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3. What is meant by the period of a pendulum?

Ans. The period of a pendulum is the time required for the bob to swing out and back once.

7. How many vibrations per second are represented in a radio wave of 101.7 MHz?

Ans. The M represents million and HZ represents vibrations per second, therefore we have the frequency is 101.7 million vibrations per second.

8. How do frequency and period relate to each other?

Ans. They are inversely proportional to each other. Frequency = $\frac{1}{T}$ where T represents the period.

11. What is the relationship among frequency, wavelength, and wave speed?

Ans. $V = \text{frequency} \times \text{wavelength}$, therefore the wave's speed is directly proportional to its frequency and wavelength.

Extra: As the frequency of a wave of constant speed is increased, does the wavelength increase or decrease.

Ans. $V = f\lambda$; Solving for wavelength we see that $\lambda = \frac{\text{velocity}}{\text{frequency}}$

Since there is an inverse relationship between frequency and wavelength, as the frequency increases the wavelength must decrease.

12. In a transverse wave, in which direction does the medium vibrate when compared to the direction that the wave is "moving"?

Ans. The wave vibrates at right angles (90°) to the direction of wave propagation.

13. In what direction are the vibrations relative to the direction of wave travel in a longitudinal wave.

Ans. The vibrations are in the direction of propagation.

14. The wavelength of a transverse wave is the distance between successive crests. What is the wavelength of a longitudinal wave?

Ans. The distance between two compressions.

15. What is meant by the superposition principle?

Ans. Place two or more waves in the same place at the same time. The result will be one wave that is the sum of their combined effects.

16. Define: a) constructive interference
b) destructive interference

Ans. a) Constructive interference is the increase in wave amplitude caused by the superposition of waves. This occurs when the crest and trough of one wave is in the same space as the crest and trough of another wave.

b) Destructive interference is the decreased in wave amplitude caused by the superposition of waves. This occurs when the crest of one wave is in the same space as the trough of another wave.

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20. In the Doppler effect, does frequency change? Does wavelength change? Does wave speed change?

Ans. Both the frequency and wavelength change. The wave speed remains constant.

22. What is meant by a blue shift and a red shift for light?

Ans. Blue shift for light indicates an increase in frequency and tells you that the objects are approaching one another. Red shift is a decrease in frequency and indicates that the objects are moving apart.

Extra: What does it mean to say that one wave is out of phase with another?

Ans. It means that their crests and trough don't occur at the same place at the same time. This results in destructive interference. If they are 180° out of phase, complete destructive interference occurs.

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19. If we double the frequency of a vibrating medium, what happens to the period of the wave?

Ans. Since the period is inversely proportional to the frequency, the period will be one-half its original value if its frequency is doubled while keeping wave velocity constant.

24. You dip your finger repeatedly into a puddle of water and make waves. What happens to the wavelength if you dip your finger more frequently?

Ans. From the equation for wave velocity, $V = f\lambda$, solving for wavelength, $\lambda = \frac{v}{f}$, we see that wavelength is inversely proportional to frequency. That indicates that increasing the frequency must decrease the wavelength in order to maintain a constant velocity.

36. Why is there a Doppler effect when the source of sound is stationary and the listener is in motion? In which direction should the listener move to hear a higher frequency? A lower frequency?

Ans. The Doppler effect is produced by the relative motion of the wave emitter and receiver. If the crests arrive sooner than the source emitted them there will be an increase in frequency. If the crests arrive less frequently than the source emitted them there will be a decrease in frequency.

39. How does the Doppler effect aid police in detecting speeding motorists?

Ans. The police radar unit sends out waves of invisible light at a specific frequency. Some of the waves bounce off the vehicle and return back to the officer. The faster your relative motion, the larger the frequency shift. The unit then calculates your speed and displays it on a screen.

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3. A skipper on a boat notices wave crests passing his anchor chain once every 5 seconds. He estimates the distance between wave crests to be 15 meters. What is the speed of the wave?

Ans. $v = f\lambda = \frac{1}{5s} \cdot 15m = 3 \frac{m}{s}$