Q1.

A string fixed at both ends is oscillating in a standing wave pattern with four loops. The time for a particle to go from maximum upward displacement to maximum downward displacement is 0.025 s. What is the fundamental frequency of the string?

A) 5.0 Hz
B) 10 Hz
C) 2.5 Hz
D) 7.5 Hz
E) 15 Hz

Ans:

$$n = 4$$

$$\frac{\lambda}{4} = 0.25\ m$$

$$\Rightarrow \lambda = 1.00\ m$$

$$\frac{\mathrm{T}}{2} = 0.025\ \mathrm{s} \ \Rightarrow \mathrm{T} = 0.050\ \mathrm{s}$$

$$\mathrm{f}_4 = \frac{1}{\mathrm{T}} = \frac{1}{0.05} = 20\ \mathrm{Hz}$$

$$\mathrm{f}_4 = 4\mathrm{f}_1 \Rightarrow \mathrm{f}_1 = \frac{\mathrm{f}_4}{4} = \frac{20}{4} = 5\ \mathrm{Hz}$$

Q2.

A sound wave travelling in a medium is given by

$s(x,t) = 6.00\times10^{-6}\cos[0.900\,x - 315\,t]$ (SI units)

If the bulk modulus of the medium is 1.40×10^6 N/m^2, what is the pressure amplitude of the wave?

A) 7.56 Pa
B) 10.0 Pa
C) 4.62 Pa
D) 5.00 Pa
E) 9.24 Pa

Ans:

$$\mathrm{v} = \frac{\omega}{\mathrm{k}} = \frac{3.15}{0.9} = 350\ \mathrm{m/s}$$

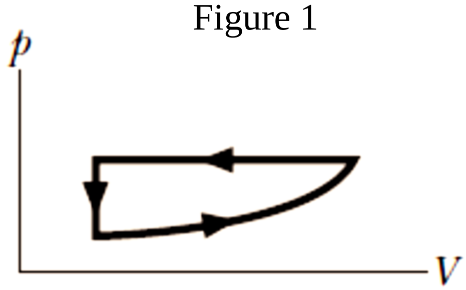
$$\mathrm{v} = \sqrt{\frac{\mathrm{B}}{\rho}} \Rightarrow \rho = \frac{\mathrm{B}}{\mathrm{v}^2} = 11.4\ \mathrm{kg/m^3}$$

$$\Delta p_m = \rho\, \mathrm{v}\, \omega\, S_m = 11.4 \times 350 \times 315 \times 6 \times 10^{-6} = 7.56\ \mathrm{Pa}$$

Q3.

For one complete cycle as shown in the *p*-*V* diagram in **FIGURE 1**, the heat (Q) and work (W) are

Figure 1



A) Q < 0 , W < 0
B) Q < 0 , W > 0
C) Q > 0 , W < 0
D) Q > 0 , W > 0
E) Q = 0 , W < 0

Ans:

$$\Delta E_{\cancel{int}}^{\;0} = Q - W$$

$\Rightarrow\ \mathrm{Q = W\ and\ W < 0}$

Q4.

An ideal gas is compressed at a constant pressure of 25.0 N/m^2 from a volume of 3.00 m^3 to a volume of 1.80 m^3. In the process, 75.0 J is lost by the gas as heat. What is the change in the internal energy of the gas?

A) – 45.0 J
B) – 105 J
C) + 105 J
D) + 45.0 J
E) + 75.0 J

Ans:

$$\mathrm{W = p\ \Delta V = \ 25 \times (1.8 - 3) = -30\ J}$$

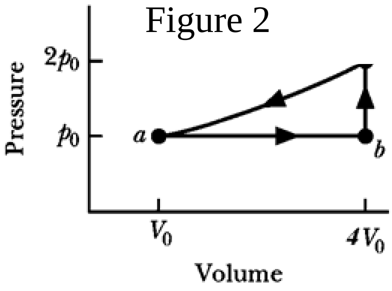
$$\mathrm{Q = -75\ J}$$

$$\mathrm{\Delta E_{int} = Q - W = \ -75 + 30 = -45\ J}$$

Q5.

One mole of an ideal monatomic gas is taken through the cycle shown in **FIGURE 2**. What is the change in the entropy of the gas for process $c \rightarrow a$?

