```
1  Q0 A string 180 cm long has a fundamental frequency of vibration
17 Q0 of 300 Hz. What length of the same string, under the same
   Q0 tension, will have a fundamental frequency of 200 Hz?
   Q0
   A1  270 cm.
   A2  147 cm.
   A3  120 cm.
   A4  220 cm.
   A5  900 cm.
   Q0
2  Q0 A point source emits 30 W of sound. A small microphone
18 Q0 has an area of 0.75 cm**2 is placed 10 m from the point
   Q0 source. What power does the microphone receive?
   Q0
   A1  1.8 micro-W.
   A2  3.6 micro-W.
   A3  0.1 micro-W.
   A4  9.3 micro-W.
   A5  30  micro-W.
   Q0
3  Q0 A closed tank, at room temperature, has a mixture of hydrogen
19 Q0 molecules and helium atoms. The ratio of rms speed of
   Q0 hydrogen molecules to that of helium is:
   Q0 [Note: The molar mass of the hydrogen molecule is 2.0 g/mol
   Q0 and the molar mass of the helium atom is 4.0 g/mol]
   Q0
   A1  1.4
   A2  2.1
   A3  3.2
   A4  0.1
   A5  0.3
   Q0
4  Q0 A Carnot engine has an efficiency of 20%. It operates between
21 Q0 two constant-temperature reservoirs differing in temperature
   Q0 by 70.0 K. What is the temperature of the HOT reservoir?
   Q0
   A1    350 K.
   A2    280 K.
   A3    300 K.
   A4    400 K.
   A5     70 K.
   Q0
5  Q0 In figure (1), if Q = 30 micro-C, q = 5.0 micro-C and d = 0.3 m,
22 Q0 find the net force on q. [i and j are the unit vectors in the
   Q0 positive direction of x-axis and y-axis, respectively].
   Q0
   A1    zero.
   A2    7.5 i (N).
   A3   -7.5 i (N).
   A4   -3.8 j (N).
   A5    3.8 i (N).
   Q0
6  Q0 A metallic sphere, in electrostatic equilibrium, has a
   Q0 radius R and carries a net charge Q. Which of the following
25 Q0 statements are true for the sphere?
   Q0
   Q0   i- It is made of a non-conducting material.
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   Q0  ii- The excess charge resides on its surface.
   Q0 iii- The electric field inside it is zero.
   Q0  iv- The electric potential inside it is constant.
   Q0
   A1  ii, iii, and iv only.
   A2  i and  ii only.
   A3  i, ii, and iii only.
   A4  iii, and iv only.
   A5  i, ii, and iv only.
   Q0
7  Q0 The electric field 20 mm from a certain point charge has
23 Q0 a magnitude |E|. The magnitude of the electric field
   Q0 10 mm from the point charge is
   Q0
   A1  4.0*|E|.
   A2  2.0*|E|.
   A3  1.5*|E|.
   A4  6.0*|E|.
   A5  zero.
   Q0
8  Q0 In figure (2), find the charge stored by the capacitor C3
   Q0 if the potential difference across the battery is 10.0 V.
26 Q0 Use the values C1 = C2 = 2.0 micro-F and C3 = 4.00 micro-F.
   Q0
   A1   20 micro-C.
   A2   10 micro-C.
   A3   15 micro-C.
   A4   30 micro-C.
   A5   99 micro-C.
   Q0
9  Q0 Two concentric spherical shells of radii 10 cm and 5.0 cm
26 Q0 are charged to a potential difference of 20 V. How
   Q0 much energy is stored in this spherical capacitor?
   Q0
   A1   2.2*10**(-9) J.
   A2   1.3*10**(-9) J.
   A3   3.1*10**(-7) J.
   A4   5.4*10**(-9) J .
   A5   9.8*10**(-8) J .
   Q0
10 Q0 A parallel-plate air-filled capacitor, of area 25 cm**2 and
26 Q0 plate separation of 1.0 mm, is charged to a potential
   Q0 difference of 600 V. Find the energy density between
   Q0 the plates.
   Q0
   A1    1.6 J/m**3.
   A2    0.3 J/m**3.
   A3    7.4 J/m**3 .
   A4    3.2 J/m**3.
   A5    1.6 J/m**3.
   Q0
11 Q0 A parallel-plate capacitor has an area A and a separation d.
   Q0 Find its capacitance if it is filled with two dielectrics as
26 Q0 shown in figure 3. [Co is the capacitance of the air-filled
   Q0 parallel-plate capacitor. K1 = 3 and K2 = 1.5 are the
   Q0 dielectric constants]
   Q0
```

