Question 1
The average person can hear sound waves ranging in frequency from about 20 Hz to 20 kHz. Determine the wavelengths at these limits, taking the speed of sound to be 340 m/s.

(A) 17 m, 1.7 cm
B) 0.059 m, 58.8 m
C) 6800 m, 6.8 x 106 m
D) 17m, 0.0017 cm

$\lambda = \frac{v}{f}$ $\quad \lambda_1 = \frac{340}{20} = 17\ m$

$\lambda_2 = \frac{340}{20{,}000} = 0.017\ m$

Question 2
When driven by a 120 Hz vibrator, a string has transverse waves of 31 cm wavelength traveling along it. (a) What is the speed of the waves on the string? (b) If the tension in the string is 1.20 N, what is the mass of 50 cm of the string?

A) (a) 387 m/s, b) 0.00043 g
B) (a) 0.0026 m/s, b) 43.5 g
(C) (a) 37 m/s, (b) 0.43 g
D) (a) 3720 m/s, (b) 16.2 g

a) $\lambda = \frac{v}{f} \rightarrow v = \lambda f = (0.31)(120) = 37\ m/s$

b) $v = \sqrt{\frac{F}{\mu}} \rightarrow 37 = \sqrt{\frac{1.2}{\mu}} \rightarrow \mu = 8.76 \times 10^{-4}\ kg/m$

$m = (8.76 \times 10^{-4})(0.5) = 0.043\ kg$

Question 3
A string 180 cm long resonates in three segments to transverse waves sent down it by a 270 Hz vibrator. What is the speed of the waves on the string?

A) 486 m/s
B) 225 m/s
(C) 324 m/s
D) 32400 m/s

$f = 270$

$\frac{\lambda}{2} = 180/3 = 60 \rightarrow \lambda = 120\ cm = 1.2\ m$

$\lambda = \frac{v}{f} \rightarrow v = (1.2)(270) = 340\ m/s$

Question 4
A flexible cable, 30 m long and weighing 70 N, is stretched between two poles by a force of 2.0 kN. If the cable is struck sideways at one end, how long will it take the transverse wave to travel to the other end and return?

A) 0.33 s
(B) 0.65 s
C) 3.6 s
D) 2.0 s

we need v : $v = \sqrt{F/\mu} = \sqrt{\frac{2000\ N}{0.24\ kg/m}} = 91.6\ m/s$

$\mu = \frac{70/9.8}{30} = 0.24\ kg/m$

$t = \frac{x}{t} = \frac{30}{91.6} = 0.33\ s$

$2t$ = round trip $= 0.66\ s$

Question 5
The intensity of an isotropic sound wave is

A) directly proportional to the distance from the source.
B) inversely proportional to the distance from the source.
C) directly proportional to the square of the distance from the source.
(D) inversely proportional to the square of the distance from the source.
E) none of the above.

See equation (11.1)

Question 6
Of these properties of a wave, the one that is independent of the others is its

(A) amplitude

Amplitude is independent of wavelength, speed, frequency and period.

B) wavelength
C) speed
D) frequency

Question 7
The higher the frequency of a wave
A) the smaller its speed.
B) the shorter its wavelength.
C) the greater its amplitude.
D) the longer its period.

$\lambda = \frac{v}{f}$

Question 8
The speed of waves in a stretched string depends upon which one of the following?
A) The tension in the string
B) The amplitude of the waves
C) The wavelength of the waves
D) The gravitational field strength

$v = \sqrt{\frac{F}{\mu}}$ (notice that it is independent of amplitude)

Question 9
Standing waves are produced by the superposition of two waves with
A) the same amplitude, frequency, and direction of propagation.
B) the same amplitude and frequency, and opposite propagation directions.
C) the same amplitude and direction of propagation, but different frequencies.
D) the same amplitude, different frequencies, and opposite directions of propagation.

See Section 11.10

Question 10
Two successive transverse pulses, one caused by a brief displacement to the right and the other by a brief displacement to the left, are sent down a Slinky that is fastened at the far end. At the point where the first reflected pulse meets the second advancing pulse, the deflection (compared with that of a single pulse) is
A) quadrupled.
B) doubled.
C) canceled.
D) halved.

When the two pulses meet, they are in phase and their deflections add to twice that of each.