PHYS 102 – FINAL EXAM – TERM 011

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QUESTION NO: 1
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An ordinary glass cup is filled to the top with 0.3 Liters of water at 10 degree C. If the temperature is now increased to 40 degree C, how much water (if any) will spill from the glass? [Coefficient of volume expansion of water is 21*10**(-5) K**(-1) and for glass is 27*10**(-6) K**(-1)].
A. 1.65*10**(-3) Liters.
B. 3.44*10**(-3) Liters.
C. zero Liters.
D. 0.12*10**(-3) Liters.
E. 6.67*10**(-3) Liters.
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QUESTION NO: 2
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Two light bulbs, of 25 Watts and 100 Watts, are connected in series to 110 Volts source. Which of the following statements is correct:
A. The current in the 100 Watts bulb is greater than that in the 25 Watts bulb.
B. Both bulbs will light with equal brightness.
C. Each bulb will have a potential difference of 55 Volts.
D. The current in the 100 Watts bulb is less than that in the 25 Watts bulb.
E. The current in the 100 Watts bulb is the same as that in the 25 Watts bulb.
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QUESTION NO: 3
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An electric field of 1.5*10**3 V/m and a magnetic field of 0.50 T act on a moving electron to produce no net force. Calculate the minimum speed of the moving electron.
A. Zero.
B. 0.75*10**3 m/s.
C. 4.5*10**3 m/s.
D. 3.0*10**3 m/s.
E. 7.5*10**3 m/s.
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QUESTION NO: 4
****
Two concentric shells, one with radius R and the other with radius 2R, surround an isolated point charge. The ratio of the number of field lines through the larger shell to the number of field lines through the smaller is:
A. 4.
B. 1/4.
C. 1.
D. 1/2.
E. 2.

QUESTION NO: 5
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Figure (8) shows two wires carrying anti-parallel currents.
If i2 is greater than i1, the point at which the resultant
magnetic field of the two wires will be zero is located in
the region (regions):
A. II and III.
B. I.
C. I and III.
D. II.
E. III.
****
QUESTION NO: 6
****
A proton that has velocity **v**=(3.0*10**6 i- 2.0*10**6 j) m/s
moves in a magnetic field **B** = (0.50 i) T. Find the force
on the proton. (i, j and k are the rectangular unit vectors.)
A. -1.6*10**(-13) kN.
B. 1.2*10**(-13) kN.
C. 1.6*10**(-13) kN.
D. -2.4*10**(-13) kN.
E. 2.4*10**(-13) kN.
****
QUESTION NO: 7
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A new temperature scale is called Z. On that scale, the boiling
point of water is 150 degree Z and the freezing point is
-10 degree Z. Find the corresponding 70 degree Z in degree C.
A. 90 degree C.
B. 150 degree C.
C. 80 degree C.
D. 50 degree C.
E. 70 degree C.
****
QUESTION NO: 8
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Two moles of an ideal gas, initially at 20 degrees Celsius, are
taken through an isothermal process in which the volume of the
gas doubles. The work done by the gas during this process is:
A. 230 J.
B. -230 J.
C. 3375 J.
D. Zero.
E. -3375 J.

QUESTION NO: 9
****
A 2.0 Tesla uniform magnetic field makes an angle of 60 degrees with the xy-plane. The magnetic flux through an area of 3 m**2 portion of the xy-plane is:
A. 3.0 Wb.
B. 12 Wb.
C. 6.0 Wb.
D. 2.0 Wb.
E. 5.2 Wb.
****
QUESTION NO: 10
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A hair dryer of resistance 80 ohms is plugged into a 120-V line. The charge passing through it in one hour is:
A. 2400 coulombs.
B. 90 coulombs.
C. 900 coulombs.
D. 1.5 coulombs.
E. 5400 coulombs.
****
QUESTION NO: 11
****
In the circuit shown in figure (4), the capacitor is initially uncharged. At t = 0, switch S is closed. If T denotes the time constant, then the current passing through the 3.0 Ohm resistor at t = T/100 is:
A. 0.5 A.
B. 0.8 A.
C. 1.5 A.
D. 3.0 A.
E. 0.6 A.
****
QUESTION NO: 12
****
Five moles of an ideal monatomic gas are allowed to expand adiabatically to twice its volume. In the process the gas does 831 Joules of work. The temperature of the gas will:
A. increases by 20.2 degree C.
B. decreases by 20.2 degree C.
C. increases by 13.3 degree C.
D. stays constant.
E. decreases by 13.3 degree C.
****
QUESTION NO: 13
****
The electric potential at points in an xy-plane is given by
V= 4.0*(x**2) -5.0*(y**2),
where V is in volts and x and yare in meters. What is the magnitude of the electric field at point (2.0 m, 3.0 m)?
A. 25 V/m
B. 31 V/m
C. 28 V/m
D. 15 V/m
E. 34 V/m

