

Q1.

A sinusoidal transverse wave is traveling on a string. Any point on the string:

- A) Moves in simple harmonic motion with the same angular frequency as the wave.
- B) Moves in the same direction as the wave.
- C) Moves in simple harmonic motion with a different frequency than that of the wave.
- D) Moves in uniform circular motion with a different angular speed than the wave.
- E) Moves in uniform circular motion with the same angular speed as the wave.

Sec# Wave Motion - The Speed of Waves on Strings

Grade# 50

[Stat# A_60_DIS_0.30_PBS_0.25_B_11_C_9_D_8_E_13_EXP_50_NUM_199](#)

Q2.

The sound intensity 5.0 m from a point source is 0.50W/m^2 . The power output of the source is:

- A) 157 W
- B) 39 W
- C) 266 W
- D) 320 W
- E) 390 W

Sec# Sound Waves - Intensity of Periodic Sound waves

Grade# 50

[Stat# A_50_DIS_0.44_PBS_0.39_B_28_C_7_D_9_E_7_EXP_50_NUM_199](#)

Q3.

A column of argon is open at one end and closed at the other. The shortest length of such a column that will resonate with a 200 Hz tuning fork is 42.5 cm. The speed of sound in argon must be:

- A) 340 m/s
- B) 170 m/s
- C) 850 m/s
- D) 470 m/s
- E) 940 m/s

Sec# Sound Waves - Standing waves in Air Columns

Grade# 50

[Stat# A_77_DIS_0.28_PBS_0.32_B_13_C_6_D_3_E_2_EXP_50_NUM_199](#)

Q4.

If 2.00 kg of water at 0°C is to be vaporized, how much heat must be added?

- A) 5.35×10^3 kJ
- B) 535 J
- C) 478 J
- D) 452 J

E) 4.52×10^3 kJ

Sec# Temperature - Temperatur and the First Law of Thermodynamics

Grade# 50

[Stat# A_47_DIS_0.60_PBS_0.46_B_3_C_4_D_7_E_39_EXP_50_NUM_199](#)

Q5.

An ideal gas is allowed to expand adiabatically until its volume increases by 50 %. By what factor its initial pressure is reduced? (Assume $\gamma = 5/3$):

- A) 2.0
- B) 1.5
- C) 2.5
- D) 3.5
- E) 3.0

Sec# The kinetic Theory of Gases - Adiabatic Processes for Ideal Gas

Grade# 50

[Stat# A_51_DIS_0.48_PBS_0.37_B_20_C_8_D_4_E_18_EXP_50_NUM_199](#)

Q6.

A heat engine operates between 800 K and 300 K, but its efficiency is only 80% of the maximum possible. What is the actual efficiency of the engine?

- A) 50%
- B) 70%
- C) 38%
- D) 30%
- E) 36%

Sec# Heat engines, entropy and the 2nd law - The Carnot Engine

Grade# 50

[Stat# A_48_DIS_0.42_PBS_0.34_B_18_C_15_D_9_E_10_EXP_50_NUM_199](#)

Q7.

Four point charges of varying magnitude and sign are arranged on the corners of the square of side d as shown in Fig. 1. Which of the arrows shown represents the net force acting on the point charge with a charge $+Q$?

- A) A
- B) C
- C) B
- D) D
- E) None of the above

Sec# Electric fields - Coulomb's Law

Grade# 50

[Stat# A_65_DIS_0.32_PBS_0.28_B_20_C_5_D_2_E_9_EXP_50_NUM_199](#)

Q8.

3 moles of an ideal gas are allowed to undergo free expansion. If the gas volume increases to three times of its initial value during the free expansion, calculate the change in the entropy of the gas.

- A) + 27.4 J/K
- B) - 27.4 J/K
- C) + 2.74 J/K
- D) - 2.74 J/K
- E) + 7.24 J/K

Sec# The kinetic Theory of Gases - Molecular Model of an Ideal Gas

Grade# 50

Stat# [A_77_DIS_0.46_PBS_0.40_B_11_C_7_D_4_E_2_EXP_50_NUM_199](#)

Q9.

What is magnitude of a uniform electric field if its flux through a 2.0 m x 1.0 m rectangular surface is $836.0 \text{ N}\cdot\text{m}^2/\text{C}$. The plane of the surface is at an angle of $\pi/3$ radians with respect to the direction of the field.

