

First major (T-012)

Q0 What is the wave speed of a transverse wave on a string described by

$$y = (2.0 \text{ mm}) \sin[10.0 x - 100 t]$$

Q0 where x is in meters and t is seconds.

Q0

A1 10 m/s

A2 1000 m/s

A3 0.010 m/s

A4 20 m/s

A5 2000 m/s

Q0

Q0 A string has a mass density of 0.10 kg/m and it is under

Q0 tension of 10.0 N. What must be the frequency of traveling

Q0 waves of amplitude 10.0 mm for the average power to be 0.5 W?

Q0

A1 16 Hz

A2 100 Hz

A3 0.01 Hz

A4 10 Hz

A5 32 Hz

Q0

Q0 The velocity of a traveling wave on a string under fixed

Q0 tension

Q0

A1 does not change when the frequency increases

A2 increases when the frequency increases

A3 decreases when the frequency increases

A4 decreases when the wave length increases

A5 decreases when the amplitude increases

Q0

Q0 Two identical waves moving in the same direction along a

Q0 stretched string, interfere with each other. The amplitude

Q0 of each wave is 10.0 mm and the phase difference between them

Q0 is 0.80 radian. What is the amplitude of the resultant wave?

Q0

A1 14 mm

A2 10 mm

A3 7.3 mm

A4 20 mm

A5 8.0 mm

Q0

Q0 A standing wave pattern is established on a string as shown in

Q0 Figure 1. The wavelength of the component traveling wave is

Q0

A1 10 m

A2 5.0 m

A3 0.2 m

A4 0.4 m

A5 15 m

Q0

Q0 A string that is stretched between two supports separated by

Q0 1.0 m has resonant frequencies of 500 Hz and 450 Hz, with no

Q0 intermediate resonant frequencies, what is the wave speed in

Q0 the string?

Q0

A1 50 m/s

A2 450 m/s

A3 500 m/s

A4 200 m/s

A5 350 m/s

Q0 Pipe A, which is 1.8 m long and open at both ends, oscillates at its third lowest harmonic frequency. Pipe B, which is closed at one end, oscillates at its second lowest harmonic frequency. The frequencies of pipes A and B match. They are both filled with air for which the speed of sound is 344 m/s. How long is pipe B?

Q0

A1 0.9 m

A2 1.8 m

A3 3.6 m

A4 0.6 m

A5 1.0 m

Q0

Q0 A sinusoidal sound wave is described by the displacement

Q0 $S(x,t) = 2 \cdot 10^{-8} \cos [1.25 x - 1850 t]$,

Q0 where x is in meters and t is seconds. What is the pressure

Q0 amplitude of this wave if it is traveling in a material

Q0 with a bulk modulus of $2.1 \cdot 10^9 \text{ N/m}^2$?

A1 52.5 Pa

A2 42.5 Pa

A3 62.5 Pa

A4 72.5 Pa

A5 82.5 Pa

Q0

Q0 Two sound waves, from two different sources with the same

Q0 frequency, 540 Hz, travel in the same direction at 344 m/s.

Q0 The sources are in phase. What is the phase difference of the

Q0 waves at a point that is 4.40 m from one source and 4.00 m from

Q0 the other source?

Q0

A1 3.95 rad

A2 1.97 rad

A3 0.64 rad

A4 1.27 rad

A5 1.59 rad

Q)

Q0 Two point sources S_1 and S_2 are placed on the y -axis as

Q0 shown in figure 1. The two sources are in phase and emit

Q0 identical sound waves with frequency 860 Hz. An observer

Q0 starts at point A and moves to point B along a straight

Q0 line parallel to the y -axis. How many points of maximum

Q0 intensity (constructive interference) will he observe?

Q0 (speed of sound in air = 344 m/s).

Q0

A1 5

A2 4

A3 0

A4 1

A5 3

Q0 A sound source located at the origin emits sound with an

Q0 average power of 0.04 W. Two detectors are located on the

Q0 positive x -axis. Detector A is at $x = 3.0 \text{ m}$ and detector B

Q0 is at 5.0 m. What is the difference in sound level between

Q0 A and B?

A1 4.4 dB

A2 1.1 dB

A3 2.2 dB

A4 3.3 dB

A5 5.5 dB

Q0 A car emitting a sound wave at a certain frequency moves along an x-axis (figure 2 a). The car moves directly toward detector A and directly away from detector B. The superimposed three plots of figure 2 b indicate the displacement function $s(x)$ at some time t of the sound wave as measured by detector A, by detector B, and by someone in C. Which plot corresponds to which measurement?

