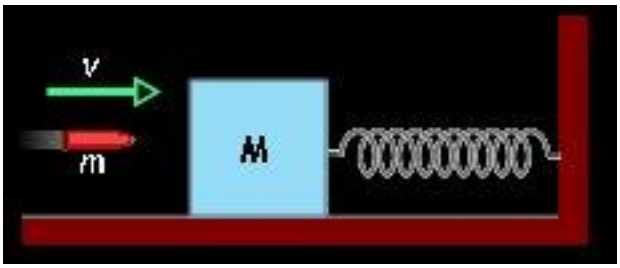
PHYS2005 Quizz1 –Unit 1 – Waves Oscillations 2015

Student Name _____ Student Number _____

1. An oscillating block–spring system takes 0.75 s to begin repeating its motion.
Find (a) the period, (b) the frequency, and (c) the angular frequency.

2. In an electric shaver, the blade moves back and forth over a distance of 2.0 mm in simple harmonic motion, with frequency 120 Hz.
Find (a) the amplitude, (b) the maximum blade speed, and (c) the magnitude of the maximum blade acceleration.

3. An oscillator consists of a block attached to a spring ($k = 400\ Nm^{-1}$). At some time t, the position (measured from the system's equilibrium location), velocity, and acceleration of the block are $x = 0.100m$, $v = 13.6ms^{-1}$, and $a = -123ms^{-2}$.
Calculate (a) the frequency of oscillation, (b) the mass of the block, and (c) the amplitude of the motion.



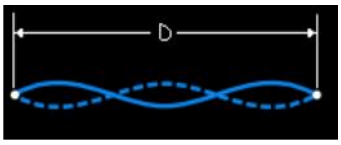
4. A block of mass M = 5.4 kg, at rest on a horizontal frictionless table, is attached to a rigid support by a spring of constant 6000 N/m. A bullet of mass m = 9.5 g and horizontal velocity v 630 m/s strikes and is embedded in the block. Assuming the compression of the spring is negligible until the bullet is embedded; determine (a) the speed of the velocity immediately after the collision and (b) the amplitude of the resulting simple harmonic motion.

5. A vertical spring stretches 9.6 cm when a 1.3 kg block is hung from its end. (a) Calculate the spring constant. This block is then displaced an additional 5.0 cm downward and released from rest. Find the (b) period, (c) frequency, (d) amplitude, and (e) maximum speed of the resulting SHM.

6. What is the frequency of a simple pendulum 2.0 m long (a) in a room, (b) in an elevator accelerating upward at a rate of 2.0 ms^{-2} and (c) in free fall?

7. A sinusoidal wave of frequency 500 Hz has a speed of 350 ms^{-1}. (a) How far apart are two points that differ in phase by p/3 rad? (b) What is the phase difference between two displacements at a certain point at times 1.00 ms apart?

8. A string fixed at both ends is 8.40 m long and has a mass of 0.120 kg. It is subjected to a tension of 96.0 N and set oscillating. (a) What is the speed of the waves on the string? (b) What is the longest possible wavelength for a standing wave? (c) Give the frequency of that wave.



9. A nylon guitar string has a linear density of 7.20 gm^{-1} and is under a tension of 150 N. The fixed supports are distance D, 90.0 cm apart. The string is oscillating in a standing wave pattern. Calculate the (a) speed, (b) wavelength, and (c) frequency of the traveling waves whose superposition gives this standing wave.

10. Earthquakes generate sound waves inside Earth. Unlike a gas, Earth can experience both transverse (S) and longitudinal (P) sound waves. Typically, the speed of S waves is about 4.5 kms^{-1}, and that of P waves 8.0 kms^{-1}. A seismograph records P and S waves from an earthquake. The first P waves arrive 3.0 minutes before the first S waves. If the waves travel in a straight line, how far away did the earthquake occur?

11. Two point sources S_1 and S_2 emit sound of wavelength λ = 2.00 m. The emissions are isotropic (the same intensity of radiation in all directions) and in phase, and the separation between the sources, d is 16.0 m. At any point P on the x axis, the wave fromS_1 and the wave from S_2 interfere. When P is very far away ($x \approx \infty$), what are (a) the phase difference between the arriving waves from S_1 and S_2 and (b) the type of interference they produce? Now move point P along the x axis toward S_1. (c) Does the phase difference between the waves increase or decrease? At what distance x do the waves have a phase difference of (d) 0.50λ, (e) 1.00λ, and (f) 1.50λ?

12. A certain sound source is increased in sound level by 30.0 dB. By what multiple is its intensity increased?

13. Suppose that the sound level of a conversation is initially at an angry 70 dB and then drops to a soothing 50 dB. Assuming that the frequency of the sound is 500 Hz, determine the (a) initial and (b) final sound intensities.

14. (a) Find the speed of waves on a violin string of mass 800 mg and length 22.0 cm if the fundamental frequency is 920 Hz. (b) What is the tension in the string? For the fundamental, what is the wavelength of (c) the waves on the string and (d) the sound waves emitted by the string?

15. The A string of a violin is a little too tightly stretched. Beats at 4.00 per second are heard when the string is sounded together with a tuning fork that is oscillating accurately at concert A (440 Hz).What is the (a) period of the violin string oscillation (b) frequency of the violin string oscillation?

16. A stationary motion detector sends sound waves of frequency 0.150 MHz and speed 343 ms^{-1} toward a truck approaching at a speed of 45.0 ms^{-1}. What is the frequency of the waves (a) detected by the truck, (b) reflected back to the detector?

17. A siren emitting a sound of frequency 1000 Hz moves away from you toward the face of a cliff at a speed of 10 m^{-1}. Take the speed of sound in air as 330 m^{-1}. (a) What is the frequency of the sound you hear coming directly from the siren? (b) What is the frequency of the sound you hear reflected off the cliff? (c) What is the beat frequency between the two sounds? Is it perceptible (less than 20 Hz)?

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