- A) 483 N/C
- B) 321 N/C
- C) 215 N/C
- D) 842 N/C
- E) 512 N/C

Sec# Gauss's law - Electric Flux and Gauss' Law

Grade# 50

Stat# [A_73_DIS_0.54_PBS_0.46_B_3_C_8_D_9_E_8_EXP_50_NUM_199](#)

Q10.

A charge of 40 pC is distributed on a isolated spherical conductor that has a 4.0-cm radius. Point A is 1.0 cm from the center of the conductor and point B is 5.0 cm from the center of the conductor. Determine the electric potential difference $V_A - V_B$?

- A) +1.8 V
- B) + 29 V
- C) + 21 V
- D) + 7.2 V
- E) + 9.0 V

Sec# Electric Potential - Electric Potential and Potential Difference

Grade# 50

Stat# [A_23_DIS_0.20_PBS_0.25_B_32_C_3_D_30_E_12_EXP_50_NUM_199](#)

Q11.

A long cylindrical shell (radius = 2.0 cm) has a charge uniformly distributed on its surface. If the magnitude of the electric field at a point 8.0 cm radially outward from the axis of the shell is 85 N/C, how much charge is distributed on a 2.0 m length of the charged cylindrical surface?

- A) 0.76 nC
- B) 0.38 nC
- C) 0.19 nC
- D) 0.57 nC
- E) 0.98 nC

Sec# Gauss's law - Electric Flux and Gauss' Law

Grade# 50

Stat# [A_35_DIS_0.36_PBS_0.36_B_29_C_18_D_13_E_6_EXP_50_NUM_199](#)

Q12.

A parallel-plate capacitor has a voltage $V = 6.0 \text{ V}$ between its plates. Each plate carries a surface charge density $\sigma = 7.0 \text{ nC/m}^2$. What is the separation of the plates?

- A) 7.6 mm
- B) 8.2 mm
- C) 2.5 mm
- D) 5.6 mm
- E) 1.2 mm

Sec# Capacitance and Dielectrics - Calculation of Capacitance

Grade# 50

Stat# [A_63_DIS_0.70_PBS_0.50_B_6_C_5_D_8_E_19_EXP_50_NUM_199](#)

Q13.

How much energy is dissipated as heat during a two-minute time interval by a $1.5 \text{ k}\Omega$ resistor which has a constant 20-V potential difference across its ends?

- A) 32 J
- B) 58 J
- C) 46 J
- D) 72 J
- E) 16 J

Sec# Current and Resistance - Electrical Energy and Power

Grade# 50

Stat# [A_52_DIS_0.76_PBS_0.56_B_7_C_8_D_8_E_25_EXP_50_NUM_199](#)

Q14.

A capacitor of $4 \times 10^{-3} \text{ F}$ capacitance is discharged through a $4 \text{ k}\Omega$ resistor. How long will it take for the capacitor to lose half its initial stored energy?

- A) 5.5 s
- B) 2.7 s
- C) 10.2 s
- D) 9.2 s
- E) 1.6 s

Sec# Direct Current Circuits - RC Circuits

Grade# 50

[Stat# A_48_DIS_0.60_PBS_0.48_B_10_C_24_D_7_E_12_EXP_50_NUM_199](#)

Q15.

Resistors A, B and C have resistances R , $2R$, and R respectively as shown in Fig. 2. Which resistor dissipates the most power?

- A) C
- B) B
- C) A
- D) A & B dissipate the same amount of power.
- E) All 3 resistors dissipate the same amount of power

Sec# Direct Current Circuits - RC Circuits

Grade# 50

[Stat# A_39_DIS_0.46_PBS_0.40_B_33_C_3_D_14_E_11_EXP_50_NUM_199](#)

Q16.

If $Q = 400 \mu\text{C}$ and the potential difference $V_A - V_B = -30 \text{ V}$ in the circuit segment shown in Fig. 3, what is the current in the resistor R ?

- A) 1.0 mA counterclockwise
- B) 1.0 mA clockwise
- C) 3.5 mA counterclockwise
- D) 2.5 mA clockwise
- E) 2.0 mA counterclockwise

Sec# Direct Current Circuits - RC Circuits

Grade# 50

[Stat# A_48_DIS_0.58_PBS_0.43_B_14_C_17_D_8_E_13_EXP_50_NUM_199](#)

Q17.

