First major exam - term991

(1)Q0 A transverse wave in a 3.0 m long string is given by the
16 Q0 harmonic wave equation: y = 0.4*cos[pi*(x/4 + 6t)] (SI units).
Q0 If the string is kept under a constant tension of 70 N, find
Q0 the power transmitted to the wave.
Q0
A1 83 W
A2 44 W
A3 25 W
A4 58 W
A5 72 W
Q0
(2)Q0 A sinusoidal wave traveling in the positive x direction has an
16 Q0 amplitude of 10 cm, a wavelength of 20 cm, and a frequency of
Q0 5.0 Hz. A particle at x = 0 and t = 0 has a displacement of
Q0 10 cm. Write the equation of the displacement of the particles
Q0 as a function of x and t.
Q0
A1 y = (0.1 m)*sin[pi*(10x-10t-3/2)]
A2 y = (0.2 m)*sin[pi*(10x-10t+3/2)]
A3 y = (0.1 m)*sin[pi*(10x+10t-3/2)]
A4 y = (0.2 m)*sin(pi*(10x+10t-3/2)]
A5 y = (0.1 m)*sin(10x-10t+pi/2)
Q0
(3)Q0 A harmonic wave is described by y = 0.2*sin(25x-10t)
16 Q0 (SI units). How far does a wave crest move in 20 sec?
Q0
A1 8 m
A2 10 m
A3 5 m
A4 50 m
A5 20 m
Q0
(4)Q0 At a distance r = 50 m from a sound source, the sound level is
17 Q0 80 dB. At what distance from the source will the sound level
Q0 be 100 dB?
Q0
A1 5 m
A2 10 m
A3 50 m
A4 85 m
A5 100 m
Q0
(5)Q0 Which of the following statements is CORRECT?

17 Q0
A1 For spherical sound waves, the displacement amplitude
A1 decreases linearly with increasing distance from the source.
A2 Sound waves are transverse.
A3 For the Doppler effect, the observed frequency is always
A3 less than the actual frequency of the source.
A4 The power of sound emitted is always inversely proportional
A4 to the distance from the source.
A5 The intensity of sound waves is independent of the distance
A5 from the source.
Q0
(6)Q0 A stationary device generates sound waves of unknown frequency.
17 Q0 An observer hears a frequency of 825 Hz as he approaches the
Q0 device with a speed of 16 m/s. He hears a frequency of 750 Hz
Q0 as he moves away from the device with the same speed. Find the
Q0 speed of sound from the above information.
Q0
A1 336 m/s
A2 350 m/s
A3 331 m/s
A4 345 m/s
A5 340 m/s
Q0
(7)Q0 Two identical speakers, facing each other are driven by a
Q0 common oscillator of frequency 600 Hz. A man, at the midpoint
18 Q0 between the speakers, start moving toward one of them. He
Q0 reaches the first minimum sound when he is 1 m from one of
Q0 the speakers. Find the distance between the speakers.
Q0 (Speed of sound = 343 m/s.)
Q0
A1 2.3 m
A2 6.1 m
A3 5.6 m
A4 4.5 m
A5 4.0 m
Q0
(8)Q0 Consider a string fixed at both ends. It has consecutive
18 Q0 standing wave modes with frequencies of 480 Hz and 600 Hz. The
Q0 tension in the string is kept constant. Find the fundamental
Q0 frequency.
Q0
A1 120 Hz
A2 150 Hz
A3 300 Hz
A4 480 Hz
A5 600 Hz

