```
Q1 Q0 A transverse wave of 0.5-m wavelength is moving in a stretched
16 Q0 string with a speed of 5 m/s. If the maximum transverse
   Q0 acceleration of the particles in the string is 80 m/s**2,
   Q0 find the amplitude of the wave.
   Q0
   A1 2  cm
   A2 4  cm
   A3 6  cm
   A4 3  cm
   A5 1  cm
   Q0
Q2 Q0 The intensity of sound waves at 5 m from a speaker vibrating
17 Q0 at 1000 Hz is 0.5 W/m**2. Determine the dislacement amplitude
   Q0 of the particles in the wave at that location (5 m away from
   Q0 the speaker).
   Q0 (The density of air = 1.3 kg/m**3 and the speed of sound in
   Q0 air = 340 m/s).
   Q0
   A1 7.6*10**(-6)  m
   A2 9.5*10**(-7)  m
   A3 6.5*10**(-6)  m
   A4 1.2*10**(-5)  m
   A5 2.3*10**(-7)  m
   Q0
Q3 Q0 A stretched string, fixed at both ends, vibrates in its
18 Q0 fundamental frequency. To double the fundamental frequency
   Q0 of the same string, one can change the tension in the string
   Q0 by a factor of:
   Q0
   A1 4
   A2 2
   A3 SQRT(2)
   A4 1/(SQRT(2))
   A5 1/2
   Q0
Q4 Q0 Calculate the change in the length of a 2.0 m aluminum thin
19 Q0 wire if its temperature is changed by 54 F-degrees.
   Q0 (the coefficient of thermal expansion for aluminum is equal to
   Q0 23*10**(-6) /C-degrees).
   Q0
   A1 1.4 mm
   A2 2.5 mm
   A3 1.2 mm
   A4 4.5 mm
   A5 9.6 mm
   Q0
Q5 Q0 How much heat is needed to convert 80 g of ice initially at
20 Q0 -10 degrees-C to steam at 100 degrees-C?
   Q0 (C(water) = 1.0 cal/g*degree C, L(f) = 80  cal/g,
   Q0 C(ice)   = 0.5 cal/g*degree C, L(v) = 540 cal/g).
   Q0
   A1 58  kcal
   A2 16  kcal
   A3 75  kcal
   A4 22  kcal
   A5 65  kcal
   Q0
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```
Q6 Q0 How much work is required to compress five moles of an ideal
21 Q0 gas at 20 degrees-C and 1.0 atmosphere to half of its initial
   Q0 volume during an isothermal process?
   Q0
   A1 -8.4 kJ
   A2 +8.4 kJ
   A3 -2.1 kJ
   A4 +2.1 kJ
   A5 Zero
   Q0
Q7 Q0 One mole of an ideal monoatomic gas (Cv = 3R/2)is taken
22 Q0 through the cycle shown in Figure 1. If Ta = 590 K,
   Q0 Tb = 450 K and Tc = 300 K, calculate the efficiency of
   Q0 an engine operating in this cycle.
   Q0
   A1 0.14
   A2 0.45
   A3 0.28
   A4 0.08
   A5 0.55
   Q0
Q8 Q0 Find the change in entropy when 100 g of ice at 0 degree-C
22 Q0 is heated slowly to 80 degrees-C.
   Q0 (C(water) = 1.0 cal/g*degree-C, L(f) = 80  cal/g).
   Q0
   A1 55 cal/K
   A2 25 cal/K
   A3 62 cal/K
   A4 12 cal/K
   A5 85 cal/K
   Q0
Q9 Q0 A 2.0 g charged ball is suspended by a 20 cm long string in a
23 Q0 uniform electric field of magnitude 1.0*10**3 N/C as shown in
   Q0 Figure 2. If the charge on the ball is 5.0 micro-C, find the
   Q0 angle theta at which the ball remains in equilibrium.
   Q0
   A1 14.3 degrees
   A2 22.4 degrees
   A3 11.5 degrees
   A4 26.6 degrees
   A5 45.0 degrees
   Q0
Q10Q0 Two thin, infinite, nonconducting sheets of charge are
24 Q0 parallel to each other and separated by a distance of 1 cm.
   Q0 One of the sheets has a charge density of 2 micro-C/m**2
   Q0 while the other sheet has a charge density of -2 micro-C/m**2.
