Physics II

Chapter 11
Practice Wave Test

Fall 2019

IMPORTANT: Except for multiple-choice questions, you will receive no credit if you show only an answer, even if the answer is correct. Always show in the space on your answer sheet some sketches, words, or equations which clearly justify your answer. Show the equations you use and the values substituted into them whenever equations are necessary. If you go from an equation directly to an answer without showing the values used, you will lose points. Points will also be deducted for missing or erroneous units.

Each individual answer is weighted roughly evenly throughout the exam.

- I will not lie, cheat, or steal in any of my academic endeavors.
- I will forthrightly oppose each and every instance of academic dishonesty.
- I will not request, receive, or give aid in examinations/tests/quizzes.

Name ____

$$f = \frac{1}{T} \qquad A = 4\pi r^2$$

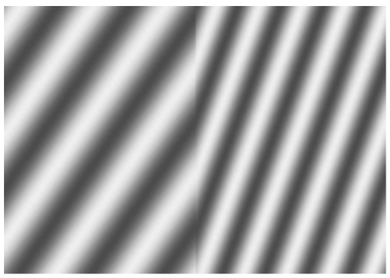
$$v = \frac{\lambda}{T} \qquad P = \frac{\Delta E}{\Delta t}$$

$$I = \frac{P}{A}$$

1. If an object is undergoing simple harmonic motion with a frequency of 4 Hz, what it the period of oscillation of that object?

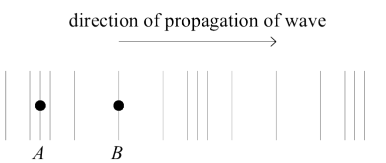
   0.25 s

2. The following questions refer to the standing wave shown in the graph below.



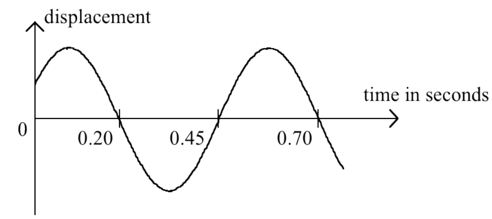
3. What is the name of the phenomenon shown above in which wave fronts change direction as they enter a region in which they travel with a speed that is different from their previous speed?

   (a) superposition
   (b) diffraction
   (c) interference
   (d) refraction



4. The figure shows a sound wave traveling to the right in air. Air particles A and B are at the center of a compression and a rarefaction respectively. Which of the following gives correctly the directions of motion of A and B at the moment shown?

	Particle A	**Particle B**
(a)	to the right	to the left
(b)	to the right	at rest
(c)	to the right	to the right
(d)	at rest	to the right
(e)	to the left	to the right



5. A "history graph" of a particle in a plane progressive wave is shown above. What is the frequency of this wave?

   (a) 1.43 Hz
   (b) 2 Hz
   (c) 2.22 Hz
   (d) 4 Hz
   (e) 5 Hz

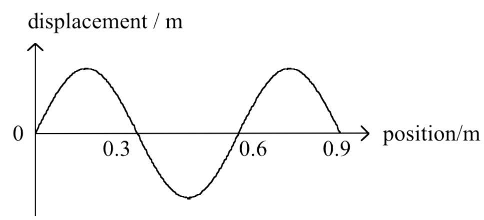


Figure (a)

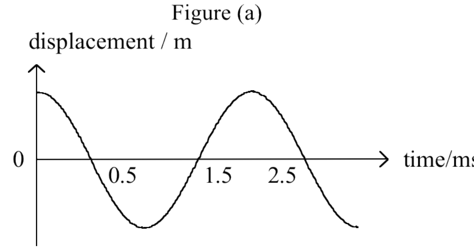
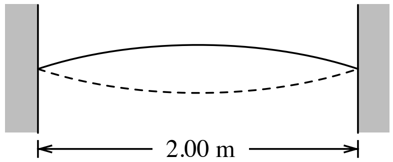


Figure (b)

6. Figure (a) represents the "snapshot graph" of a traveling wave at a certain instant and Figure (b) represents the displacement-time graph of a particle in the wave. The speed of the wave is

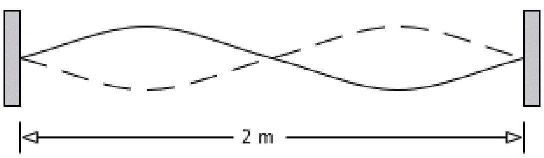
   (a) 300 m/s
   (b) 150 m/s
   (c) 1.2 m/s
   (d) 0.6 m/s
   (e) 0.3 m/s



7. A wire fixed at both ends is set into vibration by bowing or plucking near one fixed end. The diagram above shows the positions of the wire at two different times. The length of the wire is two meters. The frequency of vibration is measured to be 340 Hertz. What is the velocity of the wave as it propagates along the wire?