QUESTION NO: 14
****
A wire bent into a semicircle of radius R = 2.0 m forms a closed circuit and carries a current of 1.5 A. The circuit lies in the xy-plane, and a uniform magnetic field B = 3.0 T is present along the y axis, as shown in figure (6). Find the magnitude of the magnetic force on the curved portion of the wire.
A. 18 N.
B. 6.0 N.
C. 0 N.
D. 12 N.
E. 9.0 N.
****
QUESTION NO: 15
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An ideal refrigerator has a coefficient of performance of 5. If the temperature inside the refrigerator is -20 degrees Celsius, what is the temperature at which it rejects heat?
A. -5 degrees Celsius.
B. 27 degrees Celsius.
C. 20 degrees Celsius.
D. 42 degrees Celsius.
E. 31 degrees Celsius.
****
QUESTION NO: 16
****
A sinusoidal transverse wave is traveling on a string. Any point on the string:
A. moves in a uniform circular motion with the same angular speed as the wave.
B. moves in a uniform circular motion with a different angular speed than that of the wave.
c. moves in the same direction as that of the wave.
D. moves in a simple harmonic motion with a different frequency than that of the wave.
E. moves in a simple harmonic motion with the same angular frequency as that of the wave.
****
QUESTION NO: 17
****
What uniform magnetic field, applied perpendicular to a beam of electrons moving at 1.4*10**6 m/s is required to make the electrons travel in a circular orbit of radius 0.40 m?
A. 7.0*10**(-5) T.
B. 5.0*10**(-5) T.
C. 3.0*10**(-5) T.
D. 1.0*10**(-5) T.
E. 2.0*10**(-5) T.

QUESTION NO: 18
****
Three resistors, of resistance 2.0 Ohm, 4.0 Ohm and 6.0 Ohm,
are connected to a 24 Volt battery as shown in figure (2).
The power dissipated in the 2.0 Ohm resistor is:
A. 4 W.
B. 12 W.
C. 48 W.
D. 24 W.
E. 8 W.
****
QUESTION NO: 19
****
A current of 2.5 A passes in a solenoid of length L = 50 cm.
It produces a magnetic field of 2.3*10**(-3) T at its center.
The number of turns in the solenoid is:
A. 366.
B. 372.
C. 781.
D. 645.
E. 554.
****
QUESTION NO: 20
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Consider an infinitely long straight wire carrying a current I.
If the magnetic field at r1 = 2.5 am inside the wire and at
r2 = 10 am outside the wire are equal, then the radius of the
wire is:
A. 4.0 mm.
B. 7.O mm .
C. 6.O mm .
D. 5.O mm .
E. 3.O mm .
****
QUESTION NO: 21
****
If the current I in figure (5) is equal to 4.0 A, then the
potential difference between point 1 and 2, i.e. (V2 -V1),
is:
A. 40 Volts.
B. -24 Volts.
C. 24 Volts.
D. -40 Volts.
E. Zero.

