First Major T-042

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1  Q0 A transverse sinusoidal wave is traveling on a string with a
17 Q0 speed of 300 m/s. If the wave has a frequency of 100 Hz, what
   Q0 is the phase difference between two particles on the string
   Q0 that are 85 cm apart?
   Q0
   A1 1.8 radians.
   A2 3.4 radians.
   A3 0.6 radians.
   A4 5.6 radians.
   A5 4.1 radians.
   Q0
 2 Q0 Figure 2 shows the displacements at the same instant for
 17Q0 two waves, P and Q, of equal frequency and having amplitude
   Q0 Y and 2*Y, respectively. If the two waves move along the
   Q0 positive x-direction, what is the amplitude of the resultant
   Q0 wave, and the phase difference between the resultant wave
   Q0 and the wave P?
   Q0
   A1 Resultant amplitude is Y, and the phase difference is Pi.
   A2 Resultant amplitude is 2*Y, and the phase difference is Pi.
   A3 Resultant amplitude is 3*Y, and the phase difference is Pi.
   A4 Resultant amplitude is Y, and the phase difference is zero.
   A5 Resultant amplitude is 2*Y, and the phase difference is zero.
   Q0
3  Q0 A 50 cm long string with a mass of 0.01 kg is stretched with
17 Q0 a tension of 18 N between two fixed supports. What is the
   Q0 resonant frequency of the longest wavelength on this string?
   Q0
   A1    30 Hz.
   A2   150 Hz.
   A3    50 Hz.
   A4   312 Hz.
   A5   9.8 Hz.
   Q0
4  Q0 A transverse sinusoidal wave of frequency 100 Hz is traveling
17 Q0 along a stretched string with a speed of 20.0 m/s. What is the
   Q0 shortest distance between a crest and a point of zero
   Q0 transverse acceleration?
   Q0
   A1   0.05 m.
   A2   0.20 m.
   A3   0.10 m.
   A4   1.20 m.
   A5   0.15 m.
   Q0
5  Q0 In a liquid having density 1.30*10**3 kg/m**3, longitudinal
18 Q0 waves with frequency of 400 Hz are found to have a wavelength
   Q0 of 8.0 m. Calculate the bulk modulus of the liquid.
   Q0
   A1  1.33*10**10 Pa.
   A2  3.12*10**6  Pa.
   A3  9.62*10**7  Pa.
   A4  6.64*10**12 Pa.
   A5  1.20*10**11 Pa.
   Q0
6  Q0 An ambulance emits sound of frequency 300 Hz and is moving with
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18 Q0 a speed of 45.0 m/s away from a moving car. If the car is
Q0 moving towards the ambulance with a speed of 15.0 m/s, what
Q0 frequency does a person in the car hear?
Q0 [The speed of sound in air is 343 m/s].
Q0
A1 277 Hz.
A2 300 Hz.
A3 333 Hz.
A4 370 Hz.
A5 250 Hz.
Q0
7 Q0 A person is hearing a sound level of 70 dB at a distance of
18 Q0 3.0 m from a point source. Assuming that the sound is emitted
Q0 isotropically, find the power of the source.
Q0
A1 1.1*10**(-3) W.
A2 2.3*10**(-4) W.
A3 8.6*10**(-6) W.
A4 2.9*10**(-5) W.
A5 7.7*10**(-3) W.
Q0
8 Q0 The frequency of the fundamental mode of a sound wave in a
18Q0 30.0-cm long tube closed at one end is 256 Hz. When the tube
Q0 length is shortened to 12.0-cm, what is the new fundamental
Q0 frequency?
Q0
A1 640 Hz.
A2 102 Hz.
A3 162 Hz.
A4 416 Hz.
A5 256 Hz.
Q0
9 Q0 In figure 1, two speakers, A and B, are driven by the same
18Q0 oscillator at a frequency of 170 Hz and face each other at
Q0 a distance of 2.0 m. What is the number of minima along the
Q0 line joining the two sources? [Consider only the nodes between
Q0 the two sources.]
Q0 [Take the speed of sound in air = 340 m/s]
Q0
A1 2
A2 4
A3 5
A4 1
A5 zero
Q0
10 Q0 A bottle of soft drink is placed in a refrigerator and left
19 Q0 there until its temperature drops by 15 K from its original
Q0 value. What is the corresponding change in temperature on
Q0 the Fahrenheit scale?
Q0
A1 27 Fahrenheit degrees.
A2 59 Fahrenheit degrees.
A3 -31 Fahrenheit degrees.
A4 8.3 Fahrenheit degrees.
A5 258 Fahrenheit degrees.
Q0
11 Q0 An iron ball has a diameter of 6.00 cm and is 0.01 cm larger
19 Q0 than the diameter of a brass ring. Both are at a temperature

