

Unit 1 Conceptual Questions

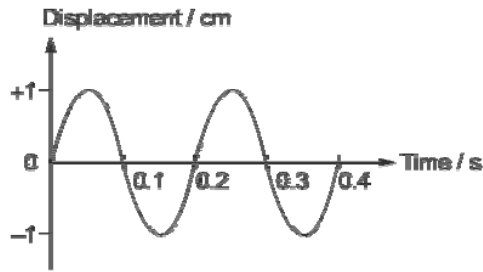
Please answer questions on Scantron form 882-ES. Otherwise you will receive a zero. Poorly erased responses will not be re-graded. Turn in two days before unit exam. You are encouraged to work together and discuss these questions!!!

- Simple harmonic motion differs from other types of oscillatory motions because the force on the object is always
 - constant
 - inversely proportional to displacement
 - proportional to displacement
 - linearly dependent on velocity
- The reason why we treat the simple pendulum as an example of simple harmonic motion for **small angle of oscillations** is because the force on the pendulum is approximately _____ in such cases.
 - constant
 - inversely proportional to displacement
 - proportional to displacement
 - linearly dependent on velocity
- The vibrational motion of two atoms in a molecule exhibits simple harmonic motion because the force the interacting atoms is approximately
 - constant
 - inversely proportional to displacement
 - proportional to displacement
 - linearly dependent on velocity
- Which quantities are considered constants for simple harmonic motion?
 - position and speed
 - acceleration and speed
 - position and angular frequency
 - amplitude and speed
 - amplitude and frequency
- A vertical spring stretches 10 cm when a 5.0-kg block is suspended from its end. The block is then displaced an additional 5.0 cm downward and released from rest to execute Simple Harmonic Motion. The block position as a function of time is given by: (Take equilibrium position of spring-block system as origin and the upward-vertical direction to be positive).
 - $y = -0.05 \cos(9.9 t) \text{ m}$
 - $y = -0.05 \sin(9.9 t) \text{ m}$
 - $y = -0.05 \cos(0.11t) \text{ m}$
 - $y = -0.05 \sin(0.11t) \text{ m}$
- The kinetic energy of the above object as a function of time is given by:
 - $y = -0.61 \cos^2(9.9 t) \text{ J}$
 - $y = 0.61 \cos^2(9.9 t) \text{ J}$
 - $y = 0.61 \sin^2(9.9 t) \text{ J}$
 - $y = -0.000075 \cos^2(0.11t) \text{ J}$
 - $y = -0.000075 \sin^2(0.11t) \text{ J}$

7. What is the work done on the mass in the above problem after one cycle?
- 0.61J
 - 0.61J
 - 0.000075J
 - 0.000075J
 - 0J
8. What is the work done on the mass in the first half of the cycle?
- 0.61J
 - 0.61J
 - 0.000075J
 - 0.000075J
 - 0J
9. Two light springs $k_1=240\text{N/m}$ and $k_2=80\text{N/m}$ are joined together. One end of the spring arrangement is tied to a ceiling and the other end is tied to 2.0kg mass such that the mass-spring system hangs from the ceiling. Which spring experiences a larger force?
- k_1
 - k_2
 - they both experience the same force
10. Which spring stretches the most?
- k_1
 - k_2
 - they both stretch by the same amount
11. How much does the spring arrangement stretch?
- 0.62cm
 - 3.3cm
 - 8.2cm
 - 14.5 cm
 - 27.7cm
12. If we can replace the above two springs with a single spring that produces the same stretch as in the previous question, we can determine it from the equation
- $k_{\text{eff}}=k_1+k_2$
 - $k_{\text{eff}}=k_1/k_2$
 - $k_{\text{eff}}=k_1k_2/(k_1+k_2)$
 - $k_{\text{eff}}=k_1-k_2$
 - no enough information provided
13. If the mass of a simple pendulum doubles, its period
- increases by the square root of two
 - decreases by the square root of two
 - doubles
 - is halved
 - is unchanged
14. Suppose you have a clock that is simple pendulum constructed from metal wire. If the temperature of the surroundings increases the clock will run
- slow
 - fast
 - can't tell
15. The kinetic energy of the bob on a simple pendulum swinging in simple harmonic motion has its maximum value when the displacement from equilibrium is
- Zero
 - $\frac{1}{4}$ the amplitude
 - $\frac{1}{2}$ the amplitude
 - equal to the amplitude

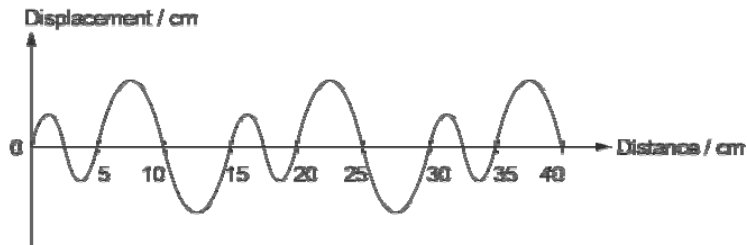
16. The diagram shows a displacement-time graph of a particle of a transverse wave. If the wavelength of the wave is twice the magnitude of amplitude, what is the speed of the wave?

- a. 0.1 m s^{-1}
- b. 0.5 m s^{-1}
- c. 1 m s^{-1}
- d. 10 m s^{-1}



17. What is the wavelength of the wave shown?

- a. 5cm
- b. 10cm
- c. 15cm
- d. 20cm



18. If the frequency of a wave is 100Hz and the distance between successive crests is 4.0cm, what is the speed of the wave?