A1 2*Co.
A2 6*Co.
A3 3*Co.
A4 4*Co.
A5 Co.
Q0
12 Q0 A 20% increase in the resistance of a copper wire was noticed
27 Q0 when its temperature was raised above room temperature. Find
Q0 the final temperature of the wire if the temperature
Q0 coefficient of resistivity for copper is 4.0*10** (-3) /K.
Q0 [Assume the room temperature = 290 K]
Q0
A1 340 K.
A2 351 K.
A3 300 K.
A4 322 K.
A5 999 K.
Q0
13 Q0 A potential difference of 9.0 V is applied across the length
Q0 of a cylindrical conductor with radius 2.0 mm. Calculate the
27 Q0 current density if the conductor has a resistance of 90 ohms.
Q0
A1 8.0*10**3 A/m**2.
A2 5.0*10**3 A/m**2.
A3 6.0*10**3 A/m**2.
A4 2.0*10**3 A/m**2.
A5 2.3*10**7 A/m**2.
Q0
14 Q0 A current of 5.0 A exists in a 10 ohms resistor for 5.0 min.
27 Q0 How many electrons pass through any cross section of the
Q0 resistor in this time?
Q0
A1 9.4*10**21
A2 6.1*10**23
A3 1.2*10**21
A4 3.3*10**22
A5 7.8*10**21
Q0
15 Q0 A 6-V battery supplies a total of 48 W to two identical
28 Q0 light bulbs connected in parallel. The resistance (in ohm)
Q0 of each bulb is
Q0
A1 1.5
A2 0.7
A3 3.0
A4 4.0
A5 1.0
Q0
16 Q0 A capacitor, initially uncharged in a single-loop RC circuit,
Q0 is charged to 85% of its final potential difference in 2.4 s.
28 Q0 What is its time constant in seconds?
Q0
A1 1.3
A2 1.5
A3 1.7
A4 2.8
A5 zero

```
   Q0
17 Q0 Find the potential difference (VB-VA) between points B and
28 Q0 A of the circuit shown in figure (4)
   Q0
   A1   - 10 volts.
   A2     10 volts.
   A3   - 5  volts.
   A4     5  volts.
   A5     20 volts.
   Q0
18 Q0 Find the value of R1 in the circuit of figure (5)
28 Q0
   Q0
   A1   6.0 ohms.
   A2   9.0 ohms.
   A3   8.0 ohms.
   A4   4.0 ohms.
   A5   2.0 ohms.
   Q0
19 Q0 Figure 6 shows the circular paths of an electron and a proton
29 Q0 that travel at the same speed in a uniform magnetic field B,
   Q0 which points into the page.
   Q0  (a) Which particle follows the bigger circle, and
   Q0  (b) does that particle travel clockwise or counterclockwise?
   Q0
   A1   (a)  proton          (b) counterclockwise
   A2   (a)  proton          (b) clockwise
   A3   (a)  electron        (b) counterclockwise
   A4   (a)  electron        (b) clockwise
   A5   Not enough information given.
   Q0
20 Q0 In figure 7, a rectangular loop, L1 = 2.0 cm by L2 = 3.0 cm,
29 Q0 carrying a current I = 0.1 A, is suspended from a spring of
   Q0 spring constant, k = 8.0*10**(-2) N/m.  The loop is placed
   Q0 into a uniform magnetic field, which points into the page,
   Q0 and the spring is observed to stretch 1.0 cm. What is the
   Q0 magnitude of the magnetic field?
   Q0 [Neglect the mass of the loop]
   Q0
   A1   0.4 T.
   A2   0.1 T.
   A3   0.3 T.
   A4   0.5 T.
   A5   0.2 T.
   Q0
21 Q0 At a point in a uniform magnetic field the acceleration of an
29 Q0 electron is 5.0*10**14 m/s**2 and its speed is 7.0*10**6 m/s.
   Q0 If the magnitude of the magnetic field is 1.0 mT, what is the
   Q0 angle between the electron’s velocity and the magnetic field?
   Q0
   Q0
   A1 24 degrees.
   A2 29 degrees
   A3 45 degrees.
   A4 90 degrees.
   A5 zero degrees.
   Q0
```

