Final

(FINAL 001)

1 Q0 Transverse waves are being generated on a rope under constant
16 Q0 tension. By what factor does the required power change if the
001Q0 length of the rope is doubled?
Q0
A1 1.
A2 2.
A3 1/2.
A4 1/4.
A5 4.
Q0
Q0
2 Q0 Determine the intensity of a harmonic longitudinal wave with
17 Q0 a pressure amplitude of 8.0*10**(-3) N/m**2 propagating inside
993Q0 a tube filled with helium. (For helium: density = 0.179 kg/m**3
001Q0 and speed of sound waves = 972 m/s.).
Q0
A1 1.8*10**(-7) W/m**2.
A2 3.7*10**(-7) W/m**2.
A3 9.2*10**(-8) W/m**2.
A4 4.6*10**(-8) W/m**2.
A5 1.5*10**(-6) W/m**2.
Q0
Q0
3 Q0 A group of students, in a class room, produce a sound level
17 Q0 of 53 dB. A single students speaking normally produces a
001Q0 sound level of 40 dB. How many students are in the room?
Q0 (Assume each student in the group speaks at the same level
Q0 as did the single person.)
Q0
A1 20.
A2 13.
A3 30.
A4 10.
A5 5.
Q0
Q0
4 Q0 A stretched wire vibrates in its fundamental mode at 300 Hz.
18 Q0 What would be the fundamental frequency if the wire were one
001Q0 third the original length, with twice the diameter and with
Q0 four times the tension?
Q0
A1 900 Hz.
A2 800 Hz.
A3 450 Hz.
A4 150 Hz.
A5 300 Hz.
Q0
5 Q0 The path difference between two waves is 5 m. If the
18 Q0 wavelength of the waves emitted by the two sources is 4 m,
992Q0 what is the phase difference (in degrees)?
001Q0
A1 450
A2 75
A3 180
A4 45
A5 320
Q0

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6  Q0 An ideal gas occupies a volume V1 at a temperature of 100 degrees
19 Q0 Celsius. If the pressure of the gas is held constant, by what
001Q0 factor does the volume change when the Celsius temperature is
   Q0 tripled?
   Q0
   A1  1.54.
   A2  3.00.
   A3  3.55.
   A4  6.00.
   A5  0.33.
   Q0
7  Q0 What is the outside temperature if 4.0*10**6 cal of heat is lost
20 Q0 through 4.0 m**2 window of 0.3 cm thick glass in one hour from a
001Q0 house kept at 20 degrees Celsius? (For glass k = 0.2 cal/s*m*C.)
   Q0
   A1  16 degrees Celsius.
   A2  32 degrees Celsius.
   A3  13 degrees Celsius.
   A4  24 degrees Celsius.
   A5   8 degrees Celsius.
   Q0
   Q0
8  Q0 A 5-kg block of lead having a temperature of 80 degrees Celsius
20 Q0 is added to 0.5 kg of water having a temperature of 20 degrees
001Q0 Celsius. What is the final equilibrium temperature of the
   Q0 system? (Specific heat of lead = 0.03 cal/g*C and for
   Q0 water = 1 cal/g*C.)
   Q0
   A1  34 degrees Celsius.
   A2  26 degrees Celsius.
   A3  54 degrees Celsius.
   A4  79 degrees Celsius.
   A5  20 degrees Celsius.
   Q0
9  Q0 Two moles of nitrogen are in a 6.0 Liter container at a
21 Q0 pressure of 5.0*10**5 Pa. Find the average transnational
001Q0 kinetic energy of a single molecule.
   Q0
   A1  3.7*10**(-21) J.
   A2  1.2*10**(-21) J.
   A3  7.5*10**(-22) J.
   A4  1.9*10**(-21) J.
   A5  9.3*10**(-22) J.
   Q0
 10Q0 Specify the CORRECT statement:
 22Q0
001Q0
   A1 Isolated systems tend toward disorder and entropy is a measure
   A1 of this disorder.
   A2 The entropy of the universe decreases in any process.
   A3 The efficiency of heat engines can be 100%.
   A4 Heat engines can have efficiency higher than Carnot engine
   A4 working between the same two temperatures.
   A5 To calculate the efficiency of ideal engine the temperature
   A5 should be in Celsius.
   Q0
   Q0
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11 Q0 Five moles of an ideal monatomic gas (Cv = 3*R/2)is allowed
22 Q0 to expand isobarically. If the initial volume is 20 cm**3 and
993Q0 the final volume is 100 cm**3, find the change in entropy.
001Q0
   A1 167  J/K.
   A2 100  J/K.
   A3 67   J/K.
   A4 52   J/K.
   A5 152  J/K.
