PHYS 102 – FIRST MAJOR EXAM – TERM 011

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QUESTION NO: 1
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A diatomic ideal gas, at a pressure of 1.0 atm, expands
isotropically from a volume of 2.0 Liters to a volume of
5.0 Liters. Calculate the change in internal energy of
the gas during the process.
A. -3.1*10**2 J.
B. 1.1*10**3 J.
C. -9.0*10**3 J.
D. 1.7*10**3 J.
E. 7.6*10**2 J.
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QUESTION NO: 2
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A police car is approaching a stationary observer at 34.0 m/s
with its siren emitting a frequency of 450 Hz. What is the
frequency heard by the observer?
[Speed of sound in air = 343 m/s].
A. 500 Hz.
B. 485 Hz.
C. 405 Hz.
D. 525 Hz.
E. 475 Hz.
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QUESTION NO: 3
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Which of the following statements are CORRECT:
1. The first law of thermodynamics represents the conservation
of energy.
2. Room temperature is about 20 degrees on the Kelvin scale.
3. A calorie is approximately 4.2 J.
4. Heat has the same units as work.
5. Heat is a temperature difference.
A. 2 and 4.
B .1 , 3 , and 4 .
C .1 , 2 and 3 .
D. 3 and 5.
E. 1 and 5.
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QUESTION NO: 4
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A 1.5*10**(-6) W point source emits sound waves isotropically.
What is the sound level 2.5 m from the source?
A. 30 dB.
B. 39 dB.
C. 55 dB.
D. 16 dB.
E. 43 dB.

QUESTION NO: 5
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A string under a tension of 15 N, is set into vibration to produce a wave of speed 20 m/s, and a maximum transverse speed of 8 m/s. For this wave, the average power is:
A. 44 W.
B. 11 W.
C. 30 W.
D. 15 W.
E. 24 w.
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QUESTION NO: 6
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A tube 1.5 m long is closed at one end. A stretched wire is placed near the open end, see Fig. (1). The wire is 0.33 m long and has a mass of 9.8 g. It is fixed at both ends and vibrates in its fundamental mode. By resonance, it sets the air column in the tube into oscillation at that column's fundamental frequency. Find the tension in the wire.
[Speed of sound in air = 343 m/s].
A. 30 N.
B. 77 N.
C. 98 N.
D. 42 N.
E. 64 N.
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QUESTION NO: 7
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The coefficient of linear expansion of gold is 14.20*10**(-6)/K.
If the density of gold is 19.30 g/cm**3 at 20 degrees Celsius, the density of gold at 90 degrees Celsius will be:
A. 19.34 g/cm**3.
B. 19.00 g/cm**3.
C. 19.24 g/cm**3.
D. 19.38 g/cm**3.
E. 19.28 g/cm**3.
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QUESTION NO: 8
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The resultant wave of two interfering waves moving in the same direction is given by:
y(x.t) = 10.0*cos(Pi/6)*sin(3.0*x + 20*Pi*t + Pi/6).
One of the two originally interfering waves could be:
A. y(x.t) = 10.0 sin(3.0*x + 20*Pi*t).
B. y(x.t) = 5.0 sin(3.0*x + 20*Pi*t + Pi/3).
C. y(x.t) = 10.0 sin(3.0*x + 20*Pi*t + Pi/3).
D. y(x,t) = 5.0 sin(3.0*x + 20*Pi*t + Pi/6).
E. y(x,t) = 10.0 sin(3.0*x -20*Pi*t).

