Q1.
A 1.40 m wire has a mass of 10.0 g and is under the tension of 100 N. The wire is fixed at both ends and set into oscillation. The frequency of the wave that produce three loop standing waves is:

A) 127 Hz
B) 364 Hz
C) 105 Hz
D) 56.0 Hz
E) 150 Hz

Stat# A_89_DIS_0.28_PBS_0.31_B_2_C_2_D_5_E_2_EXP_55_NUM_233

Q2.
The intensity of a certain sound wave is 6.0 W/m^2. If its sound level is raised by 30 decibels, the new intensity (in W/m^2) is:

A) 6.0×10^3
B) 60
C) 18
D) 6.0×10^2
E) 6.0×10^4

Stat# A_79_DIS_0.31_PBS_0.32_B_5_C_6_D_5_E_6_EXP_48_NUM_233

Q3.
Two moles of hydrogen gas at 27.00^{o}C is expanded through an isobaric process to double its original volume. The final RMS speed of the hydrogen molecules is:

(Molar mass of hydrogen = 2.020 g/mole)

A) 2721 m/s
B) 1920 m/s
C) 1851 m/s
D) 1361 m/s
E) 1.860×10^6 m/s

Stat# A_34_DIS_0.47_PBS_0.40_B_29_C_15_D_18_E_5_EXP_58_NUM_233

Q4.
The temperature of two moles of nitrogen (N_2) gas is raised from room temperature (27.0^{o}C) to 100 ^{o}C at constant pressure. The work done by the gas is:

A) 1.21 kJ
B) 4.26 kJ
C) 3.03 kJ

D) 1.81 kJ
E) 0.60 kJ

Stat# A_66_DIS_0.40_PBS_0.30_B_9_C_12_D_7_E_6_EXP_60_NUM_233

Q5.
A 100 g of water at 100 ^{o}C is poured into a lake whose temperature is 27.0 ^{o}C. Calculate the change in entropy of the lake.

A) 102 J/K
B) 191 J/K
C) –102 J/K
D) –89.0 J/K
E) 89.0 J/K

Stat# A_32_DIS_0.36_PBS_0.33_B_7_C_23_D_15_E_23_EXP_45_NUM_233

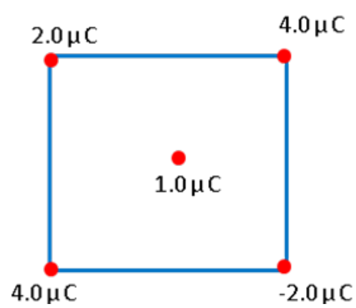
Q6.
A Carnot heat engine operates between two reservoirs at temperatures of 500 K and 300 K. If the engine extracts, 6.0 MJ/cycle find the heat rejected per cycle (in MJ).

A) 3.6
B) 4.5
C) 1.4
D) 7.1
E) 2.4

Stat# A_53_DIS_0.34_PBS_0.32_B_9_C_10_D_3_E_24_EXP_55_NUM_233

Q7.
Four charges are placed at the corners of a square of length 2.0 m as shown in **Figure 1**. The magnitude of the net force on the 1.0 μC charge at the center of the square is:

Fig#



A) 18 mN
B) 4.5 mN

C) 24 mN
D) 7.0 mN
E) 0.0 mN

Stat# A_63_DIS_0.45_PBS_0.35_B_14_C_6_D_4_E_12_EXP_60_NUM_233

Q8.
A charged particle has a mass of 10.0 x 10^{-4} kg. If it is held stationary by a downward 300 N/C electric field, the charge of the particle is:

A) – 3.27 x 10^{-5} C.
B) + 3.27 x 10^{-5} C.
C) – 1.50 x 10^{-5} C.
D) + 1.50 x 10^{-5} C.
E) – 5.00 x1 0^{-5} C.

Stat# A_72_DIS_0.45_PBS_0.37_B_21_C_2_D_2_E_3_EXP_60_NUM_233

Q9.
A charged point particle is placed at the center of a spherical Gaussian surface. The electric flux ϕ_E is changed if:

A) the point charge is moved to just outside the sphere
B) the sphere is replaced by a cube of the same volume
C) the sphere is replaced by a cube of smaller volume
D) the point charge is moved off center (but still inside the original sphere)
E) a second point charge is placed just outside the sphere

Stat# A_62_DIS_0.29_PBS_0.28_B_4_C_11_D_10_E_12_EXP_50_NUM_233

Q10.
Consider two conducting spheres A and B. Sphere A carries a charge of −2.0 μC and sphere B carries a charge of + 6.0 μC. The radius of sphere A is twice the radius of sphere B. The spheres are touched together and then separated. What is the final charge on sphere A?

