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

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E) 4.52×10^3 kJ

Sec# Temerature - 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 γ= 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 volumes 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 N·m^2/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 V between its plates. Each plate carries a surface charge density σ = 7.0 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 kΩ 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 x 10^{-3} F capacitance   is discharged through a 4 kΩ 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 μC and the potential difference $V_A - V_B$ = - 30 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 A and R = 12 Ω. 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 **i**+3.0 **j**) m/s and experiences a magnetic force of (15 **i**-10 **j**+8.0 **k**) N in a magnetic field B_y **j**+5.0 **k**. Then y- component of magnetic field B_y is :

A) + 4.0 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 μ T into the page
B) 1.00 μ T out of the page
C) 3.00 μ T into the page
D) 3.00 μ T out of the page
E) 1.00 μ 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 A.m^2 out of the page
B) 0.01 A.m^2 into the page
C) 1.01 A.m^2 into the page
D) 1.01 A.m^2 out of the page
E) 0.001 A.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 12 Ω 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
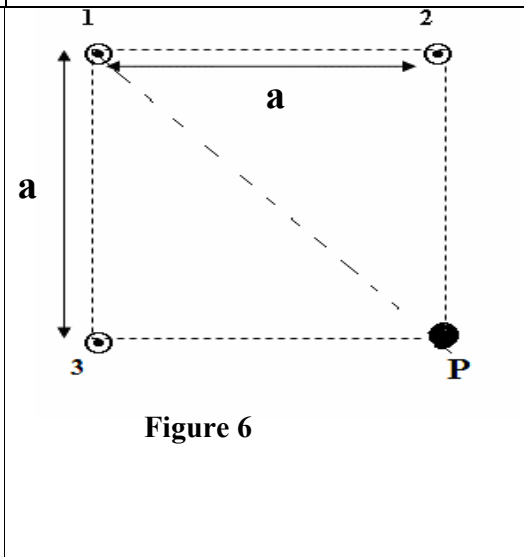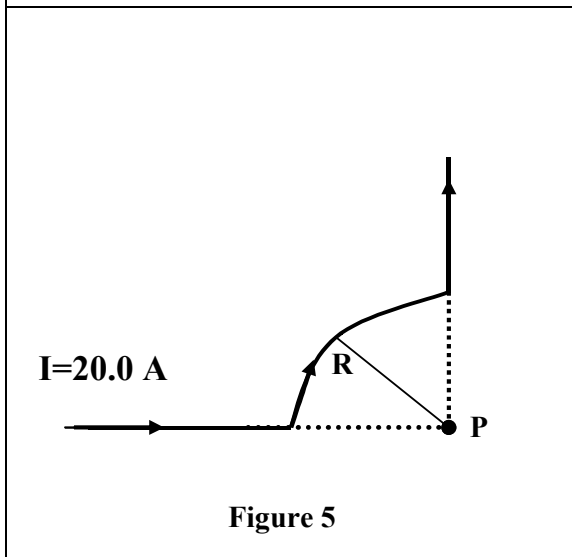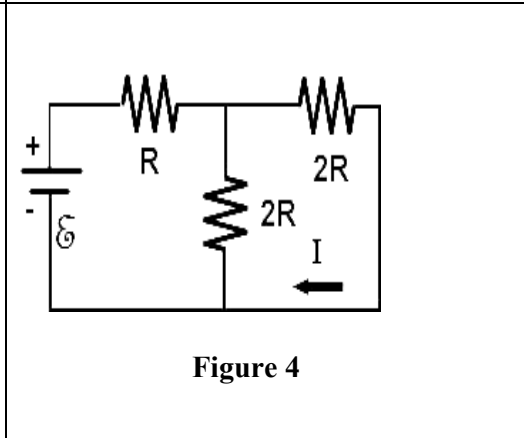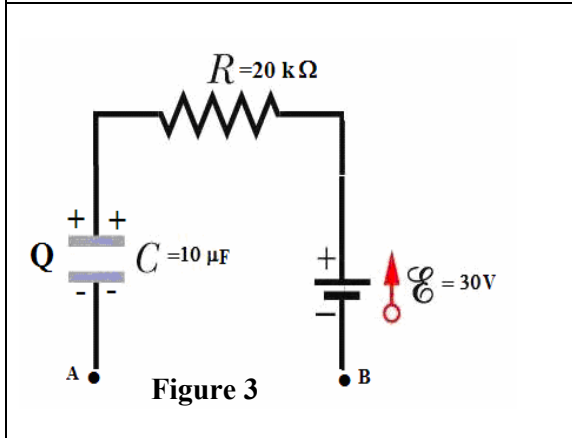Stat# A_48_DIS_0.28_PBS_0.22_B_26_C_7_D_15_E_4_EXP_50_NUM_199

Test Expected Average = 50
Test Actual Average = 52.5

Figure 1

Figure 2

Figure 3

Figure 4
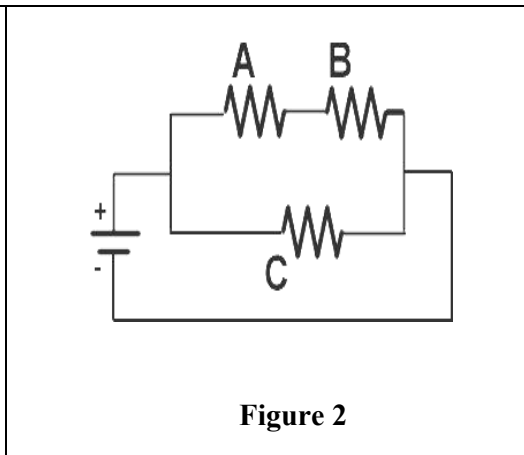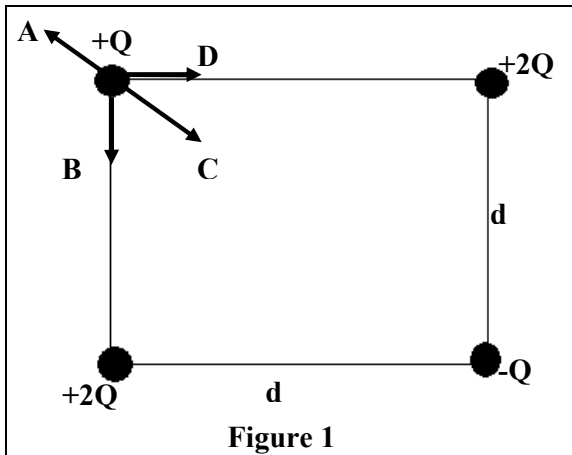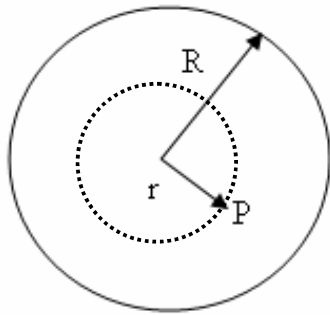
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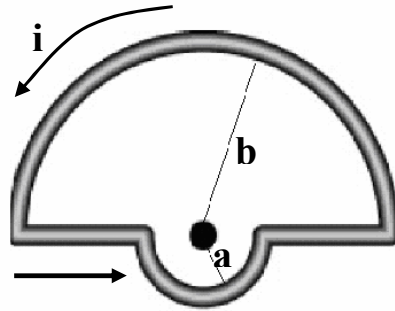
Figure 6

Figure 7

Figure 8

Figure 9

Figure 10