   Q0
12 Q0 Two identical metal balls, small and isolated, carry a charge
23 Q0 of +3.0*10**(-9) C and -11.0*10**(-9) C. The balls are touched
001Q0 together and then separated to 3.0 cm. The force between them
   Q0 is:
   Q0
   A1   1.6*10**(-4) N, repulsive.
   A2   1.6*10**(-4) N, attractive.
   A3   1.6*10**(-8) N, repulsive.
   A4   1.6*10**(-8) N, attractive.
   A5   3.2*10**(-4) N, repulsive.
   Q0
   Q0
13 Q0 In figure (1), what is the ratio of the electric flux that
24 Q0 penetrates surface S1 to that penetrates surface S2? (Note that
001Q0 S1 and S2 are closed surfaces and q is a charge.)
   Q0
   A1    3.
   A2    0.
   A3    2.
   A4  1.3.
   A5  1.0.
   Q0
14 Q0 Four charges, (-e, +e, -e, +e), are arranged as in figure (2).
25 Q0 Calculate the work required to remove the positive charge (+e)
001Q0 on the right side to infinity.
   Q0    Q0
   A1  6.4*10**(-19) J.
   A2  3.2*10**(-19) J.
   A3  1.6*10**(-19) J.
   A4  0.8*10**(-19) J.
   A5  0.4*10**(-19) J.
   Q0
15 Q0 Calculate the total charge stored by a combination of three
26Q0 capacitors, 2.0*10**(-6) F, 4.0*10**(-6) F, and 6.0*10**(-6) F,
001Q0 when connected in series to a 10-V battery.     Q0
   A1   11*10**(-6) C.
   A2   92*10**(-6) C.
   A3  0.9*10**(-6) C.
   A4  0.1*10**(-6) C.
   A5   46*10**(-6) C.
   Q0
16 Q0 For an Ohmic conductor of length L and radius r, which one
27 Q0 of the following statements is FALSE:
001Q0
   A1 with increasing the radius r the resistance increases.
   A2 with increasing the length L the resistance increases.
   A3 with increasing the temperature of the conductor the resistance
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A3 increases.
A4 The voltage across the conductor increases linearly with the
A4 current passing through it.
A5 Resistivity has a units of Ohm.m.
Q0
Q0
17 Q0 The sum of the currents entering a junction equals the sum
28 Q0 of the currents leaving that junction is a consequence of:
991Q0
001Q0
A1 conservation of charge.
A2 conservation of energy.
A3 Coulomb's law.
A4 Ampere's law.
A5 Newton's second law.
Q0
18 Q0 How long will it take a charged capacitor of 50.0*10**(-6) F to
28Q0 loss 30% of its initial energy if allowed to discharge through
001Q0 a 40 Ohm resistor? Q0
A1 0.36*10**(-3) s.
A2 0.02*10**(-3) s.
A3 0.18*10**(-3) s.
A4 Infinity.
A5 no enough information.
Q0
19 Q0 In figure (3), if R = 2 Ohms, at what rate is the thermal energy
28 Q0 being generated in the 4*R resistor?
001Q0
A1 8 Watts.
A2 12 Watts.
A3 16 Watts.
A4 24 Watts.
A5 64 Watts.
Q0
Q0
20 Q0 For the circuit shown in figure (4), if Va-Vc = 20 Volts,
28 Q0 what is the potential difference Vb-Vd?
001Q0
A1 55 Volts.
A2 -55 Volts.
A3 25 Volts.
A4 -25 Volts.
A5 35 Volts.
Q0
21 Q0 Find the CORRECT statement in the following:
29Q0
001Q0 A magnetic field applies a force on a charged particle located
Q0 within it:
Q0
A1 if the charge is moving not parallel to the magnetic
A1 field lines.
A2 always.
A3 never.
A4 if the charge is moving parallel to the magnetic field lines.
A5 if the charge is at rest.
Q0
Q0

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22 Q0 An electron is projected into a uniform magnetic field
29 Q0 B = (1.4i + 2.1j) T. Find the force on the electron when
991Q0 the velocity is v = (3.7*10**5 j) m/sec.
001Q0 (i, j and k are the unit vectors in the x, y and z directions,
   Q0 respectively).
   Q0
   A1 (8.3*10**(-14) k) N.
   A2 (5.2*10**(-15) i) N.
   A3 (7.8*10**(-15) k) N.
   A4 (1.2*10**(-13) i) N.
   A5 ZERO.
   Q0
23 Q0 A square loop (L=1.00 m) consists of 100 closely wrapped turns
 29Q0 of 0.20 A. The loop is oriented as shown in figure (5) in a
001Q0 uniform magnetic field of 0.10 T directed in the positive x-
   Q0 direction. What is the torque (in N.m) on the loop?
   Q0 (j is a unit vector in the +y-direction.)