QUESTION NO: 22
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A sound wave of 50.0 cm wavelength enters the tube shown in figure(1) at the source end. What must be the smallest radius(r) (other than zero) such that a maximum sound will be heard at the detector end?
A. 43.8 cm.
B. 15.9 cm.
C. 17.5 cm.
D. 21.3 cm.
E. 33.0 cm.
****
QUESTION NO: 23
****
What is the initial direction of the deflection of an electron, moving in the y direction as it enters the magnetic field shown in figure (7)? [The magnetic field is in the xy-plane and makes an angle of 45 degrees with the x axis].
A. y direction.
B. out of the page.
C. 45 degrees with the x direction.
D. 45 degrees with the y direction.
E. into the page.
****
QUESTION NO: 24
****
Two small charged objects repel each other with a force F when separated by a distance d. If the charge on each object is reduced to one-fourth of its original value and the distance between them is reduced to d/2 the force becomes:
A. F/16.
B. F.
C. F/4.
D. F/2.
E. F/8.
****
QUESTION NO: 25
****
Three long parallel wires, shown in figure (9), are in the xy-plane. Each wire carries a current of 3.0 A. The separation between the adjacent wires is d = 8.0 cm. What is the magnitude of the net force per meter exerted on the central wire by the other two wires?
A. 9.2*10**(-5) N/m.
B. 6.3*10**(-5) N/m.
C. 4.5*10**(-5) N/m.
D. 2.7*10**(-5) N/m.
E. 3.0*10**(-5) N/m.

QUESTION NO: 26
****
An infinite line of charge produces an electric field of
6.0*10**4 N/C at a perpendicular distance of 2.5 m from
its axis. Calculate the linear charge density.
A. 5.0*10**(-6) C/m.
B. 8.3*10**(-6) C/m.
C. 7.0*10**(-6) C/m.
D. 6.3*10**(-6) C/m.
E. 9.5*10**(-6) C/m.
****
QUESTION NO: 27
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A single turn plane loop of wire of cross sectional area
40 cm**2 is perpendicular to a magnetic field that increases
uniformly in magnitude from 0.5 T to 5.5 T in 2.0 seconds.
What is the resistance of the wire if the induced current
has a value of 1.0*10**(-3) A?
A. 20 Ohms.
B. 10 Ohms .
C. 40 Ohms.
D. 30 Ohms.
E. 50 Ohms.
****
QUESTION NO: 28
****
A parallel plate capacitor, with the space between the plates
filled with polystyrene, has a capacitance of 10 nano-F. If
the separation between the plates is 3.5 cm and the dielectric
constant of the polystyrene is 2.6, what is the area of each plate?
A. 1.20 m**2
B. 0.04 m**2
C. 15.2 m**2
D. 2.50 m**2
E. 0.11 m**2
****
QUESTION NO: 29
****
The magnitude of the magnetic field at 88.0 cm from the axis
of an infinitely long wire is 7.30*10**(-6) T. What is the current in the wire?
A. 42.8 A.
B. 22.2 A.
C. 32.1 A.
D. 5.30 A.
E. 15.4 A.
****
QUESTION NO: 30
****
The current in the 8.0 Ohm resistor shown in the circuit of
figure (3) is:
A. 3.0 A.
B. 0.4 A.
C. 1.5 A.
D. 0.67 A.
E. 2.4 A.

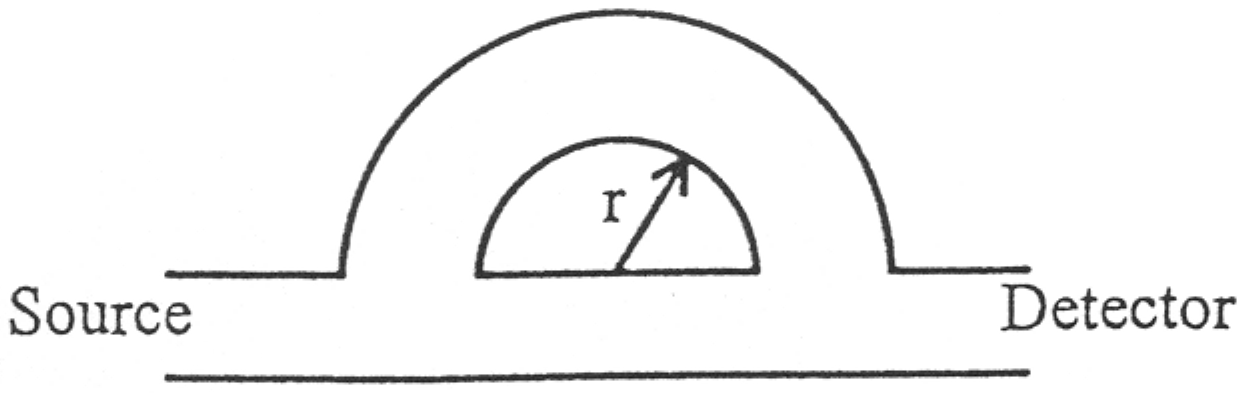

Figure (1)