   Q0 Calculate the magnitude of the electric field in the region
   Q0 between the two sheets.
   Q0
   A1 226 kN/C
   A2 345 kN/C
   A3 452 kN/C
   A4 336 kN/C
   A5 Zero
   Q0
Q11Q0 Consider two concentric (thin and conducting) spherical shells.
25 Q0 The inner has a radius a = 15 cm and a charge of 10 nano-C.
```

```
   Q0 The outer shell has a radius b = 30 cm and a charge of
   Q0 -15 nano-C. Find the electric potential on the surface of the
   Q0 inner shell.
   Q0
   A1 150 V
   A2 200 V
   A3 110 V
   A4 250 V
   A5 300 V
   Q0
Q12Q0 A parallel-plate capacitor is to be constructed using paper
26 Q0 as a dielectric. If the maximum voltage before breakdown is
   Q0 3.2*10**3 V, what thickness of dielectric is needed?
   Q0 (The dielectric strength of paper is 16*10**6 V/m).
   Q0
   A1 0.2  mm
   A2 0.4  mm
   A3 0.6  mm
   A4 0.8  mm
   A5 0.5  mm
   Q0
Q13Q0 At 40 degrees-C the resistance of a gold wire is 80 Ohms. What
27 Q0 is the resistance of the same wire at 60 degrees-C?
   Q0 (Alpha(gold) = 3.4*10**(-3) /C-degrees).
   Q0
   A1 85  Ohms
   A2 95  Ohms
   A3 98  Ohms
   A4 90  Ohms
   A5 88  Ohms
   Q0
Q14Q0 Any point on a string carrying a sinusoidal wave will move
16 Q0 with its maximum speed when the magnitude of its:
   Q0
   A1 displacement is minimum
   A2 acceleration is maximum
   A3 displacement is maximum
   A4 displacement is half the amplitude
   A5 displacement is twice the amplitude
   Q0
Q15Q0 One mole of an ideal diatomic gas (Cp = 7R/2) is cooled at
21 Q0 constant pressure from 420 K to 300 K. Calculate the change
   Q0 in internal energy of the gas in calories.
   Q0
   A1 -596 cal
   A2 +596 cal
   A3 +285 cal
   A4 -285 cal
   A5 +188 cal
   Q0
Q16Q0 What is the power dissipated in the 3-Ohm resistor shown
28 Q0 in Figure 3?
   Q0
   A1 27 W
   A2 36 W
   A3 22 W
   A4 12 W
```

```
   A5 72 W
   Q0
Q17Q0 The sum of the currents entering a junction equals the sum
28 Q0 of the currents leaving that junction is a consequence of:
   Q0
   A1 conservation of charge
   A2 conservation of energy
   A3 Coulomb's law
   A4 Ampere's law
   A5 Newton's second law
   Q0
Q18Q0 In Figure 4, if I = 1.5 A in the circuit segment shown, what
28 Q0 is the potential difference Vb-Va?
   Q0
   A1 - 22  V
   A2 + 22  V
   A3 - 38  V
   A4 + 38  V
   A5 + 12  V
   Q0
Q19Q0 A capacitor in an RC circuit is charged to 85% of its maximum
28 Q0 value in 2.4 s. What is the time constant of this circuit?
   Q0
   A1 1.3 s
   A2 2.4 s
   A3 2.9 s
   A4 1.9 s
   A5 0.9 s
   Q0
Q20Q0 Find the value of R in the circuit shown in Figure 5.
28 Q0
   A1 5  Ohms
   A2 1  Ohms
   A3 2  Ohms
   A4 7  Ohms
   A5 8  Ohms
   Q0
Q21Q0 An electron is projected into a uniform magnetic field
29 Q0 B = (1.4i + 2.1j) T. Find the force on the electron when
   Q0 the velocity is v = (3.7*10**5 j) m/sec
   Q0 (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
Q22Q0 An electron moving in a circular path perpendicular to a
29 Q0 uniform magnetic field takes 1.0 nano-second to complete one
   Q0 revolution. Determine the magnitude of the magnetic field.
   Q0
   A1 36 milli-T
   A2 55 milli-T
   A3 24 milli-T
   A4 12 milli-T
```

