8. a) f = v/λ = 3x108m/s/7x10-7m = 4.3 x 1014 Hz b) 2.5x10-15, very fast

9. a) 2.8m b) 3.4m c) reception would be much weaker

10. resultant wave will sound pleasant as the one note is twice the frequency of the other. The result will be a complex tone produced by the two notes together.



11. a)



b)



12. sound waves = longitudinal, water waves = transverse, guitar string = transverse, jump rope = transverse, drum = transverse, the “wave” = transverse, traffic jam = longitudinal

13. 2.1 or 1.9 Hz

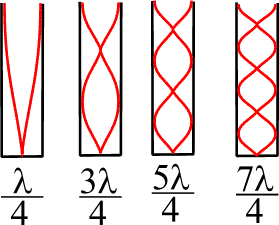
14. 330/440 = ¾. To increase the frequency to one 4/3 the previous frequency, the wavelength must be decreased accordingly, to ¾ of the previous wavelength. So, ¾ of 0.70m is 0.525m, you must place your finger 0.70-0.525m or 0.185m from the end.

15.



16.





b) frequency = v/λ. Wavelength for the four cases (l-r) 0.80m, 0.27m, 0.16m, 0.11m

f = (lowest to highest, l-r) = 340/0.80 = 425 Hz, 1260 Hz, 2125 Hz, 3090 Hz

17. a) pipe open at one end must have antinode at open end and node at closed end, so lowest frequency (fundamental tone) resonance would be ¼ wavelength in the tube, while the closed tube must have a node at each end, so the lowest frequency resonance would be ½ wavelength in the tube.

b) as the temperature rises, the speed of sound increases, but the wavelength would not change because the size of the pipe would not change significantly, so the frequency would increase proportional to the increase in temperature.



18. No, because the bullet was fired at the speed of sound relative to the moving train, so faster than the speed of sound relative to a stationary observer. The observer will not hear the bullet coming, because relative to him/her, the bullet is supersonic.

19. four antinodes = 2 wavelengths, so wavelength = 60cm. f=v/λ = 48m/s/0.6m = 80 Hz

20. assume the speed of sound = 340 m/s so wavelength of this particular wave is 340m/s/375Hz =0.91m . a) first possible standing wave is ½ wavelength, so 45.5cm b) second = 91cm c) third = 1.36m

21. wavelength would remain constant because dimensions of the flute would not change, so frequencies would increase by the same factor as the speed of sound. 1270m/s/340m/s = 3.74, so increase all frequencies by a factor of 3.74

22. f (observed) = f(source)\*(v+vo/v-vs) = 440Hz(340m/s/340-40m/s) = 498 Hz

23. 784 = 440(340/340-x) x = 149m/s



24.



|  |  |  |  |
| --- | --- | --- | --- |
| Frequency (Hz) | Length of air column (cm) | Wavelength (m) | Speed of sound (m/s) |
| 184 | 46 | 1.84 | 339 |
| 328 | 26 | 1.04 | 341 |
| 384 | 22 | 0.88 | 338 |
| 512 | 16 | 0.64 | 328 |
| 1024 | 24 | 0.96 | 983 |

b) for the highest frequency, it is likely that the students identified one of the higher frequency resonance points, rather than the ¼ wavelength one. Maybe ¾ wavelength or 5/4 wavelength?

c) If it was the ¾ wavelength for the 1024 Hz, the actual wavelength would be 32cm, giving a speed of sound that is much more reasonable

d) not always possible to know that you are getting the first resonance point. Also, it is sometimes hard to hear the resonance point.