Figure 2



A) – 37.4 J/K
B) + 37.4 J/K
C) – 14.4 J/K
D) + 14.4 J/K
E) + 20.2 J/K

Ans:

$$\Delta S_{ab} = \int n\frac{c_p dT}{T} = nc_p ln\left(\frac{T_b}{T_a}\right) = nc_p ln\left(\frac{V_b}{V_a}\right)$$

$$= c_p \cdot ln4$$

$$\Delta S_{bc} = nc_v ln\left(\frac{T_c}{T_a}\right) = nc_v ln\left(\frac{P_c}{P_b}\right) = nc_v ln2 = c_v ln2$$

$$\Delta S_{ac} = \Delta S_{ab} + \Delta S_{bc} = 2.5\ Rln4 + 1.5\ Rln2$$

$$= 28.80 + 8.64 = 37.44 \text{ J/K}$$

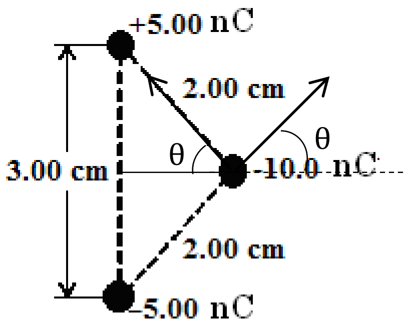
$$\Delta S_{ca} = -\Delta S_{ac} = -37.4 \text{ J/K}$$

Q6.

Three fixed point charges are arranged as shown in **FIGURE 3**. What is the net electrostatic force on the – 10.0 nC charge exerted by the other two charges?

Fig#

Figure 3



A) 1.69 mN, upward
B) 3.25 mN, downward
C) 3.25 mN, to the right
D) 3.25 mN, to the left
E) 8.63 mN, downward

Ans: *From the geometry, the net force must be upward*

$$F_{net} = 2F_i \cdot sin\theta$$

$$= \frac{2kqQ}{r^2} \cdot sin\theta = \frac{\cancel{2} \times 9 \times \cancel{10^9} \times 5 \times \cancel{10^{-9}} \times 10 \times 10^{-9}}{5 \times 10^{-4}} \times \frac{1.5}{\cancel{2}.0}$$

$$= 168.75 \times 10^{-5} \text{ N}$$

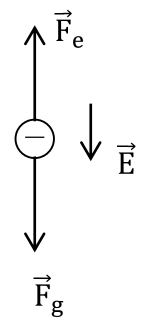
$$= 1.6875 \times 10^{-3} \text{ N}$$

$$= 1.69 \text{ mN}$$

Q7.

What electric field balances the weight of a particle of mass 6.4 g that has been charged to – 3.0 nC?

A) 2.1×10^7 N/C, downward
B) 2.4×10^6 N/C, upward
C) 4.5×10^6 N/C, upward
D) 6.4×10^6 N/C, downward
E) 3.3×10^7 N/C, downward



Ans:

$$F_e = F_g$$

$$qE = mg$$

$$E = \frac{mg}{q} = 2.1 \times 10^7 \text{ N/C}$$

Q8.

A hollow conducting sphere with an outer radius of 0.250 m and an inner radius of 0.200 m has a uniform surface charge density of + 6.37μC/m². A charge of – 0.500 μC is then introduced into the cavity inside the sphere. What is the new charge density on the outer surface of the sphere?

A) + 5.73 μC/m²
B) + 7.00 μC/m²
C) – 5.73 μC/m²
D) – 7.00 μC/m²
E) + 6.37 μC/m²

Ans:

$$q_{net} = +\sigma A_0 = +6.37 \times 10^{-6} \times 4\pi \times 0.25^2 = +5\ \mu C$$

$$q_{in} = +0.5\ \mu C$$

$$q_{out} = q_{net} - q_{in} = +5 - 0.5 = +4.5\ \mu C$$

$$\sigma_{out} = \frac{q_{out}}{A_0} = +\frac{4.5}{4\pi \times 0.25^2} = +5.73\ \mu\text{C/m}^2$$

Q9.

An infinite line of charge has a uniform linear charge density of + 2.00 × 10^{-8} C/m. Point A is a distance of 2.00 m from the line and point B is a distance of 3.00 m from the line. What is the magnitude of the potential difference between points A and B?