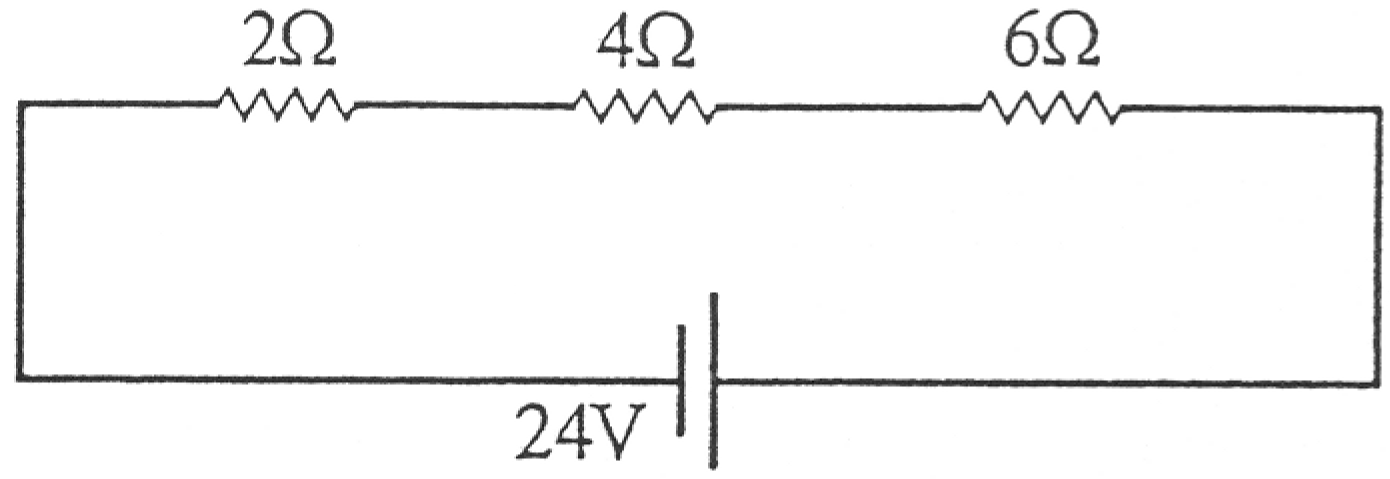

Figure (2)