A5 83 milli-T
Q0
Q23Q0 A wire of total length 4L and carrying a current I is placed
Q0 in a uniform magnetic field B that is directed out of the page
29 Q0 as shown in Figure 6. Determine the net magnetic force on the
Q0 wire.
Q0
A1 2ILB down
A2 2ILB up
A3 4ILB down
A4 4ILB up
A5 2ILB left
Q0
Q24Q0 A square loop, of side a = 5 cm and 200 turns, carries a
29 Q0 current of 10 A. The loop is placed in an external magnetic
Q0 field of 2.0 T. Determine the magnitude of the maximum torque
Q0 exerted on the loop.
Q0
A1 10 N*m
A2 12 N*m
A3 22 N*m
A4 20 N*m
A5 44 N*m
Q0
Q25Q0 What is the magnitude of the magnetic field at point P due
30 Q0 to the current carrying wire shown in Figure 7, if I = 2.0 A,
Q0 a = 20 cm and b = 2a?
Q0
A1 0.8 micro-T
A2 2.1 micro-T
A3 0.4 micro-T
A4 1.1 micro-T
A5 2.8 micro-T
Q0
Q26Q0 Figure 8 shows a cross section of three long parallel wires
30 Q0 each carrying a current of 15 A. The currents in the wires
Q0 A and C are out of the paper, while that in wire B is into
Q0 the paper. If the distance a = 5.0 mm, what is the magnitude
Q0 of the force per unit length on wire C?
Q0
A1 4.5 milli-N/m
A2 5.4 milli-N/m
A3 9.2 milli-N/m
A4 3.6 milli-N/m
A5 2.1 milli-N/m
Q0
Q27Q0 A long cylindrical wire has a radius R = 2.0 cm and carries
30 Q0 a current I = 40 A that is uniformly distributed through the
Q0 cross-section of the wire. What is the magnitude of the
Q0 magnetic field at a point which is 1.5 cm from the axis of
Q0 the wire?
Q0
A1 3*10**(-4) T
A2 5*10**(-4) T
A3 4*10**(-5) T
A4 2*10**(-3) T
A5 6*10**(-3) T

```
   Q0
Q28Q0 Consider a circular loop of radius R = 20 cm lying in the x-y
30 Q0 plane. There is throughout the region a uniform magnetic
   Q0 field given by B = (5.0i + 4.0j + 3.0k) T. Calculate the
   Q0 magnetic flux though the loop.
   Q0
   A1 0.38 T*m**2
   A2 0.62 T*m**2
   A3 0.21 T*m**2
   A4 0.15 T*m**2
   A5 0.92 T*m**2
   Q0
Q29Q0 A conducting rod of length 1.2 m is moving with a speed of
31 Q0 10 m/s as shown in Figure 9. If the magnetic field is 0.55 T
   Q0 into the page. Calculate the potential difference between
   Q0 the ends of the rod.
   Q0
   A1 6.6 V
   A2 5.5 V
   A3 2.2 V
   A4 8.8 V
   A5 ZERO
   Q0
Q30Q0 A flat coil of wire consisting of 20 turns, each with an
31 Q0 area of 50 cm**2, is positioned perpendicularly to a uniform
   Q0 magnetic field that increases its magnitude at a constant
   Q0 rate from 2.0 T to 6.0 T in 2.0 s. If the coil has a total
   Q0 resistance of 0.4 ohms, what is the magnitude of the induced
   Q0 current in the coil?
   Q0
   A1 0.5 A
   A2 0.6 A
   A3 0.7 A
   A4 0.8 A
   A5 0.2 A
```