In Fig. 4, $I = 0.5 \text{ A}$ and $R = 12 \Omega$. What is the value of the emf ϵ ?

- A) 24 V
- B) 18 V
- C) 6 V
- D) 12 V
- E) 48 V

Sec# Direct Current Circuits - RC Circuits

Grade# 50

[Stat# A_21_DIS_0.28_PBS_0.34_B_25_C_8_D_45_E_3_EXP_50_NUM_199](#)

Q18.

A 1.0-C charge moves with a velocity of $(2.0 \mathbf{i} + 3.0 \mathbf{j}) \text{ m/s}$ and experiences a magnetic force of $(15 \mathbf{i} - 10 \mathbf{j} + 8.0 \mathbf{k}) \text{ N}$ in a magnetic field $B_y \mathbf{j} + 5.0 \mathbf{k}$. Then y -component of magnetic field B_y is :

- A) $+4.0 \text{ T}$

- B) - 4.0 T
- C) + 5.0 T
- D) - 5.0 T
- E) + 6.0 T

Sec# Magnetic Fields - Motion of a Charged Particle in a Magnetic Field

Grade# 50

Stat# [A_69_DIS_0.58_PBS_0.46_B_12_C_5_D_9_E_5_EXP_50_NUM_199](#)

Q19.

A thin copper rod 1.0 m long has a mass of 0.050 kg and is in a magnetic field of 0.10 T. What minimum current in the rod is needed in order for the magnetic force to cancel the weight of the rod?

- A) 4.9 A
- B) 1.2 A
- C) 2.5 A
- D) 7.6 A
- E) 9.8 A

Sec# Magnetic Fields - Magnetic Force on a Current-Carrying Conductor

Grade# 50

Stat# [A_74_DIS_0.50_PBS_0.44_B_8_C_6_D_5_E_7_EXP_50_NUM_199](#)

Q20.

An electron moving with a velocity $\mathbf{v} = (5.0 \times 10^7 \text{ m/s}) \mathbf{i}$ enters a region of space where perpendicular electric and a magnetic fields are present. The electric field is $\mathbf{E} = (-10^4) \mathbf{j}$. What magnetic field will allow the electron to go through, undeflected?

- A) $\mathbf{B} = -(2.0 \times 10^{-4} \text{ T}) \mathbf{k}$
- B) $\mathbf{B} = +(2.0 \times 10^{-4} \text{ T}) \mathbf{j}$
- C) $\mathbf{B} = -(2.0 \times 10^{-4} \text{ T}) \mathbf{i}$
- D) $\mathbf{B} = +(2.0 \times 10^{-4} \text{ T}) \mathbf{k}$
- E) $\mathbf{B} = +(5.0 \times 10^{-4} \text{ T}) \mathbf{k}$

Sec# Magnetic Fields - Motion of a Charged Particle in a Magnetic Field

Grade# 50

Stat# [A_42_DIS_0.22_PBS_0.15_B_8_C_5_D_41_E_5_EXP_50_NUM_199](#)

Q21.

A 200 turns circular coil having an area 0.12 m^2 carries a current of 0.50 A. It is placed in a magnetic field of 0.050 T oriented at 30° to the plane of the loop. What torque acts on the coil?

- A) 0.52 N·m
- B) 0.25 N·m
- C) 2.5 N·m
- D) 5.2 N·m

E) 25 N·m

Sec# Magnetic Fields - Torque on a Current Loop in a Uniform Magnetic Field

Grade# 50

[Stat# A_67_DIS_0.42_PBS_0.36_B_24_C_5_D_4_E_1_EXP_50_NUM_199](#)

Q22.

A proton is accelerated from rest through 500 V. It enters a magnetic field of 0.30 T oriented perpendicular to its direction of motion. Determine the radius of the path it follows.

- A) 1.1 cm
- B) 1.1 mm
- C) 11 cm
- D) 1.1 m
- E) 11 m

Sec# Magnetic Fields - Motion of a Charged Particle in a Magnetic Field

Grade# 50

[Stat# A_50_DIS_0.76_PBS_0.53_B_19_C_11_D_14_E_6_EXP_50_NUM_199](#)

Q23.

