

# Wave Characteristics Review

Grade: 11

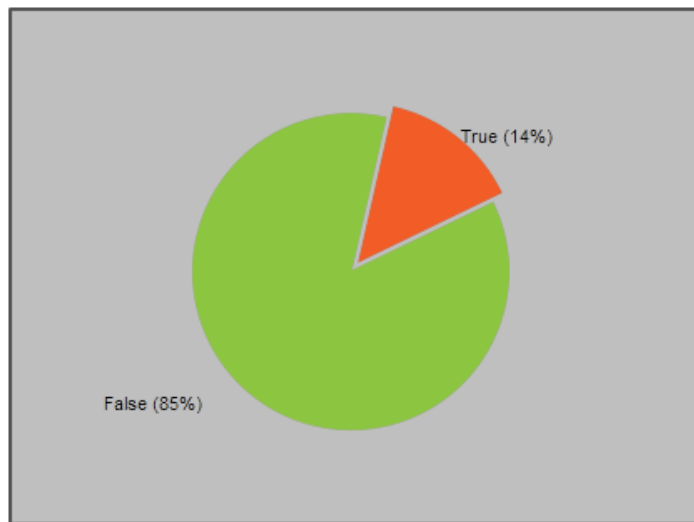
Subject: Physics 112

Date: 2014

1 The time required to complete one cycle is called the frequency.

True

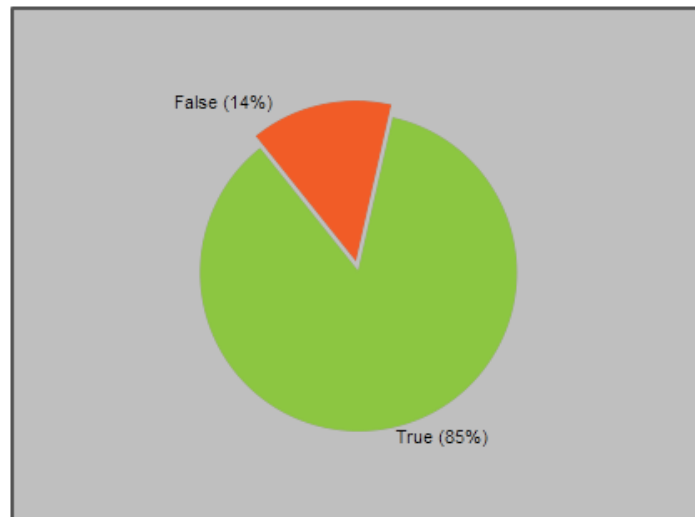
False



2 Maximum displacement from rest or equilibrium position is called the amplitude.

True

False



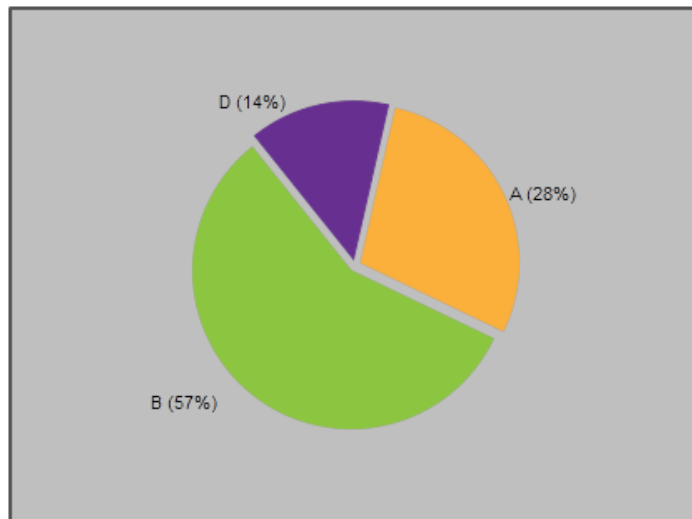
3 The number of cycles in a certain amount of time is called the \_\_\_\_\_.