   Q0
   A1  1.0 j.
   A2 -1.0 j.
   A3  1.2 j.
   A4 -1.2 j.
   A5  2.0 j.
   Q0
24 Q0 A deuteron is accelerated from rest through a 10**4 V potential
 29Q0 difference and then moves perpendicular to a magnetic field
001Q0 with B = 1.6 T. What is the radius of the resulting circular
   Q0 path? [For deuteron: m=3.3*10*(-27) kg, q=1.6*10**(-19) C.]
   Q0
   A1 13*10**(-3) m.
   A2 22*10**(-3) m.
   A3 15*10**(-4) m.
   A4 11*10**(-6) m.
   A5 36*10**(-3) m.
   Q0
25 Q0 Gauss's law for magnetism states that "the net magnetic flux
30 Q0 through any closed surface is always zero". The statement is
001Q0 based on:
   Q0
   A1 The experimental fact that isolated magnetic poles have never
   A1 been detected.
   A2 The magnetic field lines are separated.
   A3 The Gaussian surface is zero.
   A4 In general the dot product of the area's vector element and the
   A4 magnetic field is zero.
   A5 The magnetic field lines are short.
   Q0
26 Q0 Two infinite wires are parallel to the y-axis. One carries
30 Q0 current i1 = 12 A in the +y-axis at x=0; the other carries i2
001Q0 at x = 8.0 cm. For what magnitude and direction of i2 will the
   Q0 resultant magnetic field be zero at x = 6.0 cm?
   Q0
   A1 4.0 A in the +y-axis.
   A2 4.0 A in the -y-axis.
   A3 6.0 A in the +y-axis.
   A4 6.0 A in the -y-axis.
   A5 2.0 A in the +y-axis.
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   Q0
27 Q0 A 500 turns solenoid is 30 cm long, has a radius of 0.5 cm
30 Q0 and carries a current of 2.0 A. The magnitude of the
992Q0 magnetic field at the center of the solenoid is:
001Q0
   A1 4.2*10**(-3) T.
   A2 9.9*10**(-8) T.
   A3 1.3*10**(-3) T.
   A4 5.6*10**(-8) T.
   A5 8.2*10**(-3) T.
   Q0
   Q0
28 Q0 A conductor consists of a circular loop of radius R = 0.10 m
30 Q0 and two straight, long sections, as in Fig. (6). The wire lies
001Q0 in the plane of the paper (xy-plane) and carries a current of
   Q0 I = 7.0 A. Determine the magnetic field, in Tesla, at the center
   Q0 of the loop. (k is a unit vector in +z-direction)
   Q0
   A1 -5.8*10**(-5) k.
   A2  5.8*10**(-5) k.
   A3 -4.4*10**(-5) k.
   A4  4.4*10**(-5) k.
   A5  1.8*10**(-5) k.
   Q0
29 Q0 A constant magnetic flux of 4.0*10**(-5) Wb is maintained through
31 Q0 a coil for 0.5 s. What emf is induced in the coil by this flux
001Q0 during that period?
   Q0
   A1  Zero.
   A2  4.0*10**(-5) V.
   A3 -4.0*10**(-5) V.
   A4  2.0*10**(-5) V.
   A5 -2.0*10**(-5) V.
   Q0
30 Q0 Each turn of a 100-turn coil, whose resistance is 60.0 Ohm,
 31Q0 encloses an area of 80.0 cm**2. What should be the rate
001Q0 of change of a magnetic field parallel to its axis in
   Q0 order to induce a current of 1.00*10**(-3) A in the coil?
   Q0
   A1  0.075 T/s.
   A2  0.125 T/s.
   A3  0.235 T/s.
   A4   7.51 T/s.
   A5  Zero.
