1 Q0 A water wave is described by the equation:
17 Q0
Q0 y(x,t) = 0.40 cos [0.10(x + 3t)]
Q0
Q0 where x and y are in meters and t is in seconds. The maximum
Q0 transverse speed of the water molecules is
Q0
A1 0.12 m/s.
A2 1.20 m/s.
A3 0.04 m/s.
A4 0.22 m/s.
A5 4.11 m/s.
Q0
2 Q0 Two identical waves, moving in the same direction, have a phase
Q0 difference of Pi/2. The amplitude of each of the two waves is
17 Q0 0.10 m. If they interfere, then the amplitude of the resultant
Q0 wave is:
Q0
A1 0.14 m.
A2 0.21 m.
A3 0.05 m.
A4 1.12 m.
A5 Not enough information is given to solve this question.
Q0
3 Q0 A wave of speed 20 m/s on a string, fixed at both ends, has an
Q0 equation for a standing wave given by:
17Q0
Q0 y(x,t) = 0.05 sin(k x) cos(30 t),
Q0
Q0 where x and y are in meters and t is in seconds. What is the
Q0 distance between two consecutive nodes?
Q0
A1 2.1 m.
A2 3.2 m.
A3 0.1 m.
A4 1.1 m.
A5 5.0 m.
Q0
4 Q0 A 40 cm string of linear mass density 8.0 g/m is fixed at both
Q0 ends. The string is driven by a variable frequency audio
17 Q0 oscillator ranged from 300 Hz to 800 Hz. It was found that the
Q0 string is set in oscillation only at the frequencies 440 Hz and
Q0 660 Hz. What is the tension in the string?
Q0
A1 248 N.
A2 322 N.
A3 125 N.
A4 500 N.
A5 496 N.
Q0
5 Q0 Consider a wave described by the equation:
17 Q0
Q0 y(x,t) = A cos (k*x-w*t).
Q0
Q0 At t = 0, the displacement is zero at x= :
Q0
A1 1/4 wavelength, 3/4 wavelength, . . .