In Fig.5, a wire forms a quarter of a circle of radius $R = 3.14$ m and two straight segments of length 5.5 m. The wire carries a current of 20.0 A. What is the magnitude and direction of magnetic field at the center.

- A) $1.00 \mu\text{T}$ into the page
- B) $1.00 \mu\text{T}$ out of the page
- C) $3.00 \mu\text{T}$ into the page
- D) $3.00 \mu\text{T}$ out of the page
- E) $1.00 \mu\text{T}$ to the right

Sec# Sources of the Magnetic Field - Biot-Savart Law

Grade# 50

[Stat# A_57_DIS_0.60_PBS_0.51_B_19_C_11_D_10_E_4_EXP_50_NUM_199](#)

Q24.

Three long straight wires are perpendicular to the page, and are placed at three corners of a square of edge length $a = 20$ cm, as shown in Fig. 6. Wires number 1, 2 and 3 each carries 1 A current out of the page. What is the direction of the net force on wire number 1 due to wires number 2 and 3?

- A) Towards point P
- B) Away from point P
- C) Towards wire number 2
- D) Away from wire number 2
- E) Towards wire number 3

Sec# Sources of the Magnetic Field - Magnetic Force Between Two Parallel Conductors

Grade# 50

[Stat# A_62_DIS_0.46_PBS_0.37_B_26_C_5_D_4_E_4_EXP_50_NUM_199](#)

Q25.

Fig. 7 shows a cross of a long cylindrical conductor of radius $R = 4.00$ cm carrying a uniform current of 100 A. What is the magnitude of the magnetic field at a point P at a distance 2 cm from the center of the wire ?

- A) 2.5×10^{-4} T
- B) 4.5×10^{-4} T
- C) 3.2×10^{-4} T
- D) 1.7×10^{-4} T
- E) Zero T

Sec# Sources of the Magnetic Field - Biot-Savart Law

Grade# 50

[Stat# A_54_DIS_0.60_PBS_0.48_B_7_C_8_D_13_E_19_EXP_50_NUM_199](#)

Q26.

A single loop consists of two concentric semicircles and carries current $i = 25.5$ mA, as shown in Fig. 8. If $a = 30.0$ cm and $b = 40.0$ cm, what is the magnitude and direction of the loop's magnetic dipole moment ?

- A) $0.01 \text{ A}\cdot\text{m}^2$ out of the page
- B) $0.01 \text{ A}\cdot\text{m}^2$ into the page
- C) $1.01 \text{ A}\cdot\text{m}^2$ into the page
- D) $1.01 \text{ A}\cdot\text{m}^2$ out of the page
- E) $0.001 \text{ A}\cdot\text{m}^2$ into the page

Sec# Sources of the Magnetic Field - Biot-Savart Law

Grade# 50

[Stat# A_44_DIS_0.50_PBS_0.42_B_19_C_8_D_23_E_6_EXP_50_NUM_199](#)

Q27.

The circuit is located in a region containing a magnetic field directed perpendicular into the page, as shown in Fig. 9. The induced current in the circuit is 0.45 A. At what rate is the magnitude of the magnetic field decreasing or increasing?

- A) 0.30 T/s, decreasing
- B) 0.30 T/s, increasing
- C) 0.12 T/s, increasing
- D) 0.12 T/s, decreasing
- E) 0

Sec# Faraday's Law - Faraday's Law of Induction

Grade# 50

[Stat# A_42_DIS_0.44_PBS_0.34_B_19_C_12_D_14_E_13_EXP_50_NUM_199](#)

Q28.

In Dhahran, the total magnetic field of the Earth has been measured to be 0.54×10^{-4} T and it points downward at an angle of 53° below the horizontal. What is the magnetic flux through 1.0 m^2 of ground in Dhahran due to the Earth magnetic field?

- A) 0.43×10^{-4} Wb
- B) 0.32×10^{-4} Wb
- C) 0.54×10^{-4} Wb
- D) 0.11×10^{-4} Wb
- E) Zero

Sec# Faraday's Law - Faraday's Law of Induction

Grade# 50

[Stat# A_36_DIS_0.26_PBS_0.23_B_47_C_10_D_2_E_6_EXP_50_NUM_199](#)

Q29.

A rod (length $L=10$ cm) moves on two horizontal frictionless conducting rails , as shown in Fig. 10. The magnetic field in the region is directed perpendicular to the plane of the rails and is uniform and constant. If a constant force of 0.60 N moves the bar at a constant velocity of 2.0 m/s, what is the current through the 12Ω resistor?