A period

B frequency

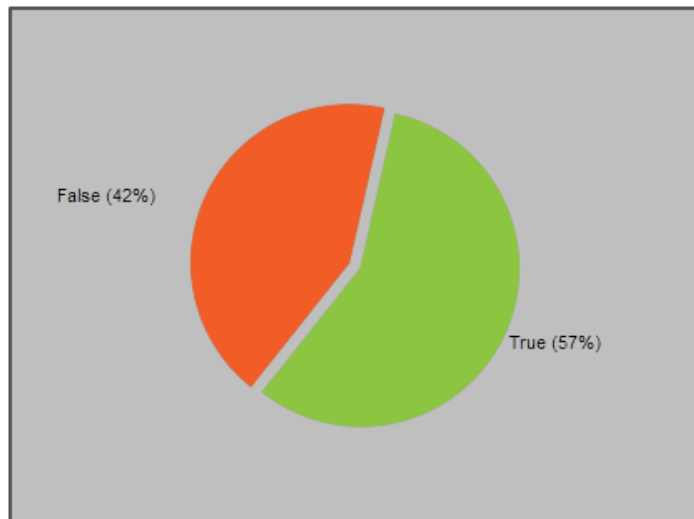
C amplitude

D wavelength



4 The unit of Hertz, Hz, is only used if the time is measured in seconds.

True  
False



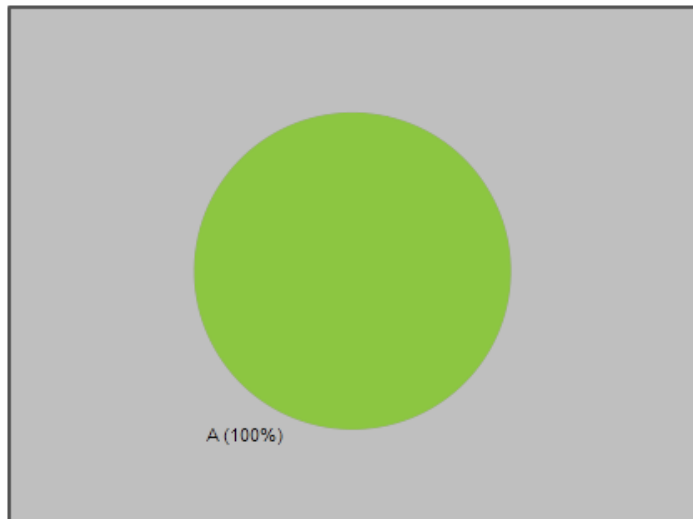
5 A child on a swings completes 15 cycles in 45 seconds.  
The period is:

