Physics 11
Spring 2026

$\boxed{\begin{array}{l} \text{ave.} = 6.6 \\ \sigma = 1.8 \end{array}}$

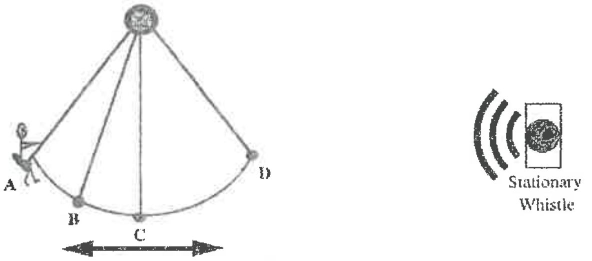
Name Answer Key

Quiz #8: Waves and Interference

Problem 1 (1 point)
The diagram below shows the various position of a child in motion on a swing. Somewhere in front of the child a stationary whistle is blowing. At which position will the child hear the highest frequency for the sound from the whistle?

$\boxed{E}$

a) at both A and D
b) at B when moving toward A
c) at B when moving toward C
d) at C when moving toward B
[✓ e)] at C when moving toward D

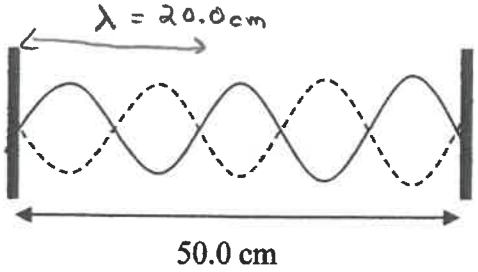


Problem 2 (3 points)
Do the wavelength **and** frequency of the second harmonic on a string stretched between two supports increase, decrease, or remain the same if we (a) **decrease** the distance between the supports without increasing the tension, (b) **increase** the tension in the string without changing the distance between the supports, and (c) switch to a string with a **smaller** linear density without changing the tension or distance between the supports?

$$\lambda_m = 2L/m$$
$$f_m = mv/2L$$
$$v = \sqrt{\frac{T_s}{\mu}}$$

	Wavelength	**Frequency**
(a)	decrease	increase
(b)	remain the same	increase
(c)	remain the same	increase

Problem 3 (3 points)
The following standing wave is produced on a string that is under a tension of 350 N. The linear density of the string is 6.22×10^{-2} kg/m. What is the frequency of the standing wave?



$m = 5$

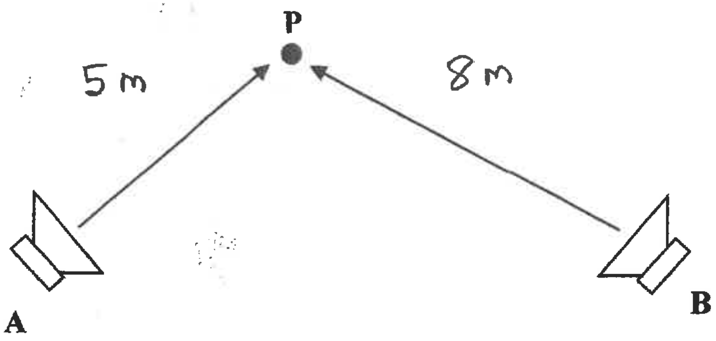
$$\lambda_m = 2L/m \rightarrow \lambda_5 = \frac{2(50.0\text{cm})}{5} = 20.0\text{cm} = 0.20\text{m}$$

$$v = \sqrt{\frac{T_s}{\mu}} = \sqrt{\frac{350\text{N}}{6.22\times10^{-2}\text{kg/m}}} \rightarrow v = 75.0\text{m/s}$$

$$\lambda f = v \rightarrow f = v/\lambda = \frac{75.0\text{m/s}}{0.20\text{m}}$$

$$\boxed{f = 375\text{Hz}}$$

Problem 4 (3 points)
A person is standing at point P, which is 5 m away from speaker A and 8 m away from speaker B as shown below. Both speakers vibrate in phase and play sound of the same frequency. Assume that the speed of sound is 343 m/s.



$$\Delta d = 8m - 5m = \underline{3m}$$

What are the two smallest frequency sound waves that the speakers can play so that a person at point P hears no sound?

↳ destructive interference

$$\Delta d = (m + \tfrac{1}{2})\lambda \rightarrow \underline{\lambda = \frac{\Delta d}{(m+\frac{1}{2})}} \qquad m = 0, 1, 2, \ldots$$

⇒ the two greatest wavelengths will result in the two smallest frequencies

$M = 0$ $$\lambda = \frac{3\ m}{(0+\frac{1}{2})} = 6\ m \qquad f = \frac{v}{\lambda} = \frac{343\ m/s}{6\ m} = \boxed{57\ Hz}$$

$m = 1$ $$\lambda = \frac{3m}{(1+\frac{1}{2})} = 2\ m$$

$$f = \frac{v}{\lambda} = \frac{343\ m/s}{2\ m} = \boxed{172\ Hz}$$