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   Q0 of 20 degrees Celsius. To what temperature should the brass
   Q0 ring be heated so that the ball just passes through the hole?
   Q0 [The coefficient of linear expansion of
   Q0 brass = 1.9*10**(-5) K**-1]
   Q0
   A1 108 degrees Celsius.
   A2 590 degrees Celsius.
   A3 430 degrees Celsius.
   A4 165 degrees Celsius.
   A5  32 degrees Celsius.
   Q0
12 Q0 A person wants to cool 0.3-kg of water that is initially at
19 Q0 30 degrees Celsius by adding ice initially at -25 degrees
   Q0 Celsius. How much ice should he add so that the final
   Q0 temperature will be 0 degrees Celsius with all the ice melted?
   Q0 [For ice, use the specific heat = 2.1*10**3 J/ (kg*K),
   Q0 and heat of fusion = 3.3*10**5 J/kg].
   Q0
   A1  99  g.
   A2  11  g.
   A3  43  g.
   A4  22  g.
   A5  1.2 g.
   Q0
13 Q0 In a PV diagram, a system of an ideal gas goes through the
19 Q0 process shown in Figure 3. How much heat is absorbed after
   Q0 the system goes through this cycle 10 times.
   Q0 [Take P= 1.0 Pa and V= 1.0 m**3].
   Q0
   A1  20 Joules.
   A2  25 Joules.
   A3  15 Joules.
   A4   5 Joules.
   A5   2 Joules.
   Q0
14 Q0 An ideal monatomic gas originally in state A is taken reversibly
20 Q0 to state B along the straight line path shown in figure 4.
   Q0 What is the change in the internal energy of the gas for this
   Q0 process?
   Q0
   A1   30  kJ.
   A2  -30  kJ.
   A3  -180 kJ.
   A4   180 kJ.
   A5  -15  kJ.
   Q0
15 Q0 A system of monatomic ideal gas expands to twice its original
20 Q0 volume, doing 300 J of work in the process. The heat added to
   Q0 the gas will be largest if the process is
   Q0
   A1 done at constant pressure.
   A2 cyclic.
   A3 done isothermaly.
   A4 done adiabatically.
   A5 done at constant volume.
   Q0
16 Q0 One mole of a monatomic ideal gas is initially at a temperature
20 Q0 of 300 K and with a volume of 0.080 m**3. The gas is compressed
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Q0 adiabatically to a volume of 0.040 m**3. What is the final
Q0 temperature?
Q0
A1   476 K.
A2   100 K.
A3   522 K.
A4   999 K.
A5   7.00 K.
Q0
17 Q0 Five moles of an ideal gas are kept at a constant temperature of
20 Q0 53.0 degrees Celsius while the pressure of the gas is increased
Q0 from 1.00 atm to 3.00 atm. Find the work done in the process.
Q0
A1 14.9 kJ of work done on the gas.
A2 14.9 kJ of work done by the gas.
A3 2.42 kJ of work done on the gas.
A4 2.42 kJ of work done by the gas.
A5 zero.
Q0
18 Q0 Two moles of a monatomic ideal gas with an RMS speed of 254 m/s
20 Q0 are contained in a tank that has a volume of 0.15 m**3. If the
Q0 molar mass of the gas is 0.39 kg/mole, what is the pressure
Q0 of the gas?
Q0
A1 1.1*10**5 Pa.
A2 2.3*10**5 Pa.
A3 6.8*10**4 Pa.
A4 3.2*10**6 Pa.
A5 2.2*10**4 Pa.
Q0
19 Q0 A car engine delivers 8.6 kJ of work per cycle. If its
21 Q0 efficiency is 30%, find the energy lost by the engine
Q0 per cycle.
Q0
A1 20 kJ.
A2 8.6 kJ.
A3 14 kJ.
A4 24 kJ.
A5 26 kJ.
Q0
20 Q0 A 5.00-kg block of copper is at 296 K. If it is heated
21 Q0 that its entropy increases by 1.07 kJ/K, what is the
Q0 final temperature?
Q0 [The specific heat of copper is 386 J/(kg*K)]
Q0
A1 515 K.
A2 310 K.
A3 760 K.
A4 100 K.
A5 273 K.