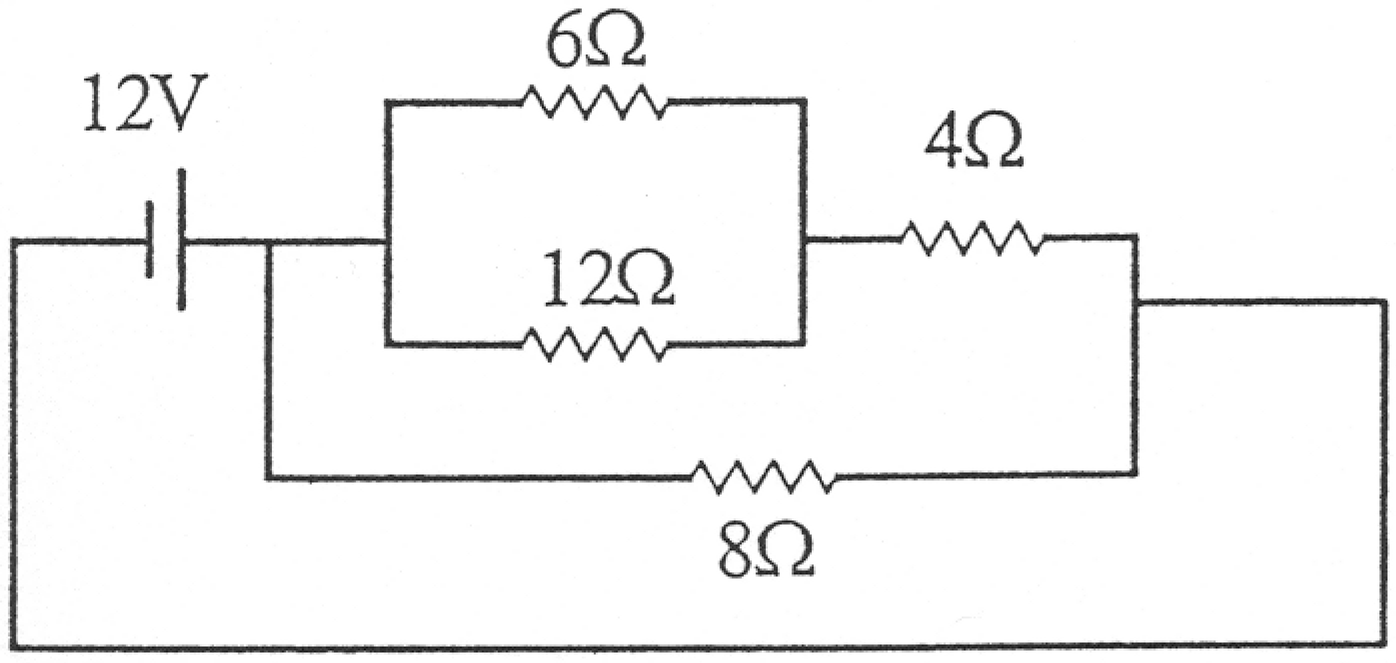

Figure (3)

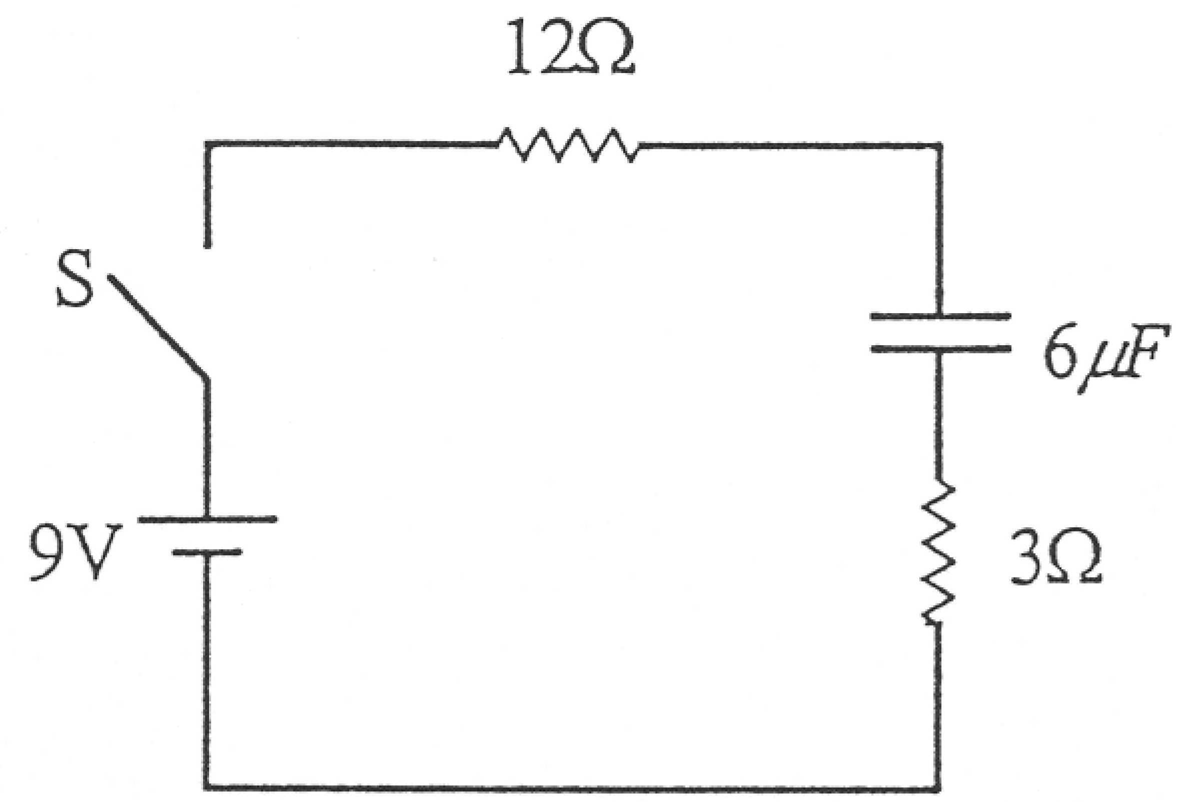

Figure (4)