A) 146 V
B) 645 V
C) 59.8 V
D) 50.4 V
E) 103 V

Ans:

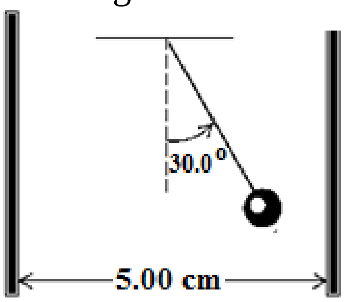
$$\Delta V = V_A - V_B = -\int_B^A E d_r = -\int_B^A \frac{2k\lambda}{r} dr = -2k\,\lambda \ln r|_A^B$$

$$= -2k\,\lambda \ln\left(\frac{r_B}{r_A}\right) = -2 \times 9 \times 10^9 \times 2 \times 10^{-8} \times ln\left(\frac{3}{2}\right) = -146\,V$$

Q10.

A small sphere, with mass 2.00 g and charge 8.90 nC, hangs by a string between two large parallel vertical plates that are 5.00 cm apart, as shown in **FIGURE 4**. The plates are insulating and have uniform surface charge densities + σ and – σ. What potential difference causes the string to be deflected by an angle of 30.0° from the vertical?

Figure 4



A) 6.36×10^4 V
B) 3.83×10^4 V
C) 2.63×10^4 V
D) 2.01×10^4 V
E) 7.13×10^4 V

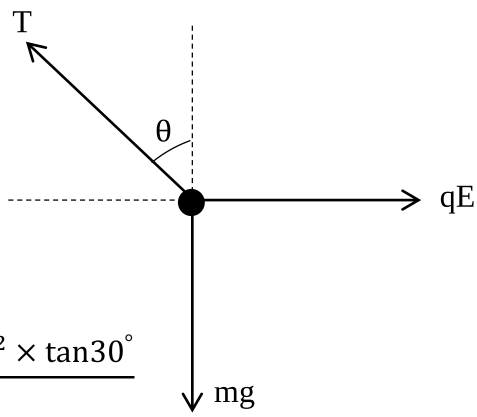
Ans:

$$T\cos\theta = mg$$

$$T\sin\theta = qE$$

$$\frac{qE}{mg} = \tan\theta$$

$$E = \frac{mg\tan\theta}{q}$$



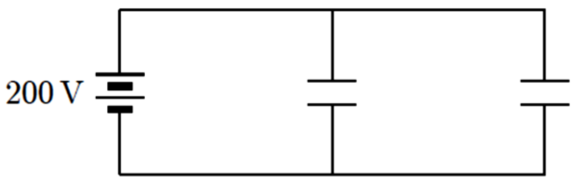
$$\Delta V = \frac{mg\,d\tan\theta}{q} = \frac{2 \times 10^{-3} \times 9.8 \times 5 \times 10^{-2} \times \tan 30^{\circ}}{8.9 \times 10^{-9}}$$

$$= 6.36 \times 10^4\ V$$

Q11.

To store a total energy of 0.0500 J in the two identical capacitors shown in **FIGURE 5**, each should have a capacitance of

Figure 5



A) 1.25 μF
B) 2.50 μF
C) 5.00 μF
D) 3.75 μF
E) 6.00 μF

Ans:

$$C_{eq} = 2\ C$$

$$U = \frac{1}{2} C_{eq} V^2 = CV^2$$

$$C = \frac{U}{V^2} = \frac{0.05}{40000} = 1.25\ \mu F$$

Q12.

A cylindrical conducting wire has resistance *R*. It is reformed to twice its original length with no change of volume. Its new resistance is

A) 4*R*
B) *R*
C) 2*R*
D) 8*R*
E) *R*/2

Ans:

$$A_i L_i = A_f L_f$$

$$A_f \cdot 2\cancel{L_i} = A_i \cdot \cancel{L_i} \Rightarrow A_f = \frac{A_i}{2}$$

$$R_f = \frac{\rho\ L_f}{A_f} = \frac{\rho \times 2L_i}{\frac{A_i}{2}} = 4\ \frac{\rho L_i}{A_i} = 4\ R$$

Q13.

