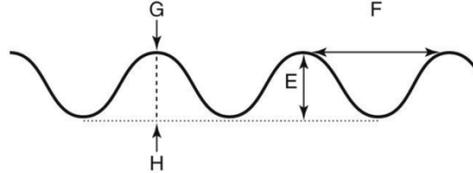


TEST - WAVES, PERIODIC MOTION, & SOUND

MULTIPLE CHOICE

_____ 1. If a wave has a high frequency, what else must it have?
 a) High Amplitude b) High Wavelength c) Low Speed d) Low Wavelength

_____ 2. What is the term that is used to define the difference between two identical and repeated points on a wave?
 a) Period b) Amplitude c) Wavelength d) Frequency



_____ 3. What property of a wave is represented by letter E in the diagram above?
 a) Period b) Frequency c) Amplitude d) Wavelength e) Speed

_____ 4. What property of a wave represents the amount of energy that the wave has?
 a) Amplitude b) Speed c) Frequency d) Period e) Wavelength

_____ 5. The highest (positive) point that a wave travels from the equilibrium position is called a(n)-
 a) Node b) Antinode c) Crest d) Trough e) Amplitude

_____ 6. A wave transfers-
 a) Electricity b) Energy c) Matter d) Power

_____ 7. As the frequency of a wave increases...
 a) The Speed of the wave also increases
 b) The Wavelength of the wave also increases
 c) The Wavelength of the wave will decrease
 d) The Amplitude of the wave will decrease
 e) Nothing will happen to the wave

_____ 8. The lowest (negative) point that a wave travels from the equilibrium position is called a(n)-
 a) Crest b) Trough c) Amplitude d) Node e) Antinode

_____ 9. What is periodic motion?
 a) Motion that requires a medium
 b) Motion that occurs in random periods of time
 c) Motion that occurs several times in a given period of time
 d) Motion that repeats itself in a random cycle
 e) Motion that occurs at the same time as other motion occurs

_____ 10. A single bump or disturbance of a wave that travels through a medium is called a(n)-
 a) Wave Pulse b) Waveform c) Wavefront d) Node e) Antinode

_____ 11. The part of a standing wave that does not move at all during interference is called a(n)-
 a) Node b) Antinode c) Trough d) Crest

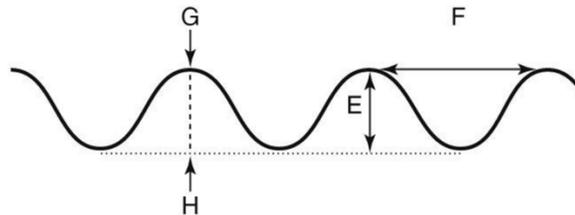
_____ 12. Which of the following units is NOT applicable to a measure of frequency?
 a) Hz b) $\frac{1}{s}$ c) s d) s^{-1}

_____ 13. Which of the following relationships between velocity, frequency, and wavelength is NOT true?

- a) $v = \lambda f$ b) $f = \frac{v}{\lambda}$ c) $\lambda = \frac{f}{v}$ d) $\lambda = \frac{v}{f}$ e) $T = \frac{1}{f}$

- _____ 14. Transverse waves-
- a) Move up and down at the same time
 - b) Vibrates perpendicular to the direction of the wave's motion
 - c) Vibrate parallel to the direction of wave travel.
 - d) Have characteristics of longitudinal waves
- _____ 15. Longitudinal waves-
- a) Move up and down at the same time
 - b) Vibrates perpendicular to the direction of the wave's motion
 - c) Vibrate parallel to the direction of wave travel.
 - d) Have characteristics of transverse waves
- _____ 16. Surface waves-
- a) Move up and down at the same time
 - b) Vibrates perpendicular to the direction of the wave's motion
 - c) Vibrate parallel to the direction of wave travel.
 - d) Have characteristics of transverse and longitudinal waves
- _____ 17. If a wave has a high amplitude, what is true about that wave?
- a) That wave has a high speed
 - b) That wave has a high frequency
 - c) That wave has a high wavelength
 - d) That wave is carrying a low amount of energy
 - e) That wave is carrying a high amount of energy