A) 2.7 μC
B) 1.3 μC
C) 2.0 μC
D) 4.0 μC
E) 1.9 μC

Stat# A_29_DIS_0.21_PBS_0.20_B_12_C_39_D_14_E_6_EXP_40_NUM_233

Q11.

Over a certain region of space, the electric potential is give by: $V(x,y) = x^2+y^2-5xy$ where V is in volts and x and y are in meters. The magnitude of the electric field at the point P (1.0 m, 2.0 m) is:

A) 8.1 N/C
B) 4.5 N/C
C) 2.4 N/C
D) 3.0 N/C
E) 0.5 N/C

Stat# A_51_DIS_0.52_PBS_0.42_B_16_C_9_D_15_E_7_EXP_70_NUM_233

Q12.
Two parallel plate capacitors each with a capacitance of 2.0 μF are connected in parallel to an 18 V battery. One of the capacitors is then squeezed so that its plate separation is halved. Because of the squeezing, the additional charge transferred to the capacitors by the battery is:

A) 36 μC
B) 45 μC
C) 24 μC
D) 70 μC
E) 12 μC

Stat# A_70_DIS_0.43_PBS_0.37_B_7_C_8_D_8_E_7_EXP_45_NUM_233

Q13.
A wire having a resistance of 2 Ω is stretched so that its length becomes two times its original length. Its volume remains unchanged. The resistance of the stretched wire is

A) 8 Ω
B) 4 Ω
C) 2 Ω
D) 6 Ω
E) 1 Ω

Stat# A_21_DIS_0.52_PBS_0.54_B_36_C_30_D_3_E_11_EXP_60_NUM_233

Q14.
The resistance of resistor 1 is twice the resistance of resistor 2. The two are connected in series and a potential difference is maintained across the combination. Then:

A) the potential difference across resistor 1 is twice that across resistor 2
B) the current in resistor 1 is twice that in resistor 2
C) the potential difference across resistor 1 is half that across resistor 2
D) the current in resistor 1 is half that in resistor 2
E) the potential difference across resistor 1 is 4 times that across resistor 2

Stat# A_56_DIS_0.43_PBS_0.38_B_9_C_16_D_15_E_4_EXP_60_NUM_233

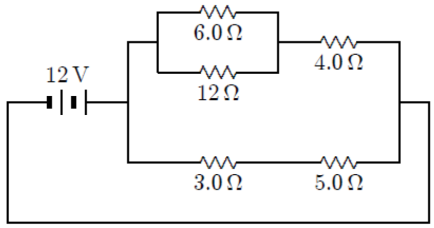
Q15.
A battery with an emf of 24 V is connected to a 6.0 Ω resistor. As a result, a current of 3.0 A flows through the resistor. What is the potential difference that appears at the terminals of the battery:

A) 18 V
B) 6.0 V
C) 12 V
D) zero
E) 24 V

Stat# A_30_DIS_0.28_PBS_0.26_B_46_C_5_D_5_E_14_EXP_45_NUM_233

Q16.
The current in the 4.0 Ω resistor in the circuit shown in **Figure 2** is :

Fig#

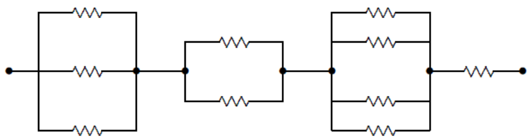


A) 1.5 A
B) 0.67 A
C) 0.42 A
D) 2.4 A
E) 3.0 A

Stat# A_58_DIS_0.69_PBS_0.48_B_7_C_1_D_5_E_30_EXP_45_NUM_233

Q17.
Each of the resistors in the diagram of **Figure 3** has a resistance of 12 Ω. The potential difference between points *a* and *b* is 10 V. What is the power dissipated in the entire circuit?