22 Q0 A proton moves with constant velocity, v = (8.0*10**5 m/s) i,
29 Q0 through crossed electric and magnetic fields. If the
Q0 magnetic field is B = (2.5 mT) j, what is the electric field?
Q0 [i, j and k are the unit vectors in the positive x, y and
Q0 z directions, respectively].
Q0
A1 (-2.0 kV/m) k.
A2 (+2.0 kV/m) k.
A3 (-1.0 kV/m) k.
A4 (+1.0 kV/m) j.
A5 (-2.5 kV/m) i.
Q0
23 Q0 Which one of the following statements is FALSE (NOT TRUE).
29 Q0 A uniform magnetic field
Q0
A1 changes the kinetic energy of a charge.
A2 exerts a force on a moving charge.
A3 accelerates a moving charge.
A4 of the earth is a measurable quantity.
A5 changes the momentum of a moving charge.
Q0
24 Q0 Figure (8) shows two concentric circular loops of radii a
Q0 and b and both carry a current I. Find the resultant
30 Q0 magnetic field at the center of the two loops if a = 10 cm,
Q0 b = 20 cm and I = 20 A.
Q0
A1 63 micro-T, out of the page.
A2 19 micro-T, into the page.
A3 15 micro-T, out of the page.
A4 15 micro-T, into the page.
A5 zero.
Q0
25 Q0 Two long parallel wires, D and B, are separated by 2.0 cm.
30 Q0 The current in D is THREE times the current in B. If the
Q0 magnitude of the force on 2.0 m length of one of the wires
Q0 is equal to 60 micro-N, find the current in B.
Q0
A1 1.0 A.
A2 2.0 A.
A3 1.5 A.
A4 5.0 A.
A5 0.5 A.
Q0
26 Q0 The radius R of a long current-carrying wire is 2.3 cm. If
30 Q0 the magnetic field at r1 = 2.0 cm is equal to THREE times
Q0 the magnetic field at r2, r2 > R, calculate the distance r2.
Q0
A1 7.9 cm.
A2 3.8 cm.
A3 5.2 cm.
A4 4.4 cm.
A5 2.0 cm.
Q0
27 Q0 A hollow cylindrical conductor of inner radius 3.0 mm and
30 Q0 outer radius 5.0 mm carries a current of 80 A parallel to
Q0 its axis. The current is uniformly distributed over the
Q0 cross section of the conductor. Find the magnitude of the

```
   Q0 magnetic field at a point that is 2.0 mm from the axis of
   Q0 the conductor.
   Q0
   A1 zero.
   A2 8.0 mT.
   A3 5.3 mT.
   A4 10  mT.
   A5 0.7 mT
   Q0
28 Q0 A 400-turn coil of total resistance 6.0 ohm has a cross
31 Q0 sectional area of 30 cm**2. How rapidly should a magnetic
   Q0 field parallel to the coil axis change in order to induce
   Q0 a current of 0.3 A in the coil?
   Q0
   A1   1.5  T/s.
   A2   0.25 T/s.
   A3   0.67 T/s.
   A4   2.8  T/s.
   A5   0.04 T/s.
   Q0
29 Q0 A circular wire loop of area 0.5 m**2 is perpendicular
31 Q0 to a magnetic field of 0.8 T. If the coil is removed
   Q0 completely from the field in 0.1 s, the average emf
   Q0 induced in the loop has a magnitude
   Q0
   A1   4.0  V.
   A2   8.0  V.
   A3   2.0  V.
   A4   5.0  V.
   A5   1.0  V.
   Q0
30 Q0 A long straight wire carrying a constant current I is in the
31 Q0 plane of a circular conducting loop as shown in figure (9).
   Q0 If the wire is moved away from the loop toward point A, the
   Q0 current induced in the loop is
   Q0
   A1   clockwise.
   A2   counterclockwise.
   A3   zero.
   A4   into the page.
   A5   out of the page.
```