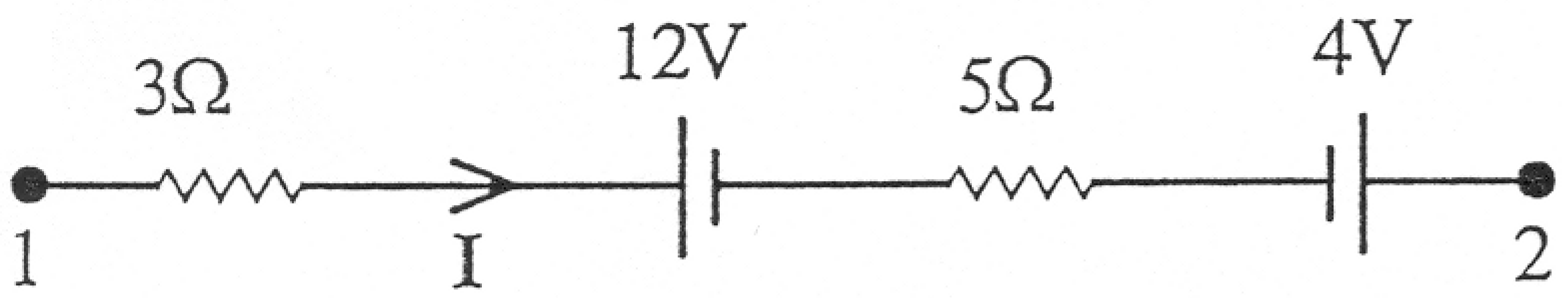

Figure (5)