Fig#



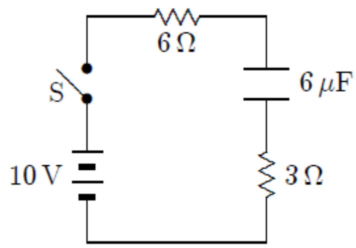
A) 4.0 W

B) 25 W
C) 33 W
D) 10 W
E) 20 W

Stat# A_67_DIS_0.62_PBS_0.48_B_8_C_6_D_10_E_9_EXP_50_NUM_233

Q18.
In the circuit shown in **Figure 4**, the capacitor is initially uncharged. At time t = 0, switch S is closed. If τ denotes the time constant, the approximate current through the 3 Ω resistor when t = $\tau/10$ is:

Fig#



A) 1.0 A
B) 1.5 A
C) 0.75 A
D) 0.38 A
E) 2.1 A

Stat# A_28_DIS_0.45_PBS_0.44_B_17_C_18_D_21_E_16_EXP_55_NUM_233

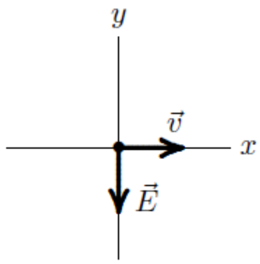
Q19.
At one instant an electron is moving in the *xy* plane, the components of its velocity being $v_x = 5.0 \times 10^5$ m/s and $v_y = 3.0 \times 10^5$ m/s. A magnetic field of 0.80 T is in the positive *x* direction. At that instant the magnetic force on the electron is

A) 3.8×10^{-14} N along the positive z direction
B) 3.8×10^{-14} N along the negative z direction
C) 6.4×10^{-14} N along the positive z direction
D) 6.4×10^{-14} N along the negative z direction
E) zero

Stat# A_46_DIS_0.55_PBS_0.39_B_32_C_7_D_9_E_6_EXP_45_NUM_233

Q20.
An electron is traveling in the positive *x* direction. A uniform electric field E is in the negative *y* direction as shown in **Figure 5**. The magnetic field that will make the electron move in a straight line has a direction

Fig#

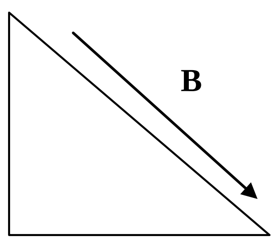


A) into the page
B) in the negative *y* direction
C) in the positive *y* direction
D) out of the page
E) in the negative *x* direction

Stat# A_40_DIS_0.40_PBS_0.27_B_7_C_15_D_33_E_4_EXP_55_NUM_233

Q21.
A loop of wire carrying a current of 2.0 A is in the shape of a right angled triangle with two equal sides, each 15 cm long as shown in **Figure 6**. A 0.70 T uniform magnetic field is parallel to the hypotenuse. The magnitude of the net magnetic force on the loop is:

Fig#



A) zero
B) 0.20 N
C) 0.30 N
D) 0.41 N
E) 0.51 N

Stat# A_43_DIS_0.33_PBS_0.29_B_11_C_33_D_9_E_5_EXP_60_NUM_233

Q22.
A loop of current-carrying wire has a magnetic dipole moment of 5.0×10^{-4} A·m^2. The magnetic moment initially is aligned with a 0.50-T magnetic field. Calculate the work done by an external agent to rotate the loop so its dipole moment is perpendicular to the field and hold it in that orientation.

A) 2.5×10^{-4} J

B) -2.5×10^{-4} J
C) 1.0×10^{-3} J
D) -1.0×10^{-3} J
E) zero

Stat# A_43_DIS_0.52_PBS_0.38_B_21_C_8_D_7_E_21_EXP_55_NUM_233

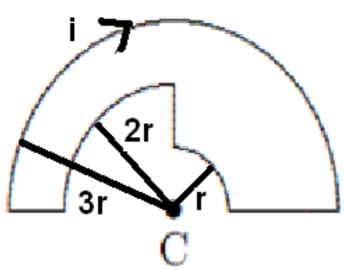
Q23.
An electron moves along a horizontal circle in a region of uniform magnetic field of magnitude 4.0 mT that is directed out of the page. It experiences a magnetic force of magnitude 3.2 x 10^{-15} N. Calculate the radius of the circular path.

A) 7.1 mm
B) 2.5 mm
C) 5.3 mm
D) 1.3 mm
E) 8.5 mm

Stat# A_58_DIS_0.72_PBS_0.54_B_11_C_11_D_12_E_8_EXP_60_NUM_233

Q24.
Figure 7 shows a wire consisting of concentric circular arcs of radii r, 2r and 3r, where r = 1.0 cm. The wire carries a current i = 1.0 A. Calculate the magnetic field at point C.