```

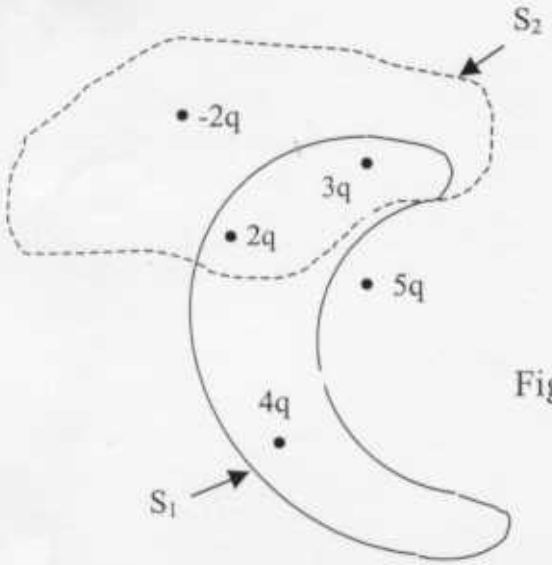

Figure 1

$a = 3 \times 10^{-10}$ m
e = charge of an electron

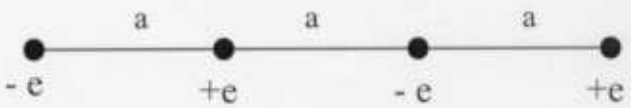

Figure 2

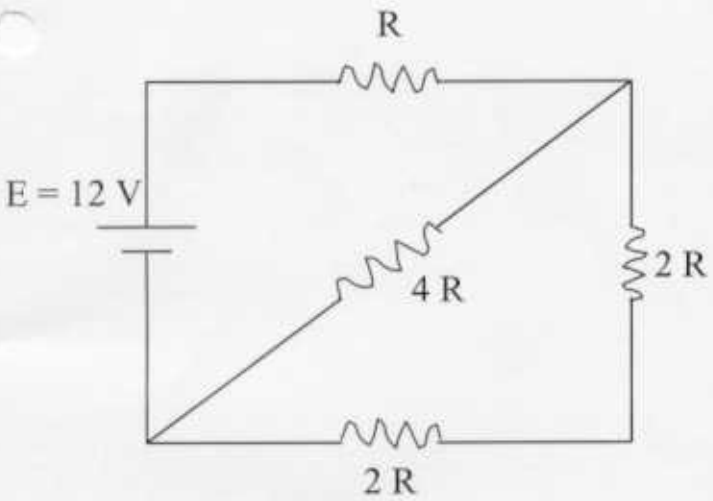

Figure 3

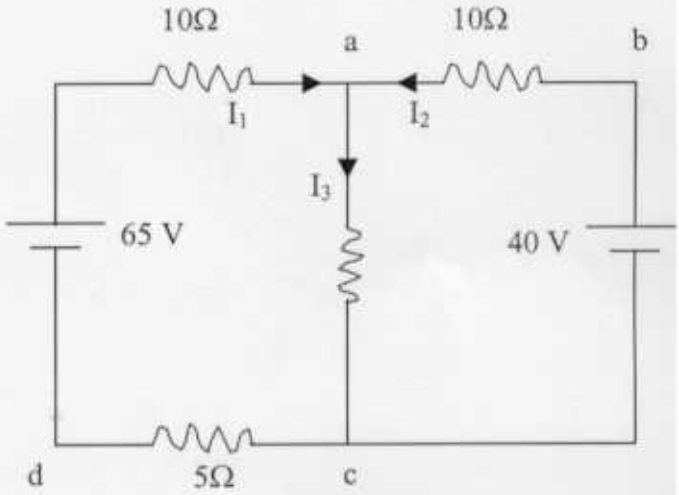

Figure 4

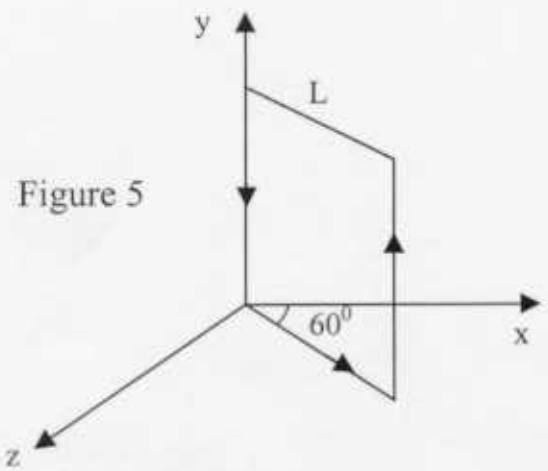

Figure 5

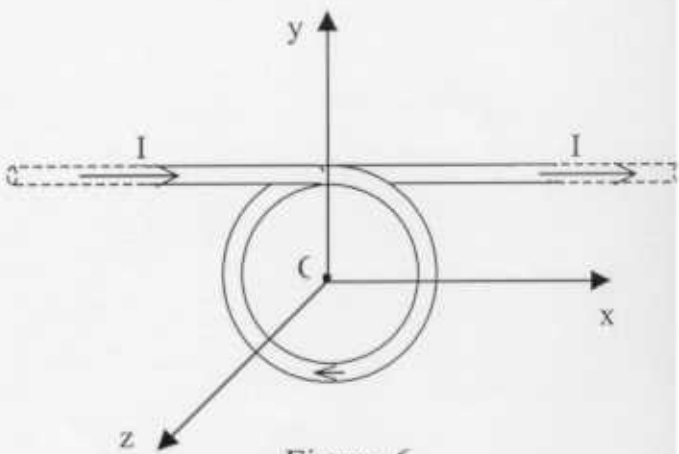

Figure 6