Two resistors of resistances R and $2R$ are connected in parallel to an ideal battery. If the power dissipated in resistor R is P, then the power dissipated in resistor $2R$ is

A) $P/2$
B) $2P$
C) P
D) $P/4$
E) $4P$

Ans:

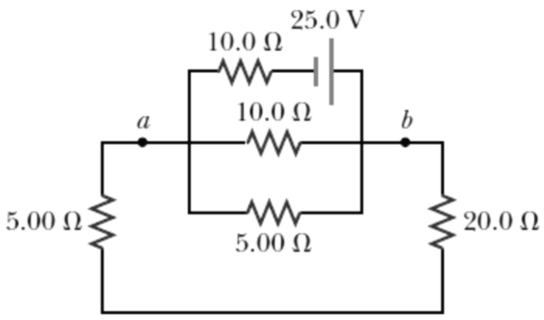
$$P = \frac{V^2}{R}$$

$$P_x = \frac{V^2}{2R} = \frac{1}{2} P$$

Q14.

Consider the circuit shown in **FIGURE 6**. Find the potential difference $V_a - V_b$.

Figure 6



A) – 5.68 V
B) + 5.68 V
C) + 44.3 V
D) + 19.3 V
E) – 19.3 V

Ans:

$$\frac{1}{R_{eq}^*} = \frac{1}{25} + \frac{1}{5} + \frac{1}{10} = \frac{2 + 10 + 5}{50} = \frac{17}{50}$$

$$R_{eq}^* = \frac{50}{17} = 2.94\ \Omega$$

$$R_{eq} = 12.94\ \Omega$$

$$i_{Battery} = \frac{25}{R_{eq}} = 1.93\ \mathrm{A}$$

$$V_a - 10\, i_B + 25 = V_b$$

$$V_a - V_b = 10\, i_B - 25 = -5.68\ \mathrm{V}$$

Q15.

An emf source with $\mathscr{E}$ = 100 V, a resistor with resistance R = 90.0 Ω, and a capacitor with capacitance C = 5.00 μF are connected in series. As the capacitor charges, what is the charge on the capacitor when the current in the resistor is 0.800 A?

A) 140 μC
B) 360 μC
C) 500 μC
D) 110 μC
E) 230 μC

Ans:

$$q = q_m\left(1 - e^{-\frac{t}{\tau}}\right) = q_m - q_m e^{-\frac{t}{\tau}}$$

$$i = \frac{q_m}{\tau} e^{-\frac{t}{\tau}} \Rightarrow e^{-\frac{t}{\tau}} = \frac{i\tau}{q_m}$$

$$\Rightarrow q = q_m\left(1 - \frac{i\tau}{q_m}\right) = q_m - i\tau$$

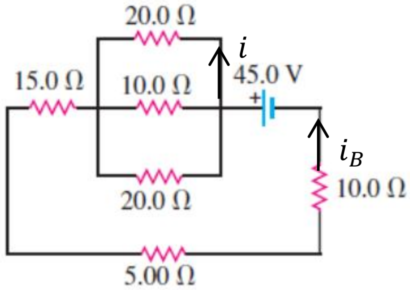
$$= \mathrm{C}\,\varepsilon - i\,\mathrm{RC} = \mathrm{C}\,(\varepsilon - i\mathrm{R})$$

$$= 5 \times (100 - 72) = 140\ \mu C$$

Q16.

For the circuit shown in **FIGURE 7**, what is the current in the upper 20.0 Ω resistor?

Figure 7



A) 0.321 A
B) 0.643 A
C) 0.429 A
D) 1.29 A
E) 0.571 A

Ans:

$$\frac{1}{R_p} = \frac{1}{20} + \frac{1}{10} + \frac{1}{20} = \frac{1+2+1}{20} = \frac{4}{20} \Rightarrow R_p = 5\ \Omega$$

$$R_{eq} = 5 + 15 + 5 + 10 = 35\ \Omega$$

$$\mathrm{i}_{\mathrm{Battery}} = \frac{45}{35} = \frac{9}{7}\ \mathrm{A};$$ Now we take the big outer loop:

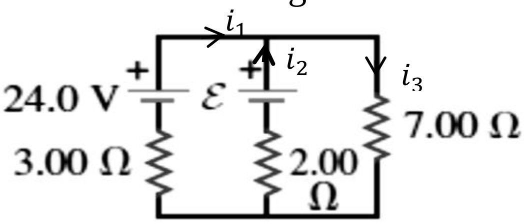
$$45 - 20i - 15i_B - 5i_B - 10i_B = 0 \Rightarrow 45 - 20i - 30i_B = 0 \Rightarrow 45 - 30i_B = 20i$$

$$\Rightarrow i = 2.25 - 1.5\, i_{\mathrm{B}} = 2.25 - \left(1.5 \times \frac{9}{7}\right) = 0.321\ \mathrm{A}$$

Q17.

In **FIGURE 8**, the two batteries are ideal. What must be the emf $\boldsymbol{\varepsilon}$ if the current in the 7.00 Ω resistor is 1.50 A?

Figure 7



A) 4.50 V
B) 8.60 V
C) 6.30 V
D) 1.20 V
E) 3.80 V

Ans:

Take the outer loop:

$$24 - 7i_3 - 3i_1 = 0$$

$$i_1 = \frac{24 - 7i_3}{3} = \frac{24 - (7 \times 1.5)}{3} = 4.5 \text{ A}$$

$$i_1 + i_2 = i_3$$

$$i_2 = i_3 - i_1 = 1.5 - 4.5 = -3.0\ A$$

Now, take the right loop:

$$\varepsilon - 7i_3 + 2i_2 = 0 \ \Rightarrow \varepsilon = 7i_3 - 2i_2 = (7 \times 1.5) - (2 \times 3) = 4.5 \text{ V}$$

Q18.

A charged particle moves through a region in which there is a uniform magnetic field. If the magnitude of the acceleration of the particle is one-fourth of the largest magnitude, what is the angle between the particle's velocity and the magnetic field?

A) 14.5°
B) 75.5°
C) 27.5°
D) 62.5°
E) 22.5°

Ans:

$$\mathrm{F} = \mathrm{q\ v\ B\ sin\Phi}$$

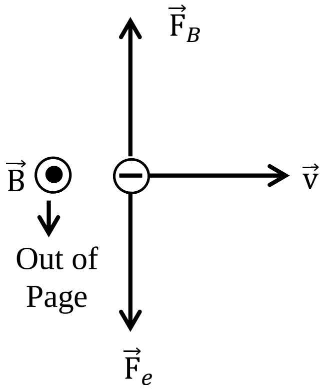
$$\mathrm{a} = \frac{\mathrm{F}}{\mathrm{m}} = \frac{\mathrm{q\ v\ B\ sin\Phi}}{\mathrm{m}} \Rightarrow a_{max} = \frac{\mathrm{q\ v\ B}}{\mathrm{m}}$$

$$\mathrm{a} = \frac{a_{max}}{4}$$

$$\frac{\mathrm{a_{max}}}{4} = \frac{\cancel{\mathrm{qVB}}}{4\cancel{\mathrm{m}}} = \frac{\cancel{\mathrm{qVB}}}{4\cancel{\mathrm{m}}}\ \mathrm{sin\Phi} \Longrightarrow \mathrm{sin\Phi} = \frac{1}{4} \Longrightarrow \Phi = \sin^{-1}\left(\frac{1}{4}\right) = 14.5°$$

Q19.

An electron moves with constant velocity $\vec{\mathbf{v}} = 3.0\times10^{6}\ \hat{\mathbf{i}}$ (m/s) through crossed electric and magnetic fields. If the electric field $\vec{\mathbf{E}} = 6.0\times10^{3}\ \hat{\mathbf{j}}$ (V/m), what is the magnetic field (in units mT)?



A) $+2.0\ \hat{\mathbf{k}}$
B) $-2.0\ \hat{\mathbf{k}}$
C) $-2.0\ \hat{\mathbf{j}}$
D) $+2.0\ \hat{\mathbf{j}}$
E) $-12\ \hat{\mathbf{i}}$

Ans:

$$\vec{F}_e = q\vec{E}$$

$$F_B = F_e$$

$$\cancel{e}vB = \cancel{e}E$$

$$B = \frac{E}{v} = \frac{6\times10^3}{3\times10^6} = 2.0\ \text{mT}$$

Q20.

