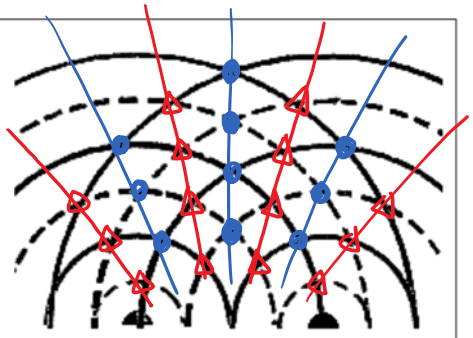
Printout

Wave and Sound January 11, 2022 8:37 AM **practice test** **Name:** _____

Written Questions: SHOW ALL WORK! Include correct units!

1. Draw the nodal and antinodal lines on the 2D interference pattern shown to the right. MAKE IT CLEAR WHICH IS WHICH! For example, you could use different colours (pen/pencil, whatever). (Draw at least 5 lines)



△ node

● antinode

2. Determine the missing property for each wave.

a) A 250 Hz wave travels at 10 m/s. Find wavelength

$V = f\lambda$ $10 = 250\lambda$ $\lambda = 0.04\text{m}$

Ans) 0.04 m

c) Determine the period of a fan that turns 340 times in 25 s.

$T = \frac{25\text{sec}}{340\text{ times.}} = 0.0735\text{ sec}$

Ans) 0.0735 sec

3. You look up and see superman passes directly overhead. He says "Hello" to you but it takes you 3.10s to hear that.

a) what is the speed of sound if the air temperature is 25.0°C,

b) how high was superman flying?

$V_s = 331 + 0.6T = 346\text{ m/s}$

$V = \frac{\text{dist}}{\text{time}}$ $346 = \frac{d}{3.1\text{ sec}}$ $d = 1073\text{m}$

a) 346 m/s

b) 1073 m

4. A water wave travels from deep to shallow water. If it's initial speed, frequency, and wavelength are 6.0 m/s, 1.5 Hz, and 4.0 m respectively, what will be its frequency and wavelength if its new speed is 4.0 m/s?

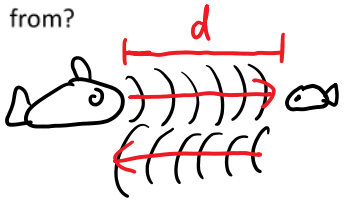
became "f" is fixed → $\frac{V_1}{\lambda_1} = \frac{V_2}{\lambda_2}$ $\frac{6\text{m/s}}{4\text{m}} = \frac{4\text{m/s}}{\lambda_2}$ $\lambda_2 = 2.\overline{6}\text{ m}$

same f

Frequency) 1.5 Hz

Wavelength) 2.6 m

5. A dolphin uses echolocation to find fish underwater. It emits a sound, and hears a reflected sound wave after 0.058 seconds. If the speed of sound in the water is 1.5×10^3 m/s, how far away is the fish that the sound wave reflected from?



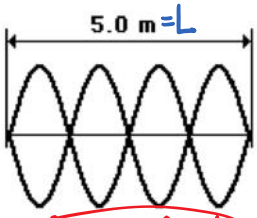
Sound travelled 2d

$V = \frac{d}{t}$ $1.5 \times 10^3 = \frac{2d}{0.058\text{sec}}$ $d =$

5) 43.5m

6. The string at the standing wave below is 5.0 meters long and is vibrating as the fourth harmonic. The string vibrates up and down with 48 cycles in 20.0 seconds. Determine

a) the frequency,
b) period
c) wavelength
d) speed for this wave.



fixed – fixed
4th even #

a) $f = \frac{48\ cys}{20\ sec} = 2.4\ Hz$

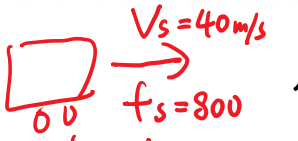
b) $T = \frac{1}{f} = \frac{1}{2.4} = 0.41\overline{6}\ sec$

c) $\lambda_4 = \frac{4}{8} \cdot L = \frac{4}{8}(5) = 2.5m$

d) $V = \lambda f = 2.5(2.4Hz) = 6\ m/s$

Frequency) 2.4 Hz
Period) 0.41$\overline{6}$ sec
Wavelength) 2.5 m
Speed) 6 m/s

7. An incoming ambulance moving at 40 m/s and emitting a steady 800-Hz sound from its siren. What is frequency of the siren received by a stationary observer if the temperature is 10° C?



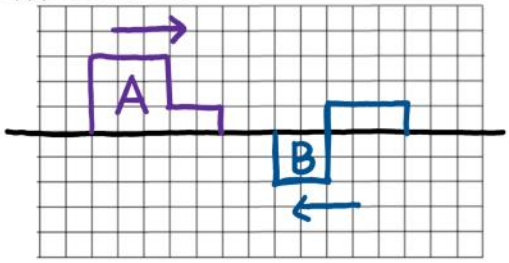
$f_o = f_s \left[\frac{V_w \pm V_o}{V_w - V_s}\right] = 800\left[\frac{337}{337-40}\right] = 908\ Hz$

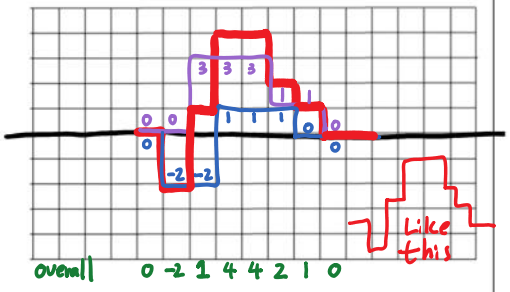
Top sign

$V_{sound} = 331 + 0.6(10°C) = 337\ m/s$

Speed of Sound) 337 m/s
freq) 908 Hz

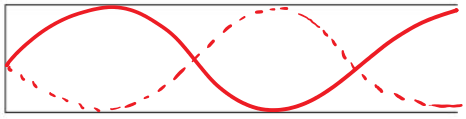
8. Two pulses A and B, traveling 2 boxes per second on a string as they head toward each other (t =0,) Using the principal of superposition, show the resultant displacement of the string after 2 sec (use a solid line in a different color). Your drawings should be precise, not sloppy. USE THE GRID





A tube **is open at one end and close at the other**, a standing wave is 6.0 meters long and is vibrating as the third harmonic. The sound wave is measured to vibrate 30 cycles in 8.0 seconds. Determine

a) Draw a picture of this standing wave
b) the frequency,
c) wavelength
d) speed for this wave.



b) $f = \frac{30\ cys}{8\ sec} = 3.75\ Hz$

c) $\lambda_3 = \frac{4}{5} \cdot [6\ m]_{tube} = 4.8\ m$

Third odd #

d) $V = \lambda f = 4.8m(3.75Hz) = 18\ m/s$.

Frequency) 3.75 Hz
Wavelength) 4.8 m
Speed) 18 m/s