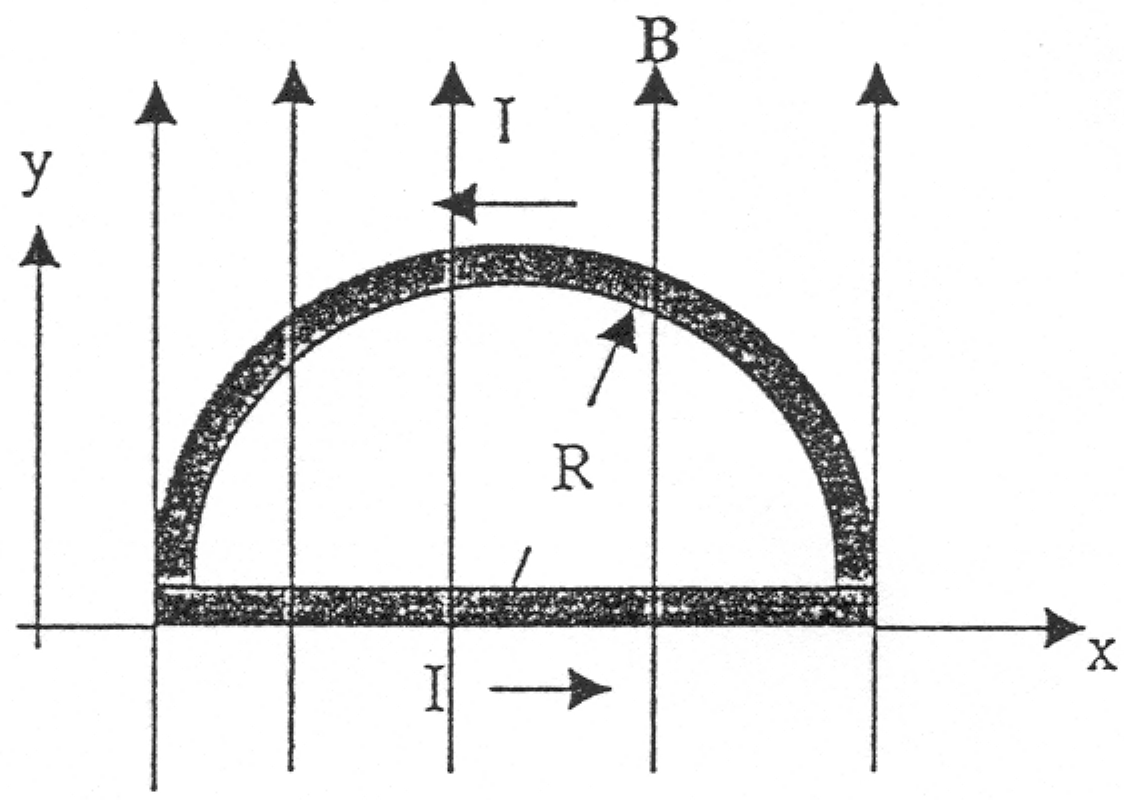

Figure (6)

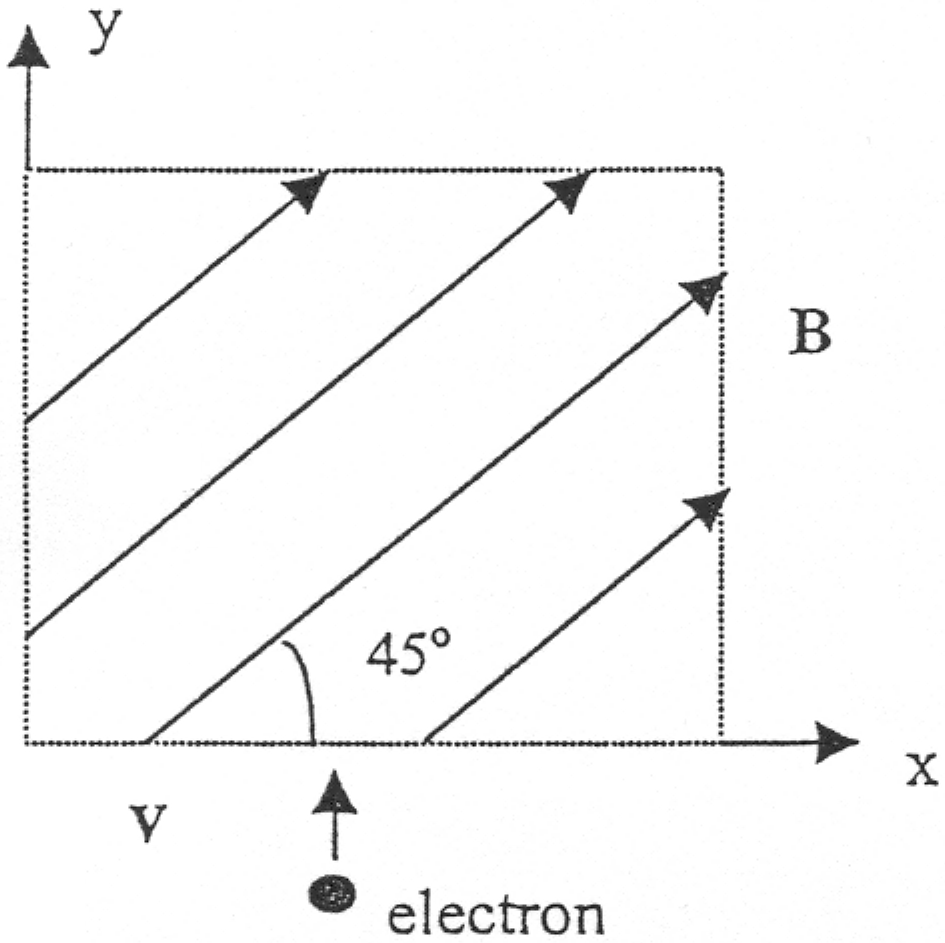

Figure (7)