What magnitude of uniform magnetic field, applied perpendicular to a beam of electrons moving at 1.6×10^{6} (m/s) is required to make the electrons travel in a circular orbit of radius 5.0 mm?

A) 1.8 mT
B) 4.6 mT
C) 2.4 mT
D) 5.5 mT
E) 1.2 mT

Ans:

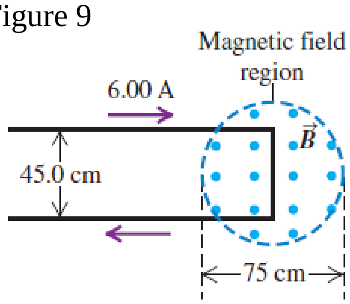
$$F_B = F_c$$

$$q\,v\,B = \frac{mv^2}{R} \Rightarrow B = \frac{mv}{qR} = 1.8\ \text{mT}$$

Q21.

A long wire carrying a 6.00 A current reverses direction by means of two right-angle bends, as shown in **FIGURE 9**. The part of the wire where the bend occurs is in a magnetic field of magnitude 0.70 T confined to a circular region of diameter 75 cm. What is the net magnetic force on the wire?

Figure 9

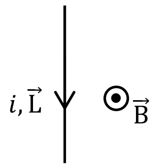


A) 1.9 N, to the left
B) 1.9 N, to the right
C) zero
D) 1.6 N, to the right
E) 1.6 N, to the left

Ans:

The forces on the upper and lower sides cancel

on the right side:



$(\vec{L} \times \vec{B})$ is to the left

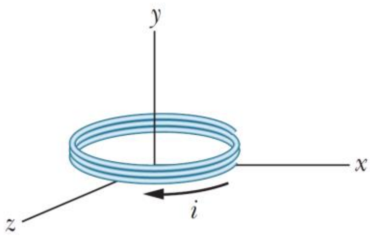
$F = iLB$

$= 6 \times 0.45 \times 0.7 = 1.9\ \mathrm{N}$

Q22.

The coil in **FIGURE 10** is parallel to the *xz* plane and carries a current of 2.0 A in the direction indicated. It has 3.0 turns and an area of $5.0\times10^{-4}\ \mathrm{m}^2$. The coil lies in a uniform magnetic field given by $\vec{\mathbf{B}} = 2.0\,\hat{\mathbf{i}} - 3.0\,\hat{\mathbf{j}}(\mathrm{mT}\ )$. What is the orientation energy of the coil?

Figure 10



A) – 9.0 μJ
B) + 9.0 μJ
C) – 6.0 μJ
D) + 6.0 μJ
E) Zero

Ans:

$$\vec{\mu} = NiA\,\hat{n} = 3 \times 2 \times 5 \times 10^{-4}(-\hat{j})$$

$$= -3 \times 10^{-3}\,\hat{j}\ (\mathrm{A \cdot m^2})$$

$$U_B = -\vec{\mu} \cdot \vec{B} = (3 \times 10^{-3}\,\hat{j}) \cdot (2\hat{i} - 3\hat{j}) \times 10^{-3}$$

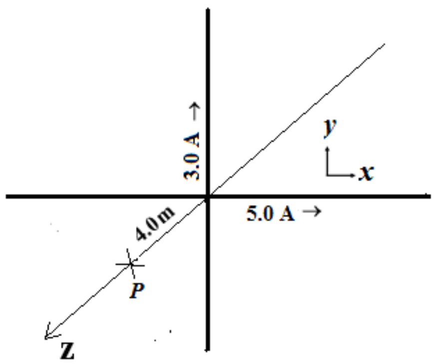
$$= -9\ \mu\mathrm{J}$$

Q23.

Two long straight wires cross each other perpendicularly without touching, as shown in **FIGURE 11**. Find the net magnetic field due to the two wires at point ***P***, which is along the positive *z* axis.