- A) 0.32 A
- B) 0.13 A
- C) 0.52 A
- D) 0.25 A
- E) 0.14 A

Sec# Faraday's Law - Faraday's Law of Induction

Grade# 50

[Stat# A_51_DIS_0.54_PBS_0.49_B_11_C_12_D_13_E_12_EXP_50_NUM_199](#)

Q30.

A circular loop of radius 45 cm is moved with a speed of 10 m/s inside a region containing a constant magnetic field of magnitude 0.50 T. If the direction of the magnetic field is perpendicular to plane of the circular loop, what is the magnitude of the induced emf in the circular loop?

- A) Zero
- B) 3.18 V
- C) 9.21 V
- D) 1.20 V
- E) 0.85 V

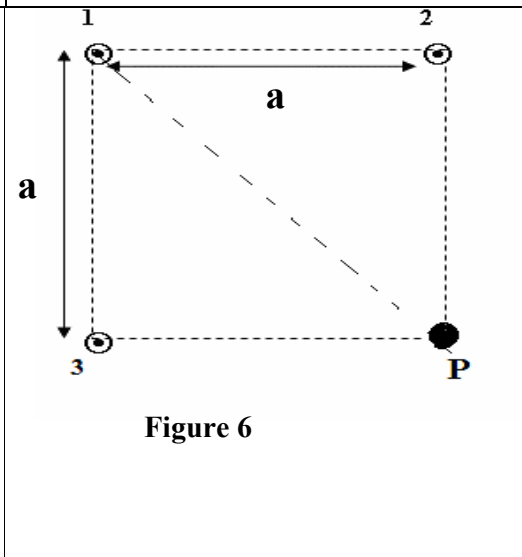
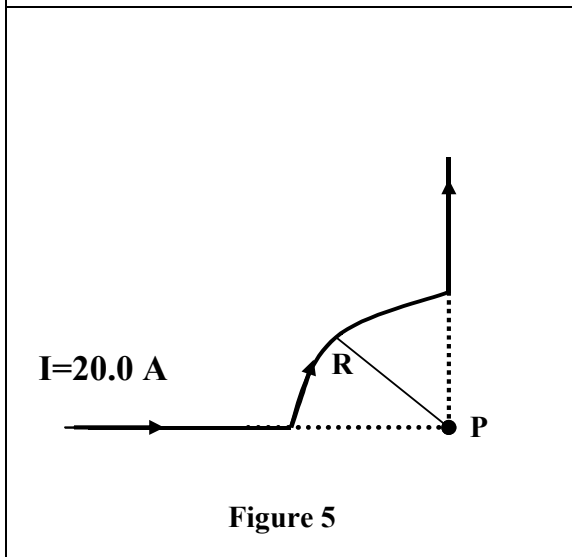
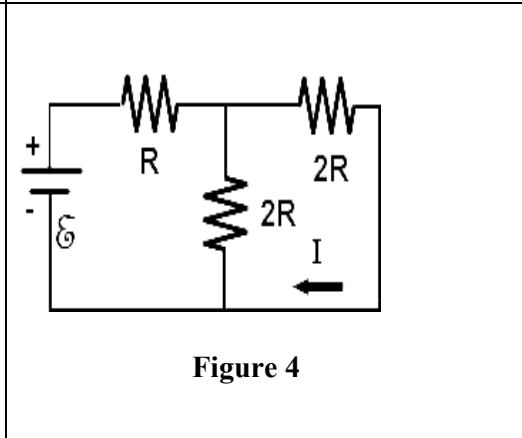
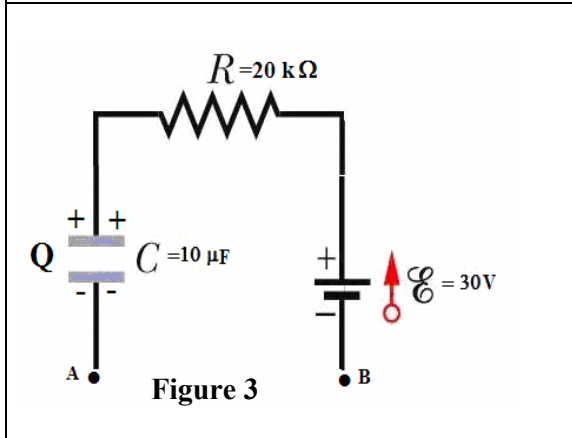
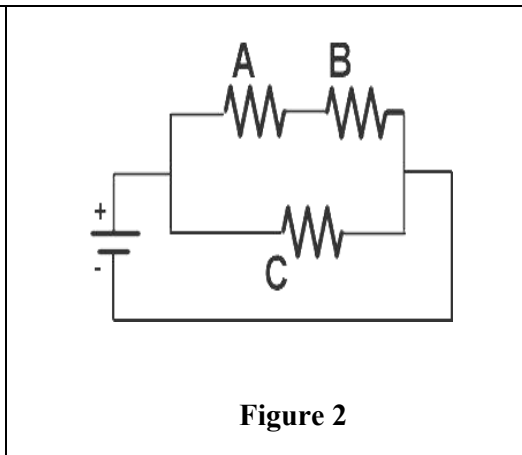
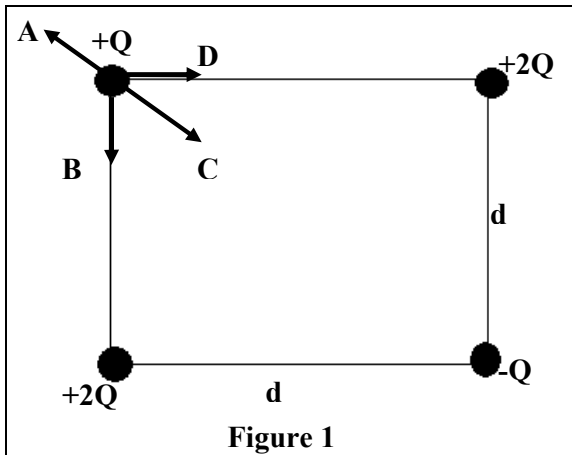
Sec# Faraday's Law - Faraday's Law of Induction