A1 1 to A , 2 to B , 3 to C

A2 1 to A , 3 to B , 2 to C

A3 2 to A , 1 to B , 3 to C

A4 2 to A , 3 to B , 1 to C

A5 3 to A , 2 to B , 1 to C

Q0

Q2 Q0 How much heat is required to melt ice of mass 500 g at -10 deg C to water at 0 deg C?

19 Q0 (specific heat of ice, c , = 2220 J/(kg.K);

Q0 heat of fusion of ice, L_f , = $333 \cdot 10^3$ J/kg)

Q0

A1 $1.78 \cdot 10^{**5}$ J

A2 $2.05 \cdot 10^{**5}$ J

A3 $3.01 \cdot 10^{**5}$ J

A4 $9.05 \cdot 10^{**5}$ J

A5 $8.45 \cdot 10^{**5}$ J

Q0

Q3 Q0 A steel washer (ring) has an inner diameter of 4.000 cm and an outer diameter of 4.500 cm at 20 deg C. To what temperature

19 Q0 must the washer be heated to just fit over a rod that is

Q0 4.010 cm in diameter?

Q0 (Coefficient of linear expansion of steel, α ,

Q0 = $11 \cdot 10^{**-6}$ per C deg)

Q0

A1 247 deg C

A2 315 deg C

A3 100 deg C

A4 509 deg C

A5 -40 deg C

Q0

Q5 Q0 A cylindrical copper rod of length 1.5 m and cross section 6.5 cm^2 is insulated to prevent heat loss through its surface.

19 Q0 The ends are maintained at a temperature difference of

Q0 100 C deg by having one end in a water-ice mixture and the

Q0 other in boiling water and steam. How much ice is melted per

Q0 hour at the cold end?

Q0 (thermal conductivity of copper, κ , = 401 W/(m.K);

Q0 heat of fusion of ice, L_f , = $333 \cdot 10^3$ J/kg)

Q0

A1 188 g

A2 281 g

A3 330 g

A4 980 g

A5 469 g

Q0

Q6 Q0

19 Q0 Two moles of a monatomic ideal gas at a temperature of 300 K

012Q0 and pressure of 0.20 atm is compressed isothermally (constant

Q0 temperature) to a pressure of 0.80 atm. Find the work done by

Q0 the gas.

Q0

A1 -6900 J

A2 +6900 J

A3 -18000 J

A4 +18000 J
A5 0 J
Q0

Q7 Q0 Body A is at a higher temperature than Body B. When they are
012Q0 placed in contact, heat will flow from A to B
19 Q0

A1 until both have the same temperature
A2 only if the specific heat of A is larger than that of B
A3 only if the volume of A is larger than that of B
A4 only if A has the greater internal energy content
A5 only if the thermal conductivity of A is greater than that of B
Q0

Q1 Q0 An ideal gas undergoes an isothermal process starting with a
20 Q0 pressure of 2×10^5 Pa and a volume of 6 cm³. Which of the
Q0 following might be the pressure and volume of the final state?
Q0

A1 6×10^5 Pa and 2 cm³
A2 1×10^5 Pa and 10 cm³
A3 3×10^5 Pa and 6 cm³
A4 4×10^5 Pa and 4 cm³
A5 8×10^5 Pa and 2 cm³
Q0

Q2 Q0 Two moles of a monatomic ideal gas is compressed at a constant
20 Q0 pressure of 1.5 atm from a volume of 70 liters to 35 liters.
Q0 Calculate the change in internal energy of the gas.
Q0

A1 -1.3×10^4 J
A2 -0.87×10^4 J
A3 -3.5×10^4 J
A4 2.4×10^4 J
A5 -1.9×10^4 J
Q0

Q3 Q0 In an adiabatic process, the temperature of one mole of an
20 Q0 ideal monatomic gas is decreased from 500 K to 400 K.
Q0 What is the work done during the process in calories?
Q0

A1 300
A2 500
A3 200
A4 100
A5 400
Q0

Q4 Q0 The figure shows 5 paths traversed by a gas on a P-V diagram.
20 Q0 For which of the 5 paths is the change in internal energy
Q0 the greatest?
Q0

A1 5
A2 1 and 2
A3 5 and 4
A4 3
A5 4
Q0

Q6 Q0 One mole of an ideal monatomic gas is taken through the cyclic
20 Q0 process shown in the figure. Calculate the net heat (lost or
Q0 gained) by the gas during one complete cycle.
Q0

A1 $4 \cdot P_0 \cdot V_0$ Joule (lost)
A2 $2 \cdot P_0 \cdot V_0$ Joule (lost)
A3 $3 \cdot P_0 \cdot V_0$ Joule (lost)
A4 $4 \cdot P_0 \cdot V_0$ Joule (gained)
A5 $2 \cdot P_0 \cdot V_0$ Joule (gained)

Q0