- a. 2.0m/s
- b. 4.0m/s
- c. 8.0m/s

19. One end of a rope is attached to a wall. Mary applied different forces to produce two pulses of different amplitudes and wavelengths in the spring. Which of the following is correct?

- a. The pulse with a higher amplitude will travel at a higher speed.
- b. The pulse with a longer wavelength will travel at a higher speed.
- c. The pulse with a larger applied force will travel at a higher speed.
- d. The two pulses travel at the same speed.

20. A traveling wave in a string moves with speed 60m/s. When the tension is increased by 20%, what will be the resulting wave speed?

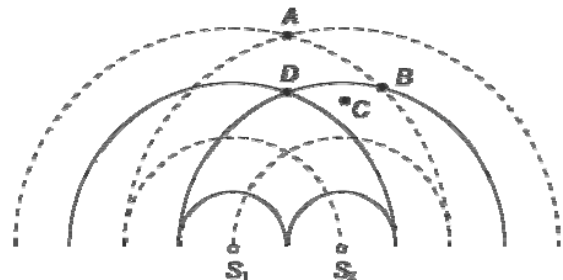
- a. 60m/s
- b. 66m/s
- c. 72m/s
- d. 55m/s

21. What is the displacement of a particle in a mechanical wave in one cycle?

- a. zero
- b. one wavelength
- c. one amplitude of the wave

22. The diagram shows two water waves which are generated by two coherent sources S_1 and S_2 . The solid lines represent wave crests and the dashed lines represent wave troughs. Which point is at a position of destructive interference?

- a. A
- b. B
- c. C
- d. D



23. Standing waves are set up in a string by a source vibrating at 100.Hz. Nine nodes are counted in a distance of 64 cm (including one node at each end). What is the wavelength of the waves traveling in the string?
- 4.0cm
 - 8.0 cm
 - 12.0cm
 - 16.0cm
 - 64.0cm
24. If increasing the tension in the string of the previous question doubles the speed of the wave, how many nodes will exist in the string?
- 3
 - 5
 - 7
 - 9
 - 11
25. Tripling the power output from a speaker emitting a frequency f , will increase the observed loudness by
- 0.33dB
 - 3.0dB
 - 4.8dB
 - 9.5dB
26. Tripling the amplitude of the signal from a speaker will increase the observed loudness by
- 0.33dB
 - 3.0dB
 - 4.8dB
 - 9.5dB
27. Hovering over the pit of hell, the devil observes screaming politicians falling by at terminal velocity. In which of the following scenarios is the observed frequency greatest?
- The frequency of the echo observed by the politicians.
 - The frequency observed by the devil as the screaming politician approaches the devil.
 - The frequency of the echo observed by the devil.
 - b and c are the same
 - a and c are the same
28. A phase difference of 270° corresponds to a wavelength difference of
- $3\lambda/4$
 - $4\lambda/3$
 - $3\lambda/2$
 - 3λ
29. When two sound waves are out of phase by _____ at a location in space, destructive interference will occur.
- 270°
 - 360°
 - 540°
 - 630°
 - 720°
30. If two waves combine at a location in space, point P, have the same phase difference of the previous two questions, this means one wave traveled _____ more than the other as they propagate from their source to point P.
- $3\lambda/4$
 - $4\lambda/3$
 - $3\lambda/2$
 - 3λ

31. Two coherent loudspeakers are producing sounds of the same frequency. They are 10.0m apart and facing each other. If the wave length produced by the speakers is 2.0m. Where in between the speakers will constructive interference be observed?
- 2.0m, 4.0m, 6.0m, 8.0m from one of the speakers
 - 1.0m, 3.0m, 5.0m, 7.0m from one of the speakers
 - 1.0m, 2.0m, 3.0m, 4.0m, 5.0m, 6.0m, 7.0m, 8.0m, 9.0m from one of the speakers
 - None are observed
32. Two coherent loudspeakers are producing sounds of the same frequency. They are 1.0m apart and facing each other. If the wave length produced by the speakers is 2.0m. Where in between the speakers will constructive interference be observed?
- 2.0m, 4.0m, 6.0m, 8.0m from one of the speakers
 - 1.0m, 3.0m, 5.0m, 7.0m from one of the speakers
 - 1.0m, 2.0m, 3.0m, 4.0m, 5.0m, 6.0m, 7.0m, 8.0m, 9.0m from one of the speakers
 - None are observed
33. When you stand halfway between two speakers, with one on your left and one on your right, a musical note from the speakers produce constructive interference. How far to the left should you move to observe destructive interference?
- One-fourth of a wavelength
 - Half a wavelength
 - One wavelength
 - One and a half wavelengths
34. An air column produces standing waves at the three consecutive frequencies: 636Hz, 1060Hz, and 1484Hz. This air column is
- open at both ends.
 - open at one end.
 - can't tell if it is open or closed since we don't know its length.
35. Beats are an example of
- Doppler Effect
 - standing waves
 - interference
 - Rock 'n Roll
36. As a violin heats up, the pitch drops, because
- the wavelength increases
 - the wave speed increases
 - neither explanation applies
37. As the slide on a trombone moves out, the pitch drops because
- the wavelength increases
 - the wave speed increases
 - neither explanation applies
38. If a guitar string has a fundamental frequency of 300Hz, what is the frequency of its second overtone?
- 150Hz
 - 450Hz
 - 600Hz
 - 750Hz
 - 900Hz

39. At which of the following frequencies is the human ear most sensitive?

- a. 33Hz b. 330Hz c. 3300Hz d. 33,000Hz

40. Two octaves below 100 Hz is

- a. 5 Hz b. 10 Hz c. 15 Hz d. 20 Hz e. 25 Hz