QUESTION NO: 9
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Which of the following statements is CORRECT for a gas undergoing an adiabatic process:
A. The internal energy of the gas is always zero.
B. The pressure of the gas remains constant.
C. There is no heat exchange between the gas and its environment.
D. The temperature of the gas remains constant.
E. The volume of the gas remains constant.
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QUESTION NO: 10
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A wave on a string is reflected from a fixed end. The reflected wave:
A. has a larger speed than the original wave.
B. has a larger amplitude than the original wave.
C. cannot be transverse.
D. is in phase with the original wave at the fixed end.
E. is 180 degrees out of phase with the original wave at the fixed end.
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QUESTION NO: 11
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The maximum pressure amplitude that the human ear can tolerate in loud sounds is 28 Pa. What is the displacement amplitude for such a sound in air of density 1.21 kg/m**3 at a frequency of 5.0*10**3 Hz?
[speed of sound in air = 343 m/s].
A. 50.5*10**(-6) m.
B. 8.30*10**(-6) m.
C. 2.15*10**(-6) m.
D. 11.0*10**(-6) m.
E. 4.15*10**(-6) m.
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QUESTION NO: 12
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Two identical containers, one has 2.0 moles of type 1 molecules, of mass m1, at 20 degrees Celsius. The other has 2.0 moles of type 2 molecules, of mass m2 = 2*m1, at 20 degrees Celsius. The ratio between the average translational kinetic energy of type 2 to that of type 1 is:
A. 8.
B. 1.
C. 2.
D. 4.
E. 16.

QUESTION NO: 13
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Standing waves are produced in a string at the two consecutive resonant frequencies 155 and 195 Hz. If the mass of the string is 5.00 g and its length is 0.80 m, then the tension applied to the string should be:
A. 19.0 H.
B. 17.2 H.
C. 28.5 H.
D. 25.6 H.
E. 6.4 H.
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QUESTION NO: 14
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A thermometer, of mass 0.06 kg and specific heat 836 J/(kg K), reads 15 degrees Celsius. It is then completely immersed in 0.15 kg of water of specific heat 4180 J/(kg K). The final temperature reading of the thermometer in the water is 45 degrees Celsius. Assuming no heat losses from the system to the surrounding, the initial temperature of the water was:
A. 47.4 degrees Celsius.
B. 15.4 degrees Celsius.
C. 50.4 degrees Celsius.
D. 35.1 degrees Celsius.
E. 42.6 degrees Celsius.
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QUESTION NO: 15
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One mole of an ideal gas is taken through the cyclic process ABCA as shown in Fig. (2). What is the net heat transfer during the cycle?
A. 2.0*10*3 J.
B. -2.0*10*3 J.
C. -1.0*10*3 J.
D. 5.0*10*3 J.
E. 1.0*10*3 J.
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QUESTION NO: 16
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Two sound waves, from two different sources with the same frequency, 660 Hz, travel at a speed of 330 m/s. The sources are in phase. What is the phase difference of the waves at a point that is 5.0 m from one source and 4.0 m from the other? (The waves are traveling in the same direction.)
A. 4 Pi.
B. 5 Pi.
c. 1 Pi.
D. 2 Pi.
E. 3 Pi.

QUESTION NO: 17
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A traveling wave is given by:
y(x,t) = 6.0*cos[0.63*x + 25.1*t)],
where x and y are in cm and t is in seconds. It interferes with a similar wave propagating in the opposite direction to produce a standing wave. The distance between the node and the consecutive antinode is:
A .2 .5 cm .
B .5 .O cm .
C. 1.0 cm.
D .7 .9 cm .
E. 0.5 cm.
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QUESTION NO: 18
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Sound waves
A. are matter waves.
B. are transverse waves.
C. travel at the same speed in all media.
D. are mechanical waves.
E. are electromagnetic waves.
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QUESTION NO: 19
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By what factor does the rate of radiant emission of heat, from a heating element, increases when the temperature of a heating element increases from 27 degrees Celsius to 327 degrees Celsius?
A. 8.
B. 16.
C. 2.
D. 64.
E. 4.
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QUESTION NO: 20
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A closed cubical box (60 cm on edge and 5 cm on thickness) contains ice at zero degrees Celsius. When the outside temperature is 20 degrees Celsius, it is found that 250 grams of ice melt each hour. What is the value of the thermal conductivity of the walls of the box?
A. 0.07 Watts/(m*K).
B. 0.01 Watts/(m*K).
C. 1.02 Watts/(m*K).
D. 0.03 Watts/(m*K).
E. 3.21 Watts/(m*K).

