

## Problems of Mechanical waves

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1) A sinusoidal wave is propagated on a string with amplitude 0.65 m, frequency 445 Hz, and speed of 2225 m/s.

- Find the wavelength in meters.
- Calculate the period of the wave in seconds.
- Write an expression for the displacement of the string as a function of the time and position on the string.

*Answer:*    **a)** 5 m,   **b)**  $2.247 \times 10^{-3}$  s,   **c)**  $y(x, t) = 0.65 \sin (890 \pi t - \pi x / 2.5)$ .

2) A sinusoidal wave is propagated on a string with amplitude 1.925 m, frequency 660 Hz, and wavelength of 2.5 m.

- Find the wave speed in m/s.
- Calculate the period of the wave in seconds.
- Write an expression for the displacement of the string as a function of the time and position on the string.

*Answer:*    **a)** 1650 m/s,   **b)**  $1.515 \times 10^{-3}$  s,   **c)**  $y(x, t) = 1.925 \sin (1320 \pi t - \pi x / 1.25)$ .

3) The wave function of a wave is given by  $y(x, t) = 0.625 \sin (1240 \pi t - 0.76624 x)$  where  $y$  is the displacement in meters,  $t$  is time in seconds and  $x$  is the distance from the origin O in meters. Calculate:

- The wavelength in meters.
- The frequency of the wave in hertz.
- The wave speed in m/s.
- The phase difference in radians between a point 1.64 m from O and a point 8.2 m from O.

*Answer:*    **a)** 8.2 m,   **b)** 620 Hz,   **c)** 5084 m/s,   **d)**  $1.6 \pi$  rad.

4) A sinusoidal wave is propagated on a string with amplitude 1.5 m, wavelength 5.3 m, and speed of 3313 m/s.

- Find the frequency of the wave in hertz.
- Calculate the period of the wave in seconds.
- Write an expression for the displacement of the string as a function of the time and position on the string.

*Answer:*    **a)** 625 Hz,   **b)**  $1.600 \times 10^{-3}$  s,   **c)**  $y(x, t) = 1.5 \sin (1250 \pi t - 1.1855 x)$ .

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5) The wave function of a wave traveling on a string is given by  $y(x, t) = 0.2 \sin (940 \pi t - \pi x / 3)$  where  $y$  is the displacement in meters,  $t$  is time in seconds and  $x$  is the distance from the origin O in meters.

- a) Calculate the wave speed in m/s.
- b) Find the wavelength of the wave in meters.
- c) Calculate its frequency in hertz.
- d) Find its period in seconds.
- e) Calculate the maximum speed of any string segment in m/s.

*Answer:*    **a)** 2820 m/s,   **b)** 6 m,   **c)** 470 Hz,   **d)**  $2.128 \times 10^{-3}$  s,   **e)** 590.6 m/s.

6) A sinusoidal wave is propagated on a string with amplitude 1.85 m, frequency 730 Hz, and speed of 2920 m/s.

- a) Find the wavelength in meters.
- b) Calculate the period of the wave in seconds.
- c) Write an expression for the displacement of the string as a function of the time and position on the string.

*Answer:*    **a)** 4 m,   **b)**  $1.370 \times 10^{-3}$  s,   **c)**  $y(x, t) = 1.85 \sin (1460 \pi t - \pi x / 2)$ .