Grade# 50

[Stat# A_48_DIS_0.28_PBS_0.22_B_26_C_7_D_15_E_4_EXP_50_NUM_199](#)

Test Expected Average = 50

[Test Actual Average = 52.5](#)



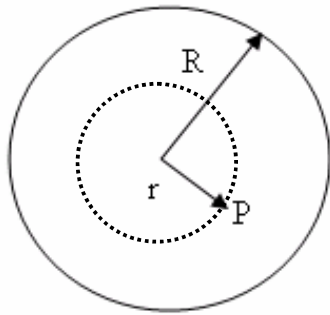


Figure 7

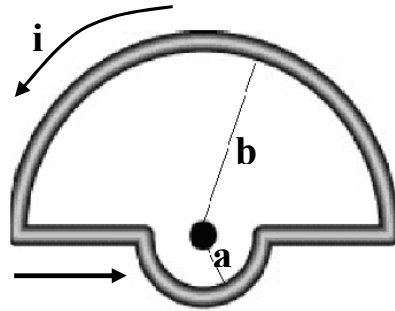


Figure 8

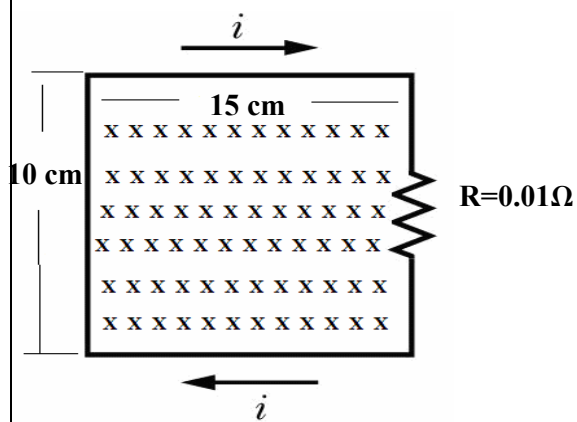


Figure 9

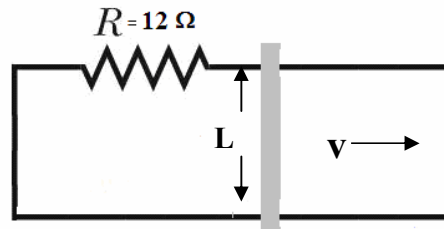


Figure 10