Fig#

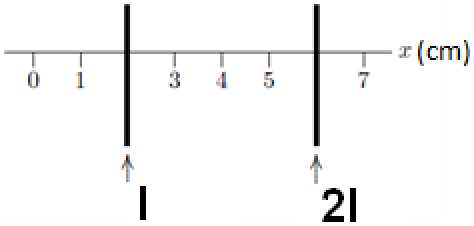


A) 1.3 x 10^{-5} T out of the page
B) 1.3 x 10^{-5} T into the page
C) 2.5 x 10^{-5} T out of the page
D) 2.5 x 10^{-5} T into the page
E) 3.4 x 10^{-4} T into the page

Stat# A_39_DIS_0.48_PBS_0.37_B_16_C_15_D_14_E_15_EXP_55_NUM_233

Q25.
Two long straight current-carrying parallel wires cross the *x* axis and carry currents I and 2I in the same direction as shown in **Figure 8**. At what value of *x* is the net magnetic field zero?

Fig#



A) 3.3 cm
B) 2.1 cm
C) 1.6 cm
D) 4.2 cm
E) 7.3 cm

Stat# A_56_DIS_0.41_PBS_0.31_B_18_C_8_D_12_E_6_EXP_45_NUM_233

Q26.
Two parallel long wires carry the same current and repel each other with a force F per unit length. If the current in each wire is doubled and the wire separation is tripled, the force per unit length becomes:

A) 4F/3
B) 4F/9
C) 2F/3
D) 2F/9
E) 6F

Stat# A_56_DIS_0.66_PBS_0.52_B_11_C_17_D_10_E_6_EXP_60_NUM_233

Q27.
Two long straight wires enter a room through a door. One carries a current of 3.0 A into the room while the other carries a current of 5.0 A out of the room. The magnitude of the path integral $\oint B\,ds$ around the door frame is:

A) 2.5×10^{-6} T · m
B) 3.8×10^{-6} T · m
C) 6.3×10^{-6} T · m
D) 1.0×10^{-5} T · m
E) zero

Stat# A_60_DIS_0.40_PBS_0.34_B_11_C_5_D_11_E_14_EXP_50_NUM_233

Q28.
The normal to a certain plane with an area of 1.0-m^2 makes an angle of 60° with a uniform magnetic field. The magnetic flux through this plane is the same as the flux through a second plane whose area is perpendicular to the magnetic field. The area of the second plane is:

A) 0.50 m^2
B) 1.2 m^2
C) 0.86 m^2
D) 2.0 m^2
E) 1.0 m^2

Sec# Induction and Inductance - Faraday's Law of Induction
Grade# 50
Stat# A_49_DIS_0.41_PBS_0.35_B_4_C_30_D_6_E_10_EXP_50_NUM_233

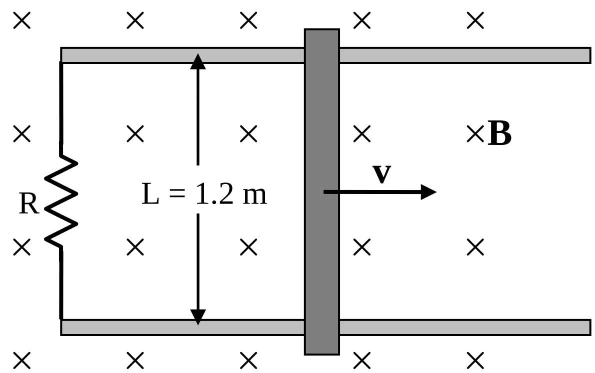
Q29.
A wire loop of radius 10 cm has resistance 2.0 Ω. The plane of the loop is perpendicular to a uniform magnetic field that is increasing at a rate of 0.10 T/s. Find the magnitude of the induced current in the loop.

A) 1.6 mA
B) zero
C) 3.1 mA
D) 6.4 mA
E) 13 mA

Stat# A_48_DIS_0.55_PBS_0.46_B_16_C_20_D_11_E_5_EXP_60_NUM_233

Q30.
Figure 9 shows a bar being moved to the right on two parallel rails at a constant speed of 3.0 m/s in a uniform magnetic field of 0.50 T directed into the page. If the induced current is 2.5 A, find the power dissipated in the resistor? (Neglect the mass of the bar, friction, and the resistance of the bar and rails).

Fig#



A) 4.5 W.
B) 1.2 W.
C) 1.9 W.

D) 2.7 W.
E) 3.8 W.

Stat# A_63_DIS_0.69_PBS_0.50_B_6_C_8_D_8_E_15_EXP_55_NUM_233