- _____ 18. Frequency is-
- a) The number of wave oscillations that occur in 1 minute
 - b) The number of waves that pass through two given points in 1 second.
 - c) The number of similar oscillating points on a wave
 - d) The number of wave oscillations that occur in 1 second
 - e) The number of wave disturbances on a waveform



- _____ 19. What wave characteristic is represented by letter E in the diagram above?
- a) Period
 - b) Frequency
 - c) Amplitude
 - d) Wavelength
 - e) Speed
- _____ 20. Period and frequency depend on-
- a) The Source of the Wave
 - b) The Medium that the Wave is Traveling through
 - c) How Fast the wave is Traveling
 - d) All of the Above
 - e) None of the Above
- _____ 21. As the period of a wave decreases...
- a) The Frequency of the wave decreases
 - b) The Amplitude of the wave decreases
 - c) The Speed of the wave increases
 - d) The Wavelength of the wave increases

_____ 22. Which of the following would occur if you increased the distance between two repeated points on a wave?

- a) The velocity of the wave would increase
- b) The distance from the equilibrium point would increase
- c) The velocity of the wave would decrease
- d) The distance from the equilibrium point would decrease
- e) None of the Above

_____ 23. When are points on a wave in phase?

- a) When those points are in the same place.
- b) When those point have the same velocity.
- c) When those points are one or more wavelengths apart
- d) When those points are in the same place in but opposite arrangement from the base line
- e) When those points are one wavelength apart when the wave has a certain frequency

_____ 24. Particles in the medium with opposite displacements and velocities are how many degrees out of phase?

- a) 90°
- b) 180°
- c) 270°
- d) 360°
- e) 0°

_____ 25. Which of the following is true of a wave in phase?

- a) Particles in the medium are said to be in phase with one another when they have the same displacement from equilibrium and the same velocity.
- b) Particles in the medium are said to be in phase with one another when they have the same displacement from equilibrium and the same frequency.
- c) Particles in the medium are said to be in phase with one another when they have the same displacement from equilibrium and the same amplitude and period.
- d) Particles in the medium are said to be in phase with one another when they have the same displacement from equilibrium and the same wavelength.

_____ 26. A wave that strikes a boundary is a(n)-

- a) Reflected Wave
- b) Mechanical Wave
- c) Electromagnetic Wave
- d) Incident Wave

_____ 27. According to the principle of superposition states that the displacement of a medium caused by two or more waves is-

- a) The Sum of the displacements of the individual waves.
- b) The difference in the displacements of the individual waves.
- c) The product of the displacements of the individual waves.
- d) The quotient of the displacements of the individual waves.

_____ 28. The result of the superposition of two or more waves is called-

- a) Imposition
- b) Displacement
- c) Interference
- d) Synthesis

_____ 29. When does constructive interference occur?

- a) When wave displacements are in opposite directions
- b) When wave displacements occur at different speeds
- c) When combining waves have the exact same amplitude
- d) When wave displacements are in the same directions

_____ 30. For destructive interference, when the pulses meet and are in the same location, the displacement is-

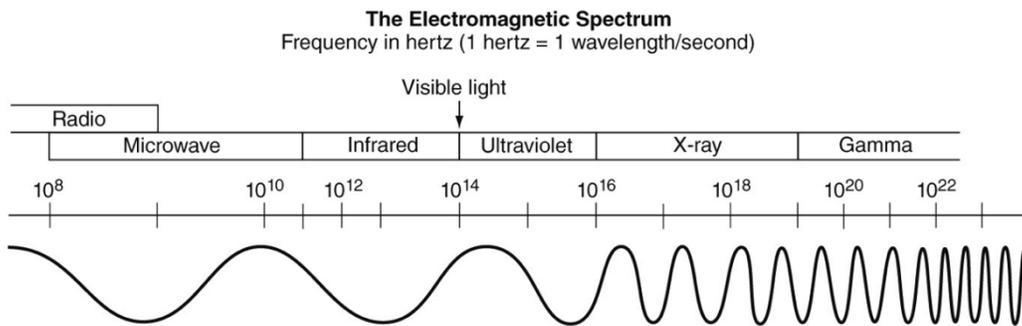
- a) Positive
- b) Negative
- c) Zero
- d) Unable to be determined