A2   1/2 wavelength, 1 wavelength, . . . .
A3   1/3 wavelength, 5/3 wavelength, . . .
A4   1/2 wavelength, 3/2 wavelength, . . .
A5   1/5 wavelength, 2/5 wavelength, . . .
Q0
06 Q0 Two transmitters, S1 and S2 shown in figure (1), emit identical
18 Q0 sound waves of wavelength lambda. The transmitters are
Q0 separated by a distance lambda/2. Consider a big circle of
Q0 radius R with its center halfway between these transmitters.
Q0 How many interference maxima are there on this big circle?
Q0
A1 2.
A2 6.
A3 8.
A4 5.
A5 1.
Q0
7  Q0 Sound waves are not:
18 Q0
A1   transverse waves.
A2   pressure waves.
A3   compression waves.
A4   longitudinal waves.
A5   mechanical waves.
Q0
8  Q0 A person closes his windows to reduce the street noise from
18 Q0 10**(-4) W/m**2 to 10**(-8) W/m**2. What is the change in the
Q0 intensity level in dB?
Q0
A1   - 40.
A2   - 20.
A3     40.
A4     20.
A5   - 60.
Q0
9  Q0 A stationary observer hears a frequency of 760 Hz of a whistle
18 Q0 of a train moving at a speed of 40 m/s towards him. If the train
Q0 is moving away with the same speed, then the frequency detected
Q0 by the observer will be:
Q0 [Take the speed of sound in air = 340 m/s].
Q0
A1  600 Hz.
A2  700 Hz.
A3  963 Hz.
A4  500 Hz.
A5  540 Hz.
Q0
10 Q0 Organ pipe A, with both ends open, has a fundamental frequency
18 Q0 of 340 Hz and length 0.4 m. The third harmonic of organ pipe B,
Q0 with one end open, has the same frequency as the second
Q0 harmonic of pipe A.  How long is pipe B?
Q0
A1   0.3 m.
A2   2.0 m.
A3   1.5 m.
A4   0.1 m.
A5   0.4 m.

```
   Q0
11 Q0 Which of the following statements is True:
19 Q0
   A1 If two objects are in thermal equilibrium they must have the
   A1 same temperature
   A2 272 Kelvin is warmer than zero degree-C.
   A3 if an object (A) is warmer than a second object (B) in the
   A3 Fahrenheit scale then object (B) must be warmer than
   A3 object (A) in the Celsius scale.
   A4 When the temperature of an object increases by one degree-C
   A4 it means that it has increased by less than one degree-F.
   A5 The coefficient of linear expansion is the same for all
   A5 materials.
   Q0
12 Q0 A certain metal rod has a length of 10.00 m at 100.00
19 Q0 degree-C and a length of 10.04 m at 773 K. Find its
   Q0 length at zero degree-C.
   Q0
   A1  9.99 m.
   A2  9.00 m.
   A3  9.83 m.
   A4 10.01 m.
   A5 10.03 m.
   Q0
13 Q0 In a P-V diagram, a system of an ideal gas goes through the
19 Q0 process shown in figure 2. How much heat is absorbed after
   Q0 the system goes 100 times through the cycle?
   Q0
   A1  300    J.
   A2  730    J.
   A3  355    J.
   A4  500    J.
   A5  zero.
   Q0
 14Q0 Consider a copper slab of thickness L and area of 5.0 m**2. If
19 Q0 the conduction rate through the copper slab is 1.2*10**6 J/s
   Q0 and the temperature on the left of the slab is 102 degree-C
   Q0 while on the right of the slab it is -12.0 degree-C, what
   Q0 must be the thickness of the slab? [Take the coefficient of
   Q0 thermal conductivity of copper as 400 W/(m K)].
   Q0
   A1   19  cm.
   A2   32  cm.
   A3   25  cm.
   A4   29  cm.
   A5   15  cm.
   Q0
15 Q0 300 grams of water at 25 degree-C are added to 100 grams of ice
20 Q0 at zero degree-C. The final temperature of the mixture is:
   Q0
   Q0
   A1   zero degree-C.
   A2     20 degree-C.
   A3     15 degree-C.
   A4      5 degree-C.
   A5     10 degree-C.
   Q0
```

```
16 Q0 One mole of oxygen molecule (M = 32 g/mol) occupies a cubic
20 Q0 vessel of side length 10 cm at a temperature of 27 degree-C.
   Q0 Calculate the pressure of the gas on the walls.
   Q0
   A1   2.49*10**6 Pa.
   A2   5.01*10**6 Pa.
   A3   7.52*10**6 Pa.
   A4   1.14*10**4 Pa.
   A5   3.33*10**4 Pa.
   Q0
17 Q0 The equation of state of a certain gas is given as P*V**2 = K,
20 Q0 where P is the pressure, V is the volume and K is a constant.
   Q0 Find the work done by the gas if its volume increases from
   Q0 Vi = 2.0 m**3 to a final volume Vf = 4.0 m**3.
   Q0
   A1   K/4.
   A2   4*K.
   A3   K/2.
   A4   K**2.
   A5   2*K**2.
   Q0
18 Q0 Which one of the following statements is correct?
20 Q0
   A1 Two different ideal gas molecules of different mass will have
   A1 the same average translational kinetic energy if they are at
   A1 the same temperature.
   A2 In an isothermal process, the work done on the gas is always
   A2 positive.
   A3 All real gases approach the ideal gas state at low temperatures.
   A4 In an isobaric process, the energy is always constant.
   A5 In an adiabatic process, the work is always zero.
   Q0
19 Q0 A diatomic ideal gas undergoes a constant pressure process in
20 Q0 which its internal energy increases by 540 J. Find the heat
   Q0 added to the gas and the work done by the gas.
   Q0
   A1 Q = 756 J, W = 216 J.
   A2 Q = 540 J, W = 0.
   A3 Q = 0,     W = 540 J.
   A4 Q = 900 J, W = 360 J.
   A5 Q = 230 J, W = 313 J.
   Q0
20 Q0 The air in an automobile engine at 20 degree-C is compressed
21 Q0 adiabatically from an initial pressure of 1 atm and a volume
   Q0 of 200 cm**3 to a final volume of 20 cm**3. Find the final
   Q0 temperature if the air behaves like an ideal gas.
   Q0 [Take gamma = 1.4]
   Q0
   A1 463 degree-C
   A2 526 degree-C
   A3 10  degree-C
   A4 50  degree-C
   A5 20  degree-C
   Q0
```