Q0
(9)Q0 The second harmonic of a string, fixed at both ends, of length
18 Q0 0.6 m and linear density 1.1*10**-3 kg/m, has the same
Q0 frequency as the fifth harmonic (n=5) of a pipe closed at one
Q0 end of length 1.0 m. Find the tension in the string.
Q0 (Speed of sound = 343 m/s).
Q0
A1 73 N
A2 90 N
A3 18 N
A4 88 N
A5 60 N
Q0
10 Q0 Two harmonic waves are described by y1 = 0.02*sin[pi*(2x-120t)]
18 Q0 and y2 = 0.02*sin[pi*(2x-120t-0.5)](SI units). What is the
Q0 amplitude of the resultant wave?
Q0
A1 28 mm
A2 50 mm
A3 20 mm
A4 0 mm
A5 10 mm
Q0
11 Q0 Calculate the number of molecules of an ideal gas occupying
19 Q0 a volume of 1 cm**3 at 27 degree Celsius and at a pressure of
Q0 1*10**-10 Pa.
Q0
A1 2.4*10**4 molecules
A2 8.4*10**6 molecules
A3 2.4*10**10 molecules
A4 1.2*10**4 molecules
A5 6.2*10**5 molecules
Q0
12 Q0 Consider a steel plate with area 2.0 m**2 at 20 degrees
19 Q0 Celsius. What is magnitude of the change in its area when the
Q0 temperature is lowered to -20 degrees Celsius? The coefficient
Q0 of linear expansion of steel (alpha) = 11.7*10**-6 /Celsius
Q0 degrees.
Q0
A1 1.9*10**-3 m**2
A2 1.2*10**-3 m**2
A3 2.3*10**-5 m**2
A4 1.9*10**-6 m**2
A5 1.2*10**-6 m**2
Q0
13 Q0 Specify the WRONG statement:

19 Q0
A1 Two bodies are in thermal equilibrium with each other if their
A1 temperatures are different.
A2 A thermometer is an instrument that measures temperature.
A3 Two bodies in thermal equilibrium with a third, are in thermal
A3 equilibrium with each other.
A4 If two bodies are in thermal contact, they can have initially
A4 different temperatures.
A5 Celsius, Fahrenheit and Kelvin are three temperature scales.
Q0
14 Q0 In a constant-volume gas thermometer, the pressure is 0.019
19 Q0 atm at 100 degrees Celsius. Find the temperature when the
Q0 pressure is 0.027 atm.
Q0
A1 257 degrees Celsius
A2 531 degrees Celsius
A3 340 degrees Celsius
A4 321 degrees Celsius
A5 132 degrees Celsius
Q0
15 Q0 Copper pellets, each of mass 1.0 g, are heated to 100 degrees
20 Q0 Celsius. How many pellets must be added to 500 g of water
Q0 initially at 20 degrees Celsius to make the final equilibrium
Q0 temperature 30 degrees Celsius?
Q0 (neglect the heat capacity of the container)
Q0 Specific heat of copper = 0.0924 cal/g degree Celsius and
Q0 specific heat of water = 1.0 cal/g degree Celsius.
Q0
A1 773
A2 680
A3 250
A4 120
A5 924
Q0
16 Q0 Nitrogen gas (m = 1.00 kg) is confined in a cylinder with a
20 Q0 movable piston at a pressure of 1 atm. A quantity of heat
Q0 of 25 kcal is added to the gas in an isobaric process, and
Q0 its internal energy increases by 8 kcal. What is the change
Q0 in the volume of the gas?
Q0
A1 0.7 m**3
A2 0.2 m**3
A3 1.4 m**3
A4 1.2 m**3
A5 0.4 m**3
Q0

17 Q0 An ideal gas is taken through the cyclic process shown in
20 Q0 Figure 1. How much heat is added or removed from the gas?
Q0
A1 200 kJ
A2 - 400 kJ
A3 600 kJ
A4 - 800 kJ
A5 100 kJ
Q0
18 Q0 An ideal gas (gamma = 1.40) expands slowly and adiabatically.
21 Q0 If the final temperature is one third the initial temperature,
Q0 by what factor does the volume change?
Q0
A1 15.6
A2 12.5
A3 14.0
A4 10.0
A5 18.0
Q0
19 Q0 Two moles of helium (monoatomic) gas are heated from 100
21 Q0 degrees Celsius to 250 degrees Celsius. How much heat is
Q0 transferred to the gas if the process is isobaric?
Q0
A1 6.23 kJ
A2 2.63 kJ
A3 3.11 kJ
A4 1.51 kJ
A5 8.52 kJ
Q0
20 Q0 Oxygen gas at 20 degrees Celsius is confined in a cube. What
21 Q0 is the translational average kinetic energy per molecule?
Q0
A1 6.1*10**-21 J
A2 9.1*10**-24 J
A3 5.2*10**-21 J
A4 4.1*10**-22 J
A5 2.1*10**-22 J