A) $+0.15\hat{\mathbf{i}} - 0.25\hat{\mathbf{j}}$ (μT)
B) $+0.15\hat{\mathbf{i}} + 0.25\hat{\mathbf{j}}$ (μT)
C) $-0.15\hat{\mathbf{i}} - 0.25\hat{\mathbf{j}}$ (μT)
D) $-0.15\hat{\mathbf{i}} + 0.25\hat{\mathbf{j}}$ (μT)
E) $+0.29\hat{\mathbf{k}}$ (μT)

Figure 11



Ans:

$$B = \frac{\mu_0 i}{2\pi r}$$

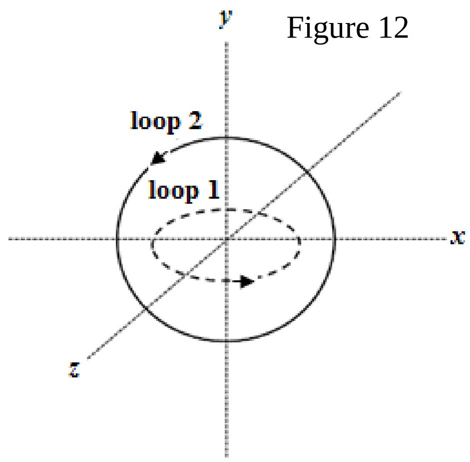
$$B_1 = \frac{\cancel{4}\cancel{\pi} \times 10^{-7} \times 5}{2\cancel{\pi} \times \cancel{4}} = 0.25\ \mu\text{T}\ \ (-y)$$

$$B_2 = \frac{\cancel{4}\pi \times 10^{-7} \times 3}{2\cancel{\pi} \times \cancel{4}} = 0.15\ \mu\text{T}\ \ (+x)$$

Q24.

Two concentric circular loops are placed with their planes perpendicular to each other, as shown in **FIGURE 12**. Loop 1 (in the *xz* plane) has radius 2.0 cm and carries a current of 4.0 A. Loop 2 (in the *xy* plane) has radius 3.0 cm and carries a current of 5.0 A. What is the magnitude of the magnetic field at the center of the loops?

Figure 12



A) 0.16 mT
B) 0.25 mT
C) 0.51 mT
D) 0.46 mT
E) 0.33 mT

Ans:

$$B = \frac{\mu_0\, i\, \Phi}{4\pi R} = \frac{\mu_0\, i\, \cancel{2\pi}}{\cancel{4}\pi R} = \frac{\mu_0\, i}{2R}$$

$$B_1 = \frac{4\pi \times 10^{-7} \times 4}{2 \times 0.02} = 0.125\ \text{mT}$$

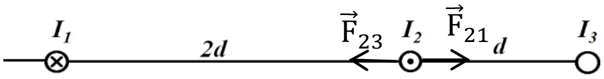
$$B_2 = \frac{4\pi \times 10^{-7} \times 5}{2 \times 0.03} = 0.104\ \text{mT}$$

$$B_{net} = \sqrt{B_1^2 + B_2^2} = 0.16\ \text{mT}$$

Q25.

Three parallel infinitely-long current-carrying wires are placed as shown, in cross section, in **FIGURE 13**. If net magnetic force on I_2 zero, what should be the current I_3?

Figure 13



A) $I_3 = I_1/2$, into the page
B) $I_3 = I_1/2$, out of the page
C) $I_3 = 2I_1$, out of the page
D) $I_3 = 2I_1$, into the page
E) No current can cancel the magnetic force on I_2.

Ans:

I_3 must be into the page for the two forces to canel.

$F_{21} = F_{23}$:

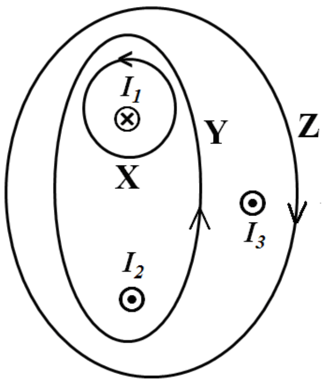
$$\frac{\cancel{\mu_0} I_1 \cancel{I_2}}{\cancel{2\pi} \times 2\cancel{d}} = \frac{\cancel{\mu_0} \cancel{I_2} I_3}{\cancel{2\pi} \cancel{d}}$$

$\Rightarrow I_3 = I_1/2$

Q26.

FIGURE 14 shows, in cross section, three long wires that carry currents perpendicular to the page. The currents have magnitudes $I_1 = 4.0$ A, $I_2 = 6.0$ A, and $I_3 = 3.0$ A. Three paths (X, Y, Z) are drawn. Rank these paths according to the value of the line integral $\oint \vec{\mathbf{B}} . d\vec{\mathbf{s}}$, greatest first.