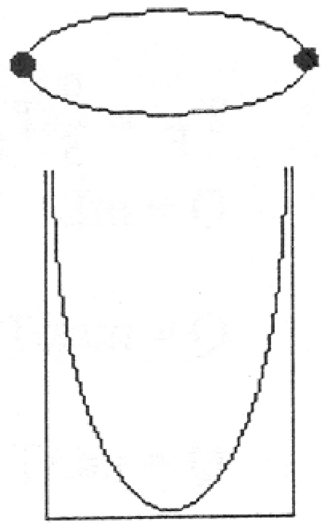

fig.(1)

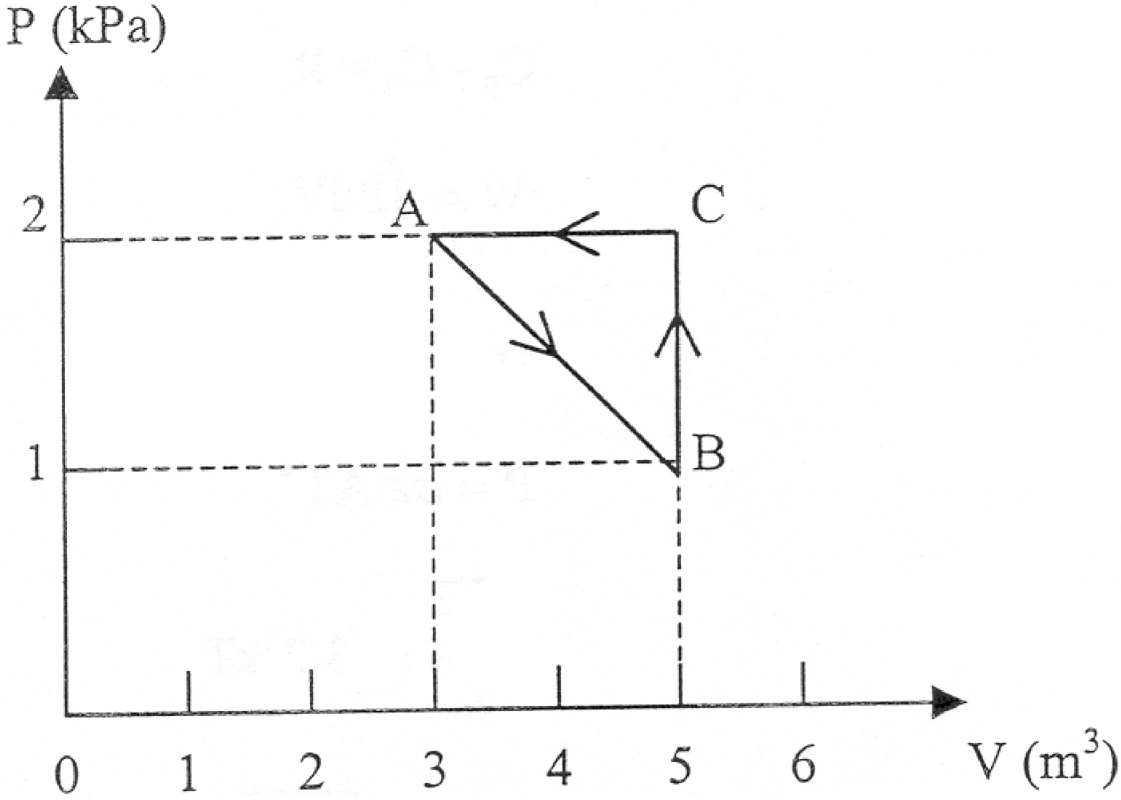

fig.(2)