

## Physics 11

### Sound Practice Problems

1. An open tube, length 24.0 cm resonates with a tuning fork when the air temperature is 20 C. Find the frequency of the tuning fork (714.6 Hz)
2. When the air temperature is 25 C a closed tube resonates with a 256 Hz tuning fork. Find the first resonance length of the tube. Where would you find the tenth resonance length? (0.34 m, 6.46m)
3. An open tube resonates with a 512 Hz tuning fork when the air temperature is 20 C. a) How long must the open tube be? (0.335m) b) if you close one end of the tube, how must it now be in order to resonate with the same fork? (0.167m)
4. A closed tube has a resonance at 2.3447m when a 256Hz is sounded in a room and the temperature is 20°C. a) What is the wavelength? b) What resonance number is this? (1.334m, 4)
5. A 512Hz tuning fork is used to create resonance in a room with a temperature of 15°C. There is resonance at 1.3328m. Is the tube open at both ends or only 1? (open – 4<sup>th</sup> point)\*
6. What is the air temperature in a closed tube that resonates at 9.82cm due to a 850Hz frequency? (4.8°C)
7. A train with a 150Hz horn is moving at 35.0m/s on a day when the speed of sound is 340m/s. What frequencies are observed by a stationary person standing at the side of the tracks as the train approaches and after it passes? (167Hz, 136Hz)
8. At an air show a jet flies directly toward the stands at a speed of 1200km/h, emitting a frequency of 3500Hz, on a day when the speed of sound is 342m/s. What frequency is received by the observers? What frequency do they receive as the plane flies directly away from them? (138kHz,  $1.77 \times 10^3$ Hz)
9. Randolph is traveling at a certain speed when he passes Helen, who is standing on a main residential street. Down the road, at a location that is 400m from her position, Randolph slams on his brakes to avoid hitting a large grey squirrel that ran across the road after a basketball. The total time for him to drive by and the sound to come back was 21.1661 seconds as recorded on Helen's Timex watch with IPOD control. Was Randolph speeding? (yes. 6.11m/s over)
10. Gunther fires a starter pistol in the air and hears an echo 2.4 seconds later. If the temperature is 0°C, how far away is the reflecting surface? ( $3.972 \times 10^2$ m) b) How much sooner would he hear the echo if the temperature was 30°C? (0.124 sec)
11. Two tuning forks, frequencies 256 Hz and 300 Hz are sounded together, how many beats per second are heard? (4)
12. When a 256 Hz tuning fork is struck at the same time as a guitar string with an unknown frequency, 12 beats/sec are heard. What is the frequency of the guitar string? (244Hz or 268Hz)
13. Eleanor is standing 500m to the west of Gunther when she hears the pistol fired. How much time is there between the time she hears the first shot and the echo of the shot. Use the information from part a in question #10. (2.4 sec)\*
14. If the tension in the guitar string above is increased and 15beats/sec are heard what was the original frequency of the guitar? (268Hz)