Figure 14



A) Y, X, Z
B) Z, X, Y
C) Z, Y, X
D) Y, Z, X
E) X, Z, Y

Ans:

X: $-4\mu_0$

Y: $+6\mu_0 - 4\mu_0 = +2\mu_0$

Z: $+4\mu_0 - 6\mu_0 - 3\mu_0 = -5\mu_0$

Y, X, Z

Q27.

Inside an ideal solenoid carrying current, the magnetic field

A) is uniform.
B) is zero.
C) decreases with distance from the axis of the solenoid.
D) increases with distance from the axis of the solenoid.
E) is perpendicular to the axis of the solenoid.

Ans:

A

Q28.

A loop of area 4.0 cm^2 and resistance 5.0 μΩ is perpendicular to a uniform magnetic field of magnitude 15 μT. The magnitude of the field drops uniformly to zero in 3.0 ms. How much thermal energy is produced in the loop by the change in field?

A) 2.4 nJ
B) 8.0 nJ
C) 6.9 nJ
D) 3.7 nJ
E) 5.3 nJ

Ans:

$$\varepsilon_{ind} = \frac{d\Phi}{dt} = \frac{d(\mathrm{NBA})}{dt} = NA\,\frac{\Delta \mathrm{B}}{\Delta \mathrm{t}} = 1 \times 4 \times 10^{-4} \times \frac{\overset{5}{\cancel{15}} \times 10^{-6}}{\cancel{3} \times 10^{-3}}$$

$$= 20 \times 10^{-7}\mathrm{V} = 2 \times 10^{-6}\ \mathrm{V}$$

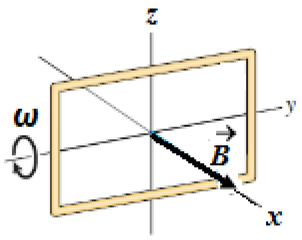
$$\mathrm{P} = \frac{\varepsilon^2}{\mathrm{R}} = \frac{4 \times 10^{-12}}{5 \times 10^{-6}} = 0.8 \times 10^{-6}\mathrm{W}$$

$$\mathrm{E} = \mathrm{P} \cdot \mathrm{t} = 0.8 \times 10^{-6} \times 3 \times 10^{-3} = 2.4 \times 10^{-9}\ \mathrm{J}$$

Q29.

A conducting loop, of area A, is parallel to the yz plane, as shown in **FIGURE 15**. It is placed in a uniform magnetic field $\vec{\mathbf{B}}$ and is rotated about the *y* axis with angular speed ω. What is the maximum induced emf in the loop if $A = 5.00\ \text{cm}^2$, $B = 0.350$ T and $\omega = 45.0$ rad/s?

Figure 15



A) 7.88 mV
B) 3.89 mV
C) 6.43 mV
D) 3.15 mV
E) 2.57 mV

$$\varepsilon = \frac{d\Phi}{dt} = \frac{d}{dt}(NBA\cos\theta)$$

$$= NBA\frac{d}{dt}(\cos\theta) = NBA\,\omega\,\sin\theta$$

$$\varepsilon_{max} = NBA\omega = BA\,\omega$$

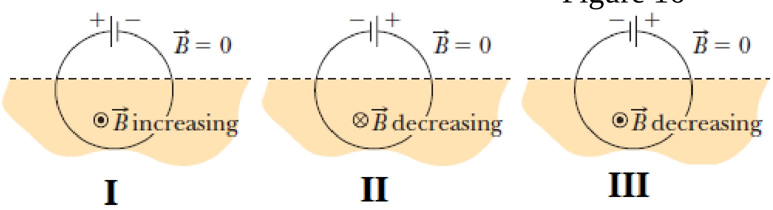
$$= 0.35 \times 5 \times 10^{-4} \times 45 = 7.88\ \text{mV}$$

Q30.

FIGURE 16 shows three situations in which a wire loop lies partially in a magnetic field, with a battery as part of the loop. The induced emf and the battery emf have the same direction in

Figure 16

A) II only
B) I only
C) III only
D) II and III
E) I and II



Ans:

A