_____ 31. During destructive interference, the wave with the greatest displacement from the origin is called the-

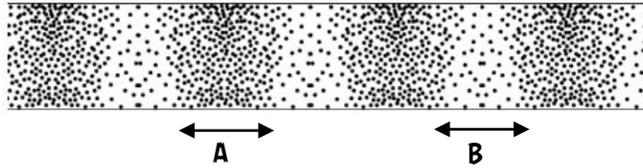
- a) Node
- b) Antinode
- c) Trough
- d) Crest
- e) Amplitude

- _____ 32. The speed for all electromagnetic waves in a vacuum is-
- a) 3.00×10^8 m/s
 - b) 3.00×10^{-8} m/s
 - c) 3,000,000 m/s
 - d) 30,000,000 m/s
 - e) Unknown

- _____ 33. Which of the following is true about electromagnetic waves?
- a) They do not have an amplitude
 - b) They do not have a wavelength
 - c) They do not have frequency
 - d) They do not require a medium to travel
 - e) They cannot travel in three-dimensions like other waves can



- _____ 34. All waves in the above diagram have the same-
- a) Period
 - b) Frequency
 - c) Velocity
 - d) Wavelength
 - e) Amplitude
- _____ 35. According to the diagram, which of the following frequencies would be a reasonable magnitude for visible light?
- a) 1.0×10^{13} s⁻¹
 - b) 1.0×10^{14} s⁻¹
 - c) 1.0×10^{15} s⁻¹
 - d) 3.0×10^8 s⁻¹
- _____ 36. Which wave property CANNOT be directly represented or calculated the information provided by the electromagnetic spectrum?
- a) Amplitude
 - b) Frequency
 - c) Wavelength
 - d) Period
- _____ 37. Sound waves are-
- a) Surface Waves
 - b) Transverse Waves
 - c) Longitudinal Waves
 - d) Electromagnetic Waves
- _____ 38. What wave characteristic determines how loud a sound is?
- a) Frequency
 - b) Wavelength
 - c) Period
 - d) Speed
 - e) Amplitude
- _____ 39. What wave characteristic determines the pitch of a sound?
- a) Frequency
 - b) Wavelength
 - c) Period
 - d) Speed
 - e) Amplitude
- _____ 40. How do echoes occur?
- a) Sound waves must travel a certain distance
 - b) Sound waves collide with certain air particles resulting in noise
 - c) Sound waves reflect off hard surfaces
 - d) Sound waves spread out in large areas



- _____ 41. In the diagram above, what sound wave characteristic is represented by letter A?
 a) Frequency b) Compression c) Amplitude d) Rarefaction
- _____ 42. In the diagram above, what sound wave characteristic is represented by letter B?
 a) Frequency b) Compression c) Amplitude d) Rarefaction
- _____ 43. Which of the following describes the states of matter in order of the speed that sound travels through them?
 a) Gases > Solids < Liquids
 b) Solids > Liquids < Gases
 c) Gases > Liquids > Solids
 d) Liquids > Solids > Gases
 e) Gases < Liquids < Solids
- _____ 44. What is sound energy?
 a) The kinetic energy of the vibrating particles of a transmitting medium.
 b) The potential energy carried by sound waves.
 c) The kinetic energy of the sound waves due to its propagation and interference
 d) The energy that is dispersed by a sound wave in a given period of time.
- _____ 45. The power of a sound wave is-
 a) How much energy is transferred by that sound wave
 b) How much time that wave took to transfer a certain amount of energy
 c) The ability of a wave to transfer a certain amount of energy over time
 d) The volume of a sound from a sound wave
 e) How much energy a sound wave transfers in a given amount of time
- _____ 46. Sound intensity varies inversely with-
 a) Temperature b) Distance c) Time d) Speed
- _____ 47. Intensity and power are-
 a) Directly related b) Inversely related c) Logarithmically related d) Not related
- _____ 48. Most people cannot hear sound frequencies that are-
 a) Below 40 Hz b) Above 10,000 Hz c) Around 20 Hz d) Above 16,000 Hz
- _____ 49. The Doppler Effect is observable because of a change in what characteristic of a sound wave?
 a) Wavelength b) Amplitude c) Frequency d) Amplitude e) Period
- _____ 50. Based on The Doppler Effect, which of the following is true?
 a) A sound will appear to become louder as the source increases its distance from the detector.
 b) A sound will appear to become quieter as the source decreases its distance from the detector.
 c) A sound will appear to have a higher pitch as the source of the sound becomes further from the detector.
 d) A sound will appear to have a lower pitch as the source of the sound becomes closer from the detector.
 e) None of the Above