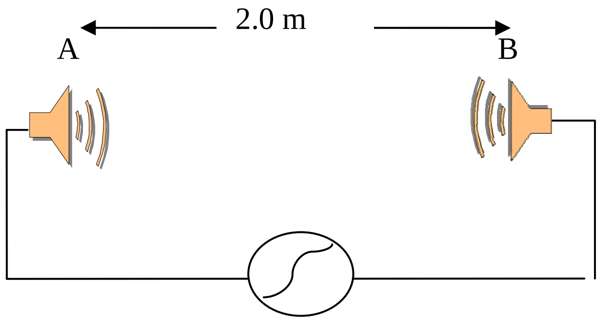
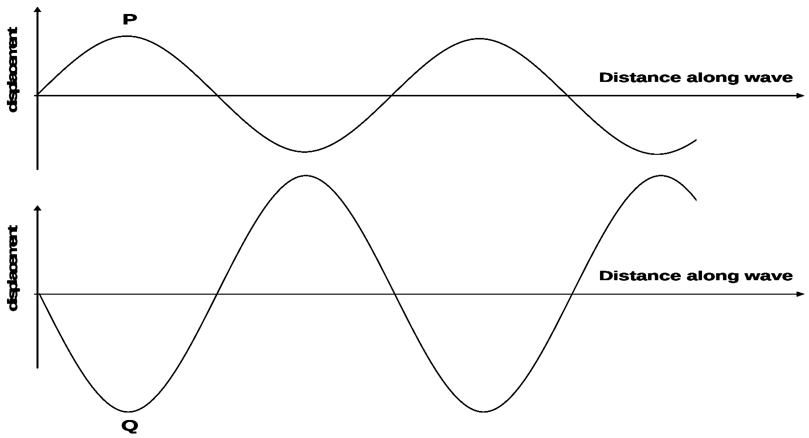
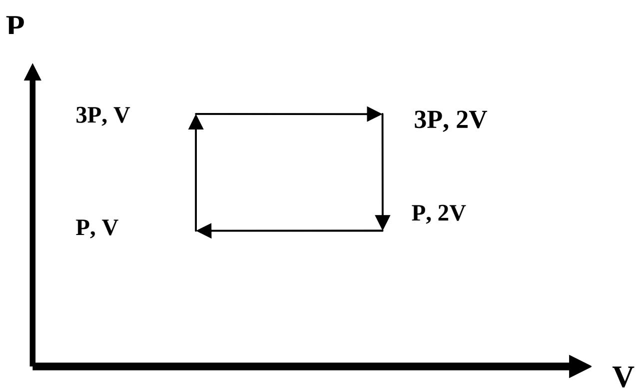


Figure 1



The waves are superimposed to give a resultant wave.

Figure 2



Figue 3

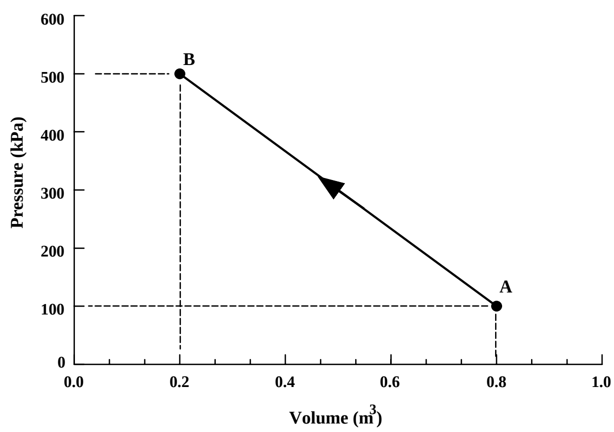


Figure 4