   (a) 170 m/s
   (b) 340 m/s
   (c) 680 m/s
   (d) 1020 m/s
   (e) 1360 m/s

   For the following two items



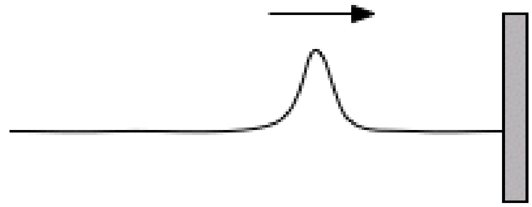
A standing wave of frequency 5 Hertz is set up on a string 2 meters long with nodes at both ends and in the center, as shown above.

8. The speed at which waves propagate on the string is

   (a) 0.4 m/s
   (b) 2.5 m/s
   (c) 5 m/s
   (d) 10 m/s
   (e) 20 m/s

9. The fundamental frequency of vibration of the string is

   (a) 1 Hz
   (b) 2.5 Hz
   (c) 5 Hz
   (d) 7.5 Hz
   (e) 10 Hz



10. One end of a horizontal string is fixed to a wall. A transverse wave pulse is generated at the other end, moves toward the wall as shown above, and is reflected at the wall. Properties of the reflected pulse include which of the following?

    I. It has a greater speed than that of the incident pulse.
    II. It has a greater amplitude than that of the incident pulse.
    III. It is on the opposite side of the string from the incident pulse.

    (a) I only
    (b) III only
    (c) I and II only
    (d) II and III only
    (e) I, II, and III

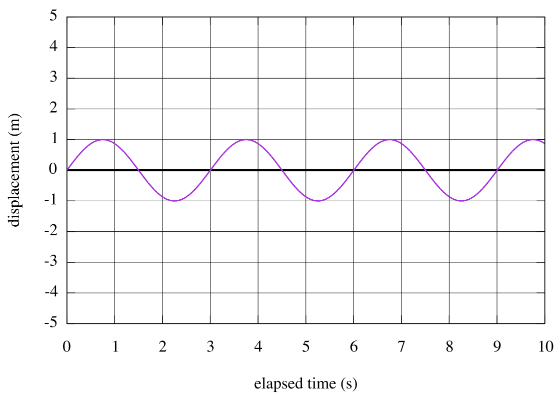
11. A fine, musical tone coming from your music player causes your mother's fine china to rattle in the hutch. This is an example of

    (a) reflection.
    (b) beats.
    (c) resonance.
    (d) interference.

12. Hearing a noise coming from around the corner of a building occurs because of

    (a) reflection.
    (b) refraction.
    (c) interference.
    (d) diffraction.

13. The graph below shows the "history plot" of an object as a function of time. One or more of the following questions cannot be answered using the given information. Answer the question(s) that you can, and tell why it is impossible to answer the other(s) with the information you've been given.

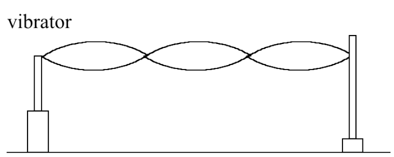


(a) What is the amplitude? 1 m

(b) What is the wavelength? No information given

(c) What is the period? 3 s

(d) What is the frequency? 0.33 s



14. Standing wave patterns can be produced on an elastic string using the experimental set-up shown above by adjusting the frequency f of the vibrator. Which of the following statements concerning the experiment is/are correct?

(1) Stationary wave patterns can be observed for more than one value of the frequency f.

(2) When the frequency f increases, the number of loops for the stationary wave pattern to be observed also increases.

(3) For a stationary wave pattern to occur, the length of the string must be equal to an integral number of wavelengths.