FILL IN THE BLANK

51. Waves are disturbances that carry _____ through matter or space.
52. Period is the inverse or reciprocal of _____.
53. Longitudinal waves, periodic waves, surface waves, and transverse waves are all types of _____ waves.
54. Sound cannot travel through a _____ because there are not any particles to collide with.
55. Sound detectors _____ sound energy into other forms of energy.

FREE RESPONSE

$$T = \frac{1}{f} \quad v = \lambda f \quad \lambda = vT \quad v_{\text{sound in air}} = 331.4 + 0.6T \quad I = \frac{P}{4\pi r^2}$$

56. At a slumber party, a group of girls are having a pillow fight. One of the girls climbs on top of a bed and jumps up and down, taking 0.72 s for each jump. What is the frequency of her jumping?
57. The pitch of a sound wave is 243 Hz. The wave has a wavelength of 1.3 m. What speed is the wave traveling at?
58. Calculate the wavelength of an ultrasonic wave emitted by a bat if the wave has a frequency of 4.0×10^4 Hz, and if the speed of sound in this case is 341 m/s.
59. A sonar device emits a sound pulse underwater, where the speed of sound is 1,482 m/s. If the pulse of sound has a wavelength of 2.4 m, determine the frequency of sound waves of the sound.
60. Santa Clause shouts "Ho Ho Ho!" as he delivers presents to children on a cold Christmas Eve night when the temperature is 4°C. How fast would the sound of his voice travel in that scenario?
61. A man of snores loudly, with a record intensity of 4.5×10^{-8} W/m². Suppose the intensity of the man's snores are measured 0.60 m from his mouth. What is the power associated with the man's record snore?
62. Determine the speed of the light (electromagnetic) waves of a yellow light at an intersection if its light waves have a wavelength of 592 nm.

ANSWER KEY TO WAVES, PERIODIC MOTION, & SOUND TEST

1. **D**
2. **C**
3. **D**
4. **A**
5. **C**
6. **B**
7. **C**
8. **B**
9. **D**
10. **A**
11. **A**
12. **C**
13. **C**
14. **B**
15. **C**
16. **D**
17. **E**
18. **D**
19. **C**
20. **A**
21. **C**
22. **A**
23. **C**
24. **B**
25. **A**
26. **D**
27. **A**
28. **C**
29. **D**
30. **C**
31. **B**
32. **A**
33. **D**
34. **C**
35. **B**
36. **A**
37. **C**
38. **E**
39. **A**
40. **C**
41. **B**
42. **D**
43. **E**
44. **A**
45. **E**
46. **B**
47. **A**
48. **D**
49. **C**
50. **E**

51. **Energy**
52. **Frequency**
53. **Mechanical**
54. **Vacuum**
55. **Transform**
56. $f = \frac{1}{0.72 \text{ s}} = 1.39 \text{ Hz}$
57. $v = (243 \text{ Hz})(1.3\text{m}) = 315.9 \text{ m/s}$
58. $\lambda = \frac{341 \text{ m/s}}{(4.0 \times 10^4 \text{ Hz})} = 0.00853 \text{ meters}$
59. $f = \frac{1,482 \text{ m/s}}{2.4 \text{ m}} = 617.5 \text{ Hz}$
60. $v = 331.4 + 0.6(4^\circ\text{C}) = 333.8 \text{ m/s}$
61. $P = (4.5 \times 10^{-8} \text{ W/m}^2) (0.60 \text{ m}) = 2.7 \times 10^{-8} \text{ W}$
62. $3.00 \times 10^8 \text{ m/s}$ because that is the speed of all electromagnetic waves (it's the speed of light)