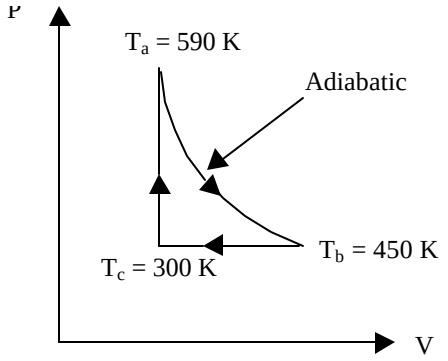


Figure 1

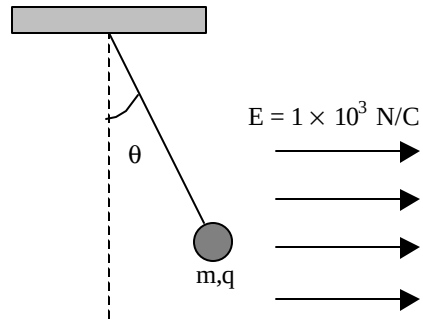


Figure 2

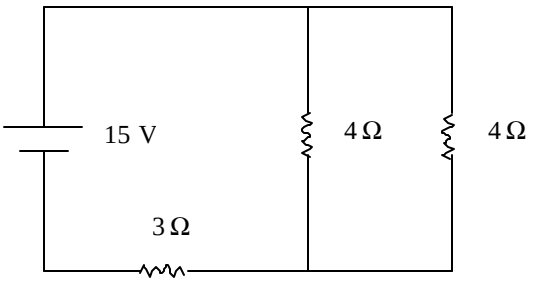


Figure 3

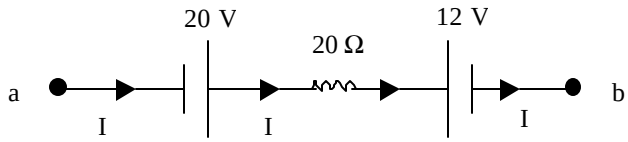


Figure 4

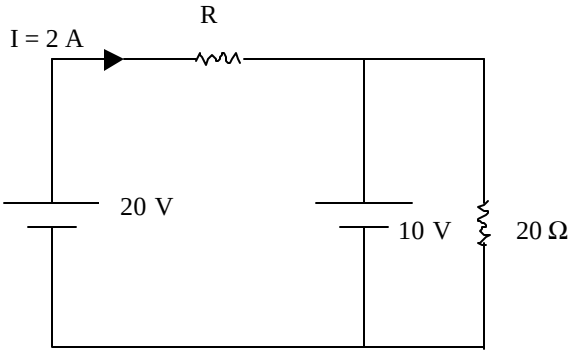


Figure 5

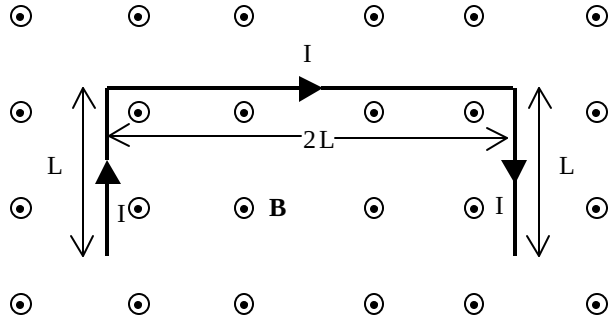
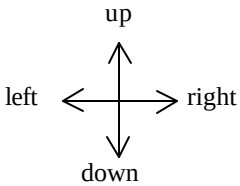


Figure 6



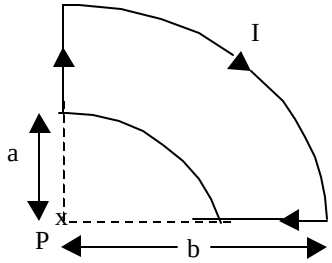


Figure 7

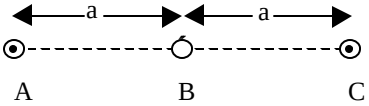


Figure 8

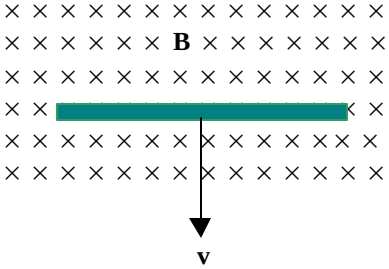


Figure 9