A 3.0 s

B 0.33 s

C 3.0 Hz

D 0.33 Hz



6 The period of a strobe light is 0.062 seconds. Calculate the frequency.

A 0.062 s

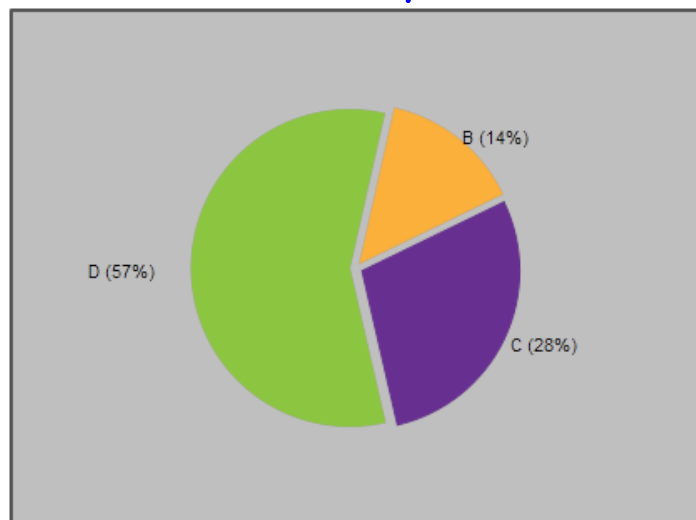
B 16.1 s

C 0.062 Hz

D 16.1 Hz

$$T = 0.062 \text{ s}$$

$$f = \frac{1}{T}$$



7 In a particular medium, what aspect of a mechanical wave always remains constant? (select all that apply)

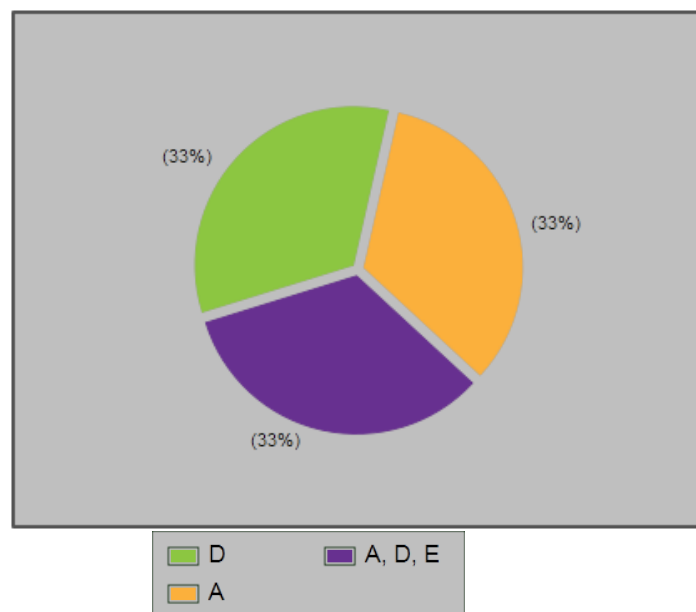
A wavelength

B frequency

C period

D speed

E amplitude





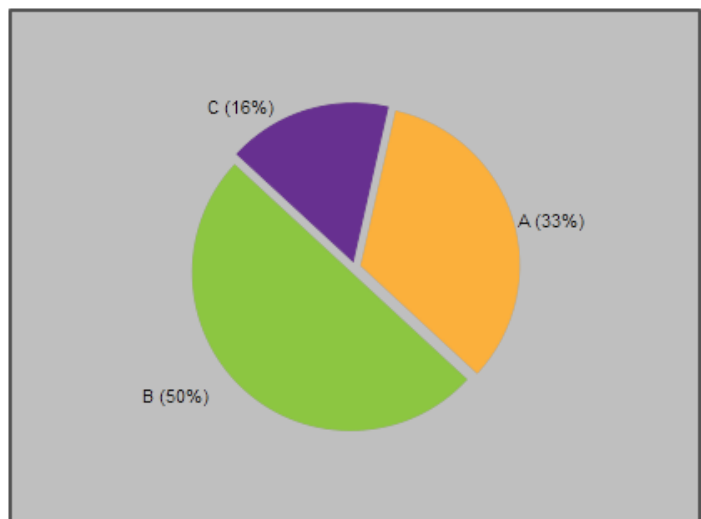
8 In what type of wave does the particles of a medium vibrate parallel to the direction of the wave?

A transverse

B longitudinal

C sound

D water



## Relationship of Wave Speed, Frequency and Wavelength

⇒ When a wave is generated in a spring or a rope, the wave travels a distance of one wavelength,  $\lambda$ , along the rope in the time required for one complete vibration of the source (the period). We can use the formula for velocity to derive the wave equation:

$$\text{velocity, } v = \frac{\text{change in position, } \Delta d}{\text{change in time, } \Delta t}$$

$$\text{and } \Delta d = \lambda, \text{ and } \Delta t = T$$

therefore

$$v = \frac{\lambda}{T}$$

$$\rightarrow v = \left(\frac{1}{T}\right) \lambda$$

but

$$f = \frac{1}{T}$$

$$v = f \lambda$$

Therefore

$$v = f \lambda$$

⇒ The wave equation,  $v = f \lambda$ , applies to all waves, visible and invisible.