(a) (1), (2) and (3)

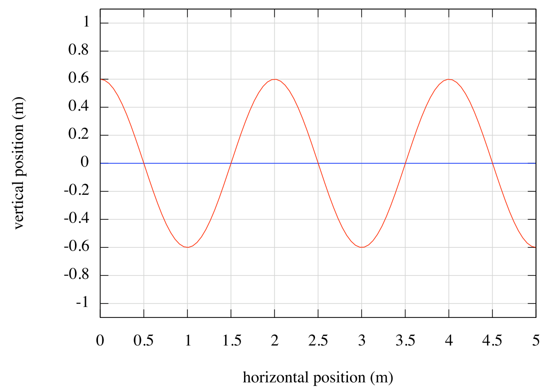
(b) (1) and (2) only

(c) (2) and (3) only

(d) (1) only

(e) (3) only

15. The graph below shows the displacement of the surface of water as a function of position along the surface. One or more of the following questions cannot be answered using the given information. Answer the question(s) that you can, and tell why it is impossible to answer the other(s) with the information you've been given.



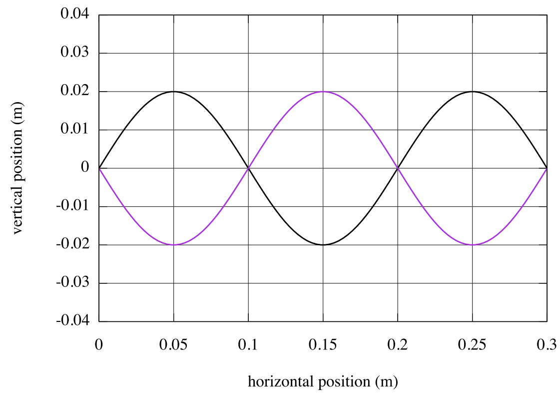
(a) What is the amplitude? 0.6 m

(b) What is the wavelength? 2 m

(c) What is the period? No time information

(d) What is the frequency? No time information

1. The following questions refer to the standing wave shown in the graph below.

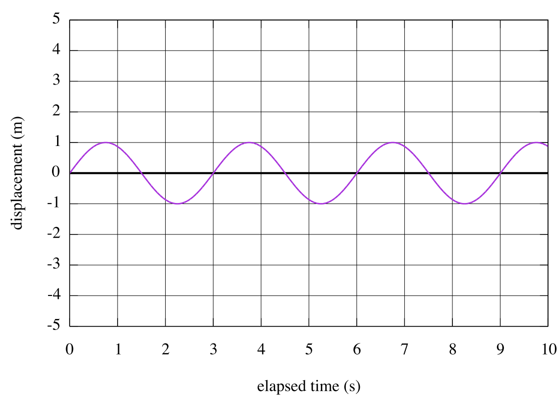


   (a) What are the x coordinates of two of the nodes? (B) What are the x coordinates of two of the antinodes? 0 m, 0.1 m, 0.2 m, 0.3 m

   (b) If x is measured in meters and the frequency of the vibrations that produced this standing wave is 120 Hz, what is the speed of the wave? 24 m/s

   (c) If this diagram shows the pressure of a sound wave resonating inside a tube, is the tube open on both ends or closed on both ends? Tell how you know. Nodes at each end indicate constraint; the ends are closed.

2. The graph below shows the "history plot" of an object as a function of time. One or more of the following questions cannot be answered using the given information. Answer the question(s) that you can, and tell why it is impossible to answer the other(s) with the information you've been given.



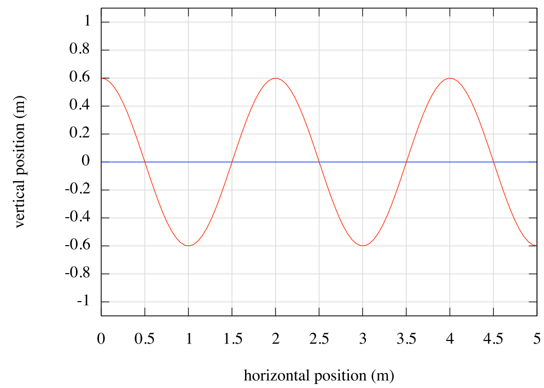
   (a) What is the amplitude? 1 m

   (b) What is the wavelength? No distance information given

   (c) What is the period? 3 s

   (d) What is the frequency? 0.333 Hz

3. The graph below shows the displacement of the surface of water as a function of position along the surface. One or more of the following questions cannot be answered using the given information. Answer the question(s) that you can, and tell why it is impossible to answer the other(s) with the information you've been given.



(a) What is the amplitude? 0.6 m

(b) What is the wavelength? 2 m

(c) What is the period? No time information

(d) What is the frequency? No time information

4. A hummingbird's wings vibrate 500 times in 10 seconds.

(a) What is the frequency of the hummingbird's wings?

50 Hz

(b) What is the period of the hummingbird's wings?

0.02 s

5. Sketch the standing wave diagrams for the first three harmonics of a violin string.