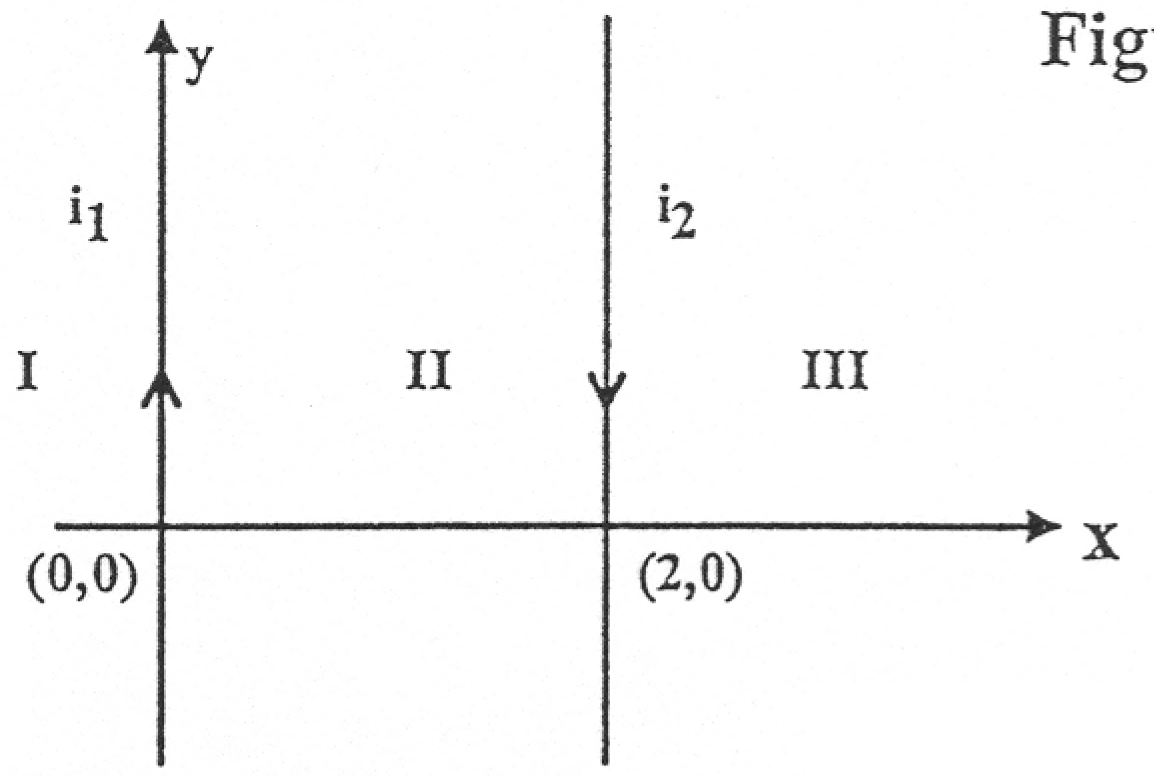

Figure (8)

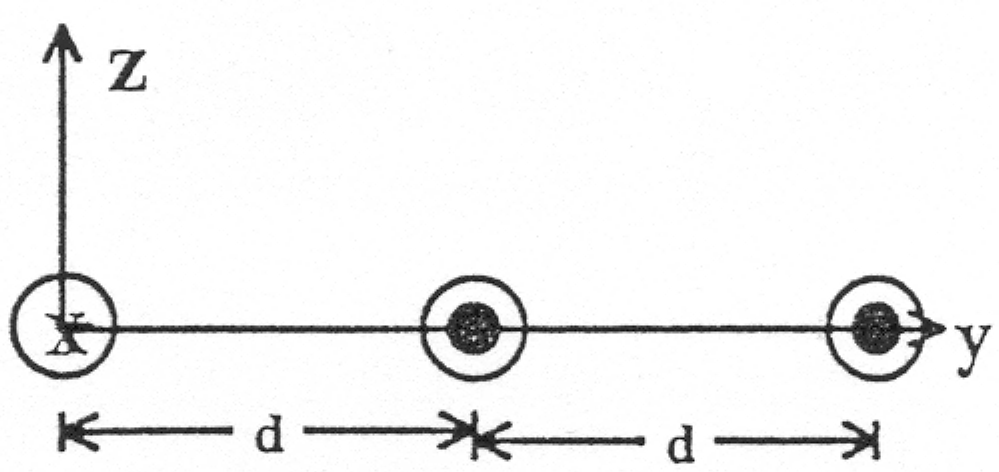

Figure (9)