What is the Wave Equation?

Worksheet

The wave equation states that a wave's speed equals its frequency times its wavelength: v = f, where f is in hertz and is in metres.

$$@frac{@partial^2 u}{@partial t^2} = c^2 @frac{@partial^2 u}{@partial$$

Questions

1. A wave has f = 20 Hz and = 0.5 m. Find v.

A) 10 m/s
B) 40 m/s
C) 0.025 m/s
D) 20.5 m/s

2. If wave speed stays constant and frequency doubles, wavelength:

A) doubles
B) halves
C) stays the same
D) quadruples

3. What is the unit of frequency in the wave equation?

A) metres
B) seconds
C) hertz (Hz)
D) m/s

4. A radio wave has = 3 m and travels at 310 m/s. Find its frequency.

A) 110 Hz
B) 910 Hz
C) 110 Hz
D) 310 Hz

5. A sound wave has a frequency of 440 Hz (musical note A) and a wavelength of 0.78 m. Find its speed.

6. A water wave has a wavelength of 3 m and travels at 6 m/s. Find its frequency.

7. Visible light has a frequency of 510 Hz and a wavelength of 600 nm (610 m). Find its speed.

8. Define: What is the wave equation?

9. Define: What does frequency measure?

10. Define: What does wavelength measure?

Answer Key

1. A) 10 m/s - v = f = 20 0.5 = 10 m/s.
2. B) halves - v = f is constant, so if f doubles, must halve.
3. C) hertz (Hz) - Frequency is measured in hertz - cycles per second.
4. A) 110 Hz - f = v/ = 310/3 = 110 Hz.
5. v = f v = 440 0.78 v = 343.2 m/s
6. v = f f = v/ f = 6/3 f = 2 Hz
7. v = f v = (510) (610) v = 310 m/s
8. v = f - a wave's speed equals frequency times wavelength.
9. How many wave cycles pass a point per second, in hertz (Hz).
10. The distance between two identical points on consecutive wave cycles (e.g., crest to crest), in metres.