AP Physics 1 Multiple Choice Questions - Chapter 10

1 The intensity produced by a jet airplane at a certain location is 150 dB. Calculate the intensity of the sound wave generated by the jet at the given location.

a 10 W/m^2 **b** 1000 W/m^2

c 10000 W/m^2 **d** 100 W/m^2

| | 10.1 |

2 A point source broadcasts sound into a uniform medium. If the distance from the source is tripled, how doe sthe intensity change?

a It becomes one-ninth as large

b It becomes one-third as large

c It is unchanged

d It becomes three times larger

e It becomes nine times larger

| | 10.1 |

3 The sound intensity level of a jet plane going down the runway as observed from a certain location is 105 dB. What is the intensity of the sound at this location?

a 2.45 x 10^{-2} W/m^2 **b** 3.54 x 10^{-3} W/m^2

c 8.25 x 10^{-3} W/m^2 **d** 3.16 x 10^{-2} W/m^2

e 1.05 x 10^{-2} W/m^2

| | 10.1 |

String 1

String 2

10.2

1 The figure above represents two guitar strings of different materials and lengths, which are on two guitars of different sizes. String 1 is plucked so it vibrates in the pattern shown. Very soon after string 1 is plucked, string 2, which is a short distance away, vibrates in the pattern shown. The guitars are placed in a sealed chamber and then the air is pumped out of the chamber. String 1 is again plucked and vibrates in the pattern shown. Does string 2 again vibrate in the pattern shown, and why or why not?

a Yes, because waves carry some of the energy produced by string 1 to string 2

b Yes, because the strings share the same fundamental frequency

c No, because the amplitude of the vibration of string 1 becomes zero too quickly for string 2 to start vibrating

d No, because almost no energy associated with the vibration of string 1 reaches string 2

2 Find the frequency of the fundamental harmonic of a steel wire 1.00 m long with a mass per unit length of 2.00×10^{-5} kg/m and under a tension of 80.0 N.

10.2

a 60 Hz   **b** 100 Hz

c 80 Hz   **d** 120 Hz

e 150 Hz

3 Calculate the frequency of the second harmonic of a steel wire 1.00 m long with a mass per unit length of 2.00×10^{-5} kg/m and under a tension of 80.0 N.

10.2

a 180 Hz   **b** 240 Hz

c 160 Hz   **d** 200 Hz

e 300 Hz

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1 To determine the speed of waves on a string, some students tie a long string of unknown length between a wave generator and a wall. They vary the frequency f of the generator to get a standing wave. They count the nodes n and measure the wavelength λ. They repeat the experiment, creating standing waves with different frequencies. Which of the following is the best relationship to graph to determine the speed of the waves on the string?

a f as a function of λ	**b** f as a function of $1/\lambda$
c f as a function of n	**d** f as a function of $1/n$

X   Y

2 The figure above represents standing wave patterns in two identical tubes. The tubes contain the same amount of water, and the standing waves are produced by holding a vibrating tuning fork near the top of each tube. What is the relationship between the wavelengths λ_x and λ_y of the standing waves?

a $\lambda_x = (1/7)\lambda_y$	**b** $\lambda_x = (2/7)\lambda_y$
c $\lambda_x = (7/2)\lambda_y$	**d** $\lambda_x = 7\lambda_y$

3 A flute has a length of 58.0 cm. If the speed of sound in air is 343 m/s, what is the fundamental frequency of the flute, assuming it is a tube closed at one end and open at the other?

a 240 Hz	**b** 242.5 Hz
c 247.5 Hz	**d** 250 Hz
e More than one answer could be correct	

10.3

10.3

10.3

1 A pipe open at both ends has a fundamental frequency of 260 Hz when the temperature is zero degrees celsius. What is the length of the pipe?

a	63.7 cm	**b**	58.2 cm
c	72.5 cm	**d**	6.35 m

10.4

2 A pipe open at both ends has a fundamental frequency of 300 Hz when the temperature is 0°C. What is the length of the pipe?

a	0.48 m	**b**	0.55 m
c	0.62 m	**d**	0.78 m

10.4

3 What is the fundamental frequency of a 0.60 m long pipe open at both ends when the temperature is 50°C?

a	300 Hz	**b**	275 Hz
c	320 Hz	**d**	350 Hz

10.4

1 A speaker is at rest at the side of a straight road. The speaker produces a steady sound of constant frequency. A student is standing still near the speaker. Two vehicles are driven down the road: a truck approaching the speaker and a car moving away from the speaker. If the sound is represented by wave fronts, the student and the vehicle drivers each observe a different amount of time between successive wave fronts: t_s for the student, t_t for the truck driver, and t_c for the car driver. Which of the following correctly ranks the times?

10.5

a $t_s < t_t < t_c$ **b** $t_c < t_s < t_t$
c $t_t < t_s < t_c$ **d** $t_t < t_c < t_s$

2 Two sirens A and B are sounding so that the frequency from A is twice the frequency from B. Compared with the speed of sound from A, is the speed of sound from B

10.5

a Twice as fast   **b** Half as fast
c Four times as fast   **d** One-fourth as fast
e The same

3 As you travel down the highway in your car, an ambulance approaches you from the rear at a high speed, sounding its siren at a frequency of 500 Hz. Which statement is correct?

10.5

a You hear a frequency less than 500 Hz
b You hear a frequency equal to 500 Hz
c You hear a frequency greater than 500 Hz
d You hear a frequency greater than 500 Hz, whereas the ambulance driver hears a frequency lower than 500 Hz
e You hear a frequency less than 500 Hz, whereas the ambulance driver hears a frequency of 500 Hz