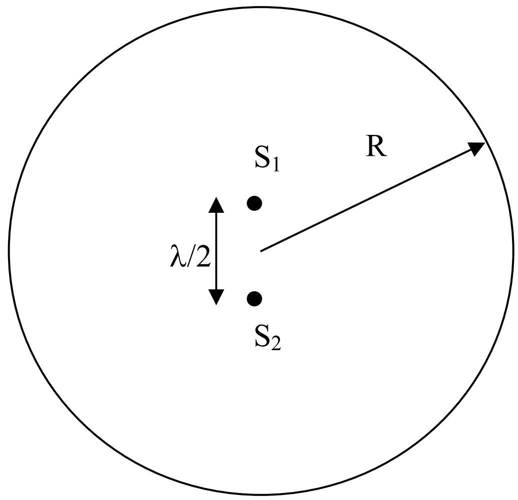


Figure (1)

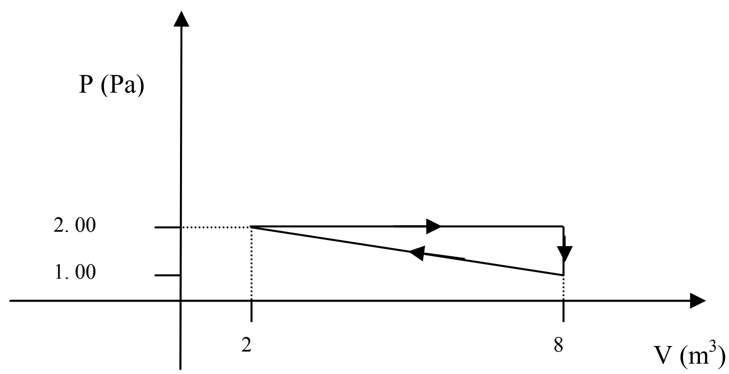


Figure (2)

*Physics 102 Major1*

*Formula sheet*

*Spring Semester 2003-2004 (Term 032)*

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

$v = \sqrt{\frac{\tau}{\mu}}$ $\quad v = \sqrt{\frac{B}{\rho}}$

$y = y_m \sin(kx - \omega t + \varphi)$

$P = \frac{1}{2}\mu\omega^2 y_m^2 v$

$S = S_m \cos(kx - \omega t)$

$\Delta P = \Delta P_m \sin(kx - \omega t), \Delta P_m = \rho v \omega S_m$

$I = \frac{1}{2}\rho(\omega S_m)^2 v$

$\beta = 10\log\left(\frac{I}{I_o}\right)$

$I = \frac{\text{Power}}{\text{Area}}$

$f' = f\left(\frac{v \pm v_D}{v \mp v_s}\right)$

$y = \left(2y_m \cos\frac{\varphi}{2}\right)\sin\left(kx - \omega t + \frac{\varphi}{2}\right)$

$y = (2y_m \sin kx)\cos\omega t$

$f_n = \frac{nv}{2L}, \quad n = 1,2,3,...$

$f_n = \frac{nv}{4L}, \quad n = 1,3,5...$

$\Delta L = \alpha L \Delta T$

$PV = nRT = NkT$

$\Delta L = \frac{\lambda}{2\pi}\varphi$

$\Delta L = m\lambda \quad m = 0,1,2,....$

$\Delta L = \left(m + \frac{1}{2}\right)\lambda, \quad m = 0,1,2,.....$

$PV^{\gamma} = \text{constant}; \quad TV^{\gamma - 1} = \text{constant}$

$C_V = \frac{3}{2}R$ for monatomic gases,

$= \frac{5}{2}R$ for diatomic gases.

$T_F = \frac{9}{5}T_C + 32$

$Q = mL$

$Q = mc\Delta T$

$Q = nc\Delta T$

$\Delta E_{int} = Q - W$

$\Delta E_{int} = nC_V\Delta T$

$C_p - C_v = R$

$W = \int P dV$

$H = \frac{Q}{t} = \kappa A \frac{T_H - T_C}{L}$

$P = \sigma\varepsilon A T^4$

$\frac{m\overline{v^2}}{2} = (3/2)kT$

$v_{rms} = \sqrt{\frac{3RT}{M}}$

## Constants:

Pi = $\pi$, lambda = $\lambda$

1 Liter = $10^{-3}$ $m^3$

R = 8.31 J/mol K

$N_A$ = 6.02 x $10^{23}$ molecules/mole

1 atm = 1.01 x $10^5$ $N/m^2$

k = 1.38 x $10^{-23}$ J/K

$I_o$ = $10^{-12}$ $W/m^2$

1 calorie = 4.186 Joule

$\sigma = 5.67 x 10^{-8} W/(m^2 K^4)$

micro = $10^{-6}$

for water: $L_f$ = 80 cal/g

$L_v$ = 540 cal/g

c = 1 cal/g.K

a * b * * c = a $b^c$

degree-C = $^oC$