## Examples

1. The wavelength of a water wave in a ripple tank is 0.080 m. If the frequency of the wave is 2.5 Hz, what is its speed?

$$\lambda = 0.080 \text{ m}$$

$$f = 2.5 \text{ Hz}$$

$$v = ?$$

$$v = f \lambda$$

$$v = (2.5)(0.080)$$

$$v = 0.2 \text{ m/s}$$

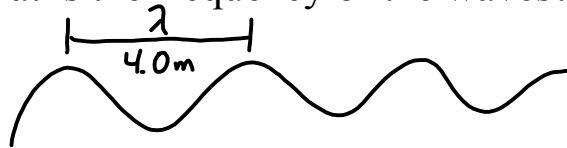
2. The distance between successive crests in a series of water waves is 4.0 m, and the crests travel 9.0 m in 4.5 s. What is the frequency of the waves?

$$\lambda = 4.0 \text{ m}$$

$$d_f = 9.0 \text{ m}$$

$$d_o = 0 \text{ m}$$

$$t = 4.5 \text{ s (not the period of the wave)}$$



Calculate v

$$v = \frac{d_f - d_o}{t} = \frac{9.0 - 0}{4.5} = \underline{\underline{2 \text{ m/s}}}$$

Calculate f

$$v = f \lambda$$

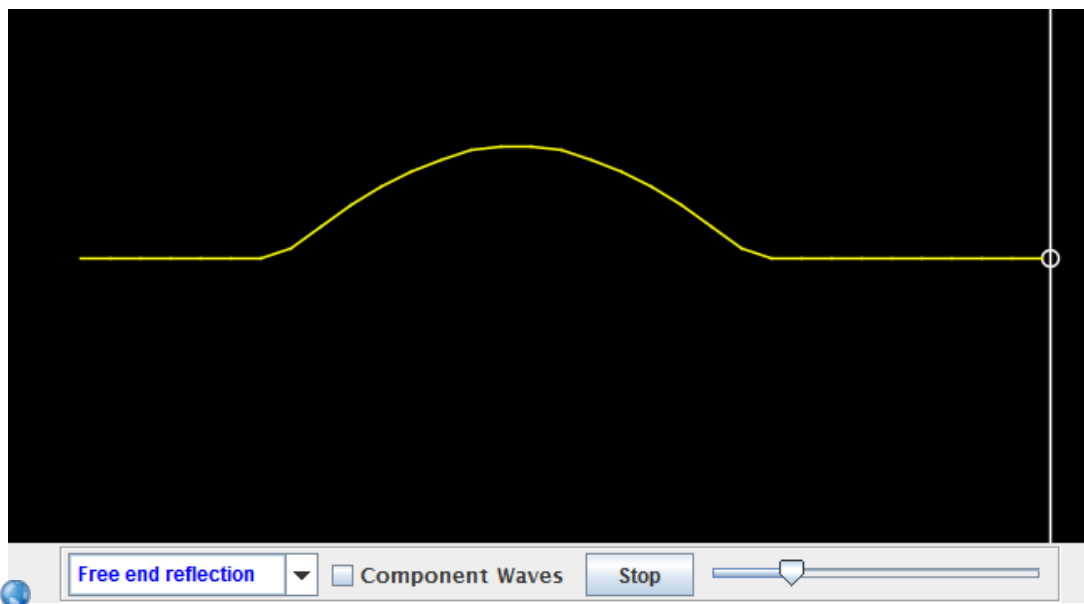
$$2 = f(4)$$

$$0.5 \text{ Hz} = f$$

# Wave Transmission & Reflection:

## Waves at Boundaries

- When a wave moves from one medium to another its frequency remains constant.
- The other quantities change and how they change depends on the properties of the medium.
- The frequency of a wave is totally depended on the source of vibrations and cannot be changed during propagation.



- Explore free and fixed-end reflection.
- Qualitative analysis of waves traveling into a different medium.