Physics 2A
Fall 2018

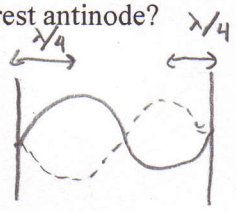
ave. = 7.2
σ = 2.3

Name Answer Key

Lab: early late (please circle one)

Quiz #10: Waves and Interference

Problem 1 (2 points)
A standing wave is formed on a guitar string fixed at both ends. What is the distance from a fixed end of the guitar string to the nearest antinode?



A

a) λ/4
b) λ/2
c) 3λ/4
d) λ

Problem 2 (2 points)
A guitar string produces 4 beats/s when sounded with a 250 Hz tuning fork and 9 beats per second when sounded with a 255 Hz tuning fork. What is the frequency of the string?

B

a) 241 Hz
b) 246 Hz
c) 254 Hz
d) 259 Hz
e) 263 Hz

250Hz 4beats/s → f = 246Hz or 254Hz
255Hz 9beats/s → f = 246Hz or 264Hz

f = 246Hz

Problem 3 (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?

	λ	f
(a)	decrease	increase
(b)	remain the same	increase
(c)	remain the same	increase

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

Problem 4 (3 points)
Two cars are moving directly away from each other along a straight road. Car A has a speed of 25 m/s and car B has a speed of 30 m/s. If car A sounds a horn whose frequency is 345 Hz, what is the frequency of the horn detected by Car B? Assume the speed of sound is 343 m/s.

25m/s ← A B → 30m/s

$f_s = 345\,Hz$
$f_o = ?$
$V_s = 25\,m/s$
$V_o = 30\,m/s$
$v = 343\,m/s$

$f_o = f_s\left(\frac{1 \pm V_o/v}{1 \mp V_s/v}\right) \rightarrow f_o = f_s\left(\frac{1 - V_o/v}{1 + V_s/v}\right)$

$f_o = (345Hz)\left(\frac{1 - \frac{30\,m/s}{343\,m/s}}{1 + \frac{25\,m/s}{343\,m/s}}\right)$

$f_o = 293\,Hz$