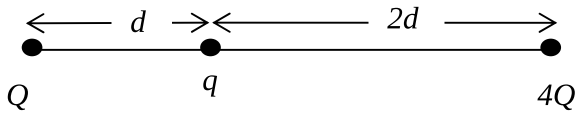

Figure 1

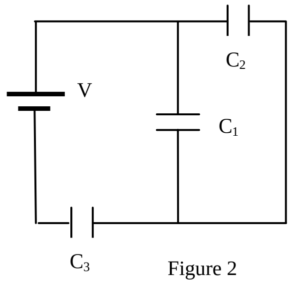

Figure 2

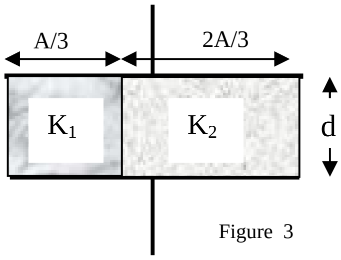

Figure 3

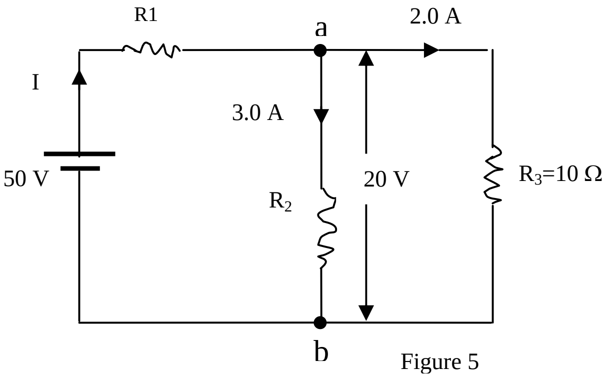

Figure 5

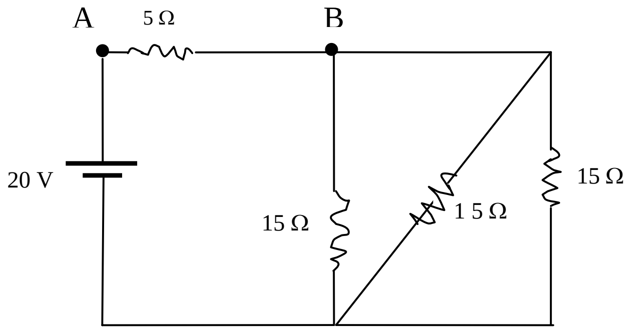

Figure 4

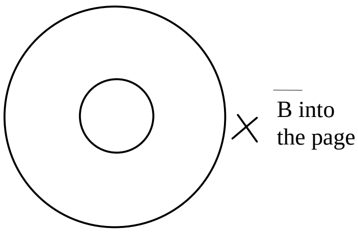

Figure 6

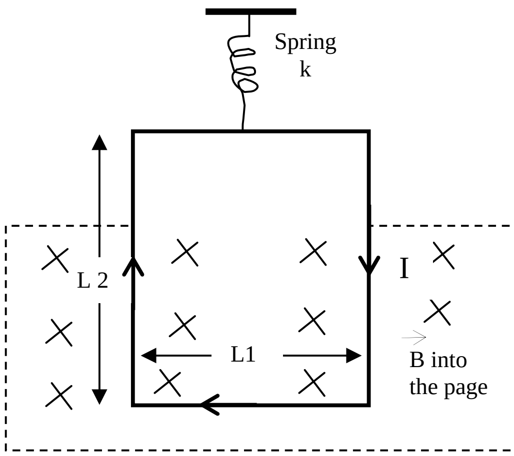

Figure 7

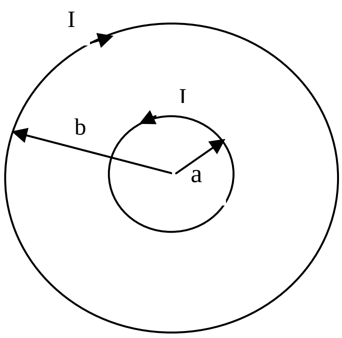

Figure 8

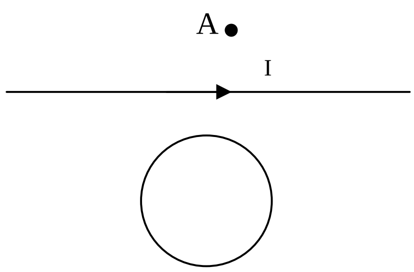

Figure 9