7) A ten-loop coil having an area of 0.23 m^2 is in a 0.047-T uniform magnetic field oriented so that the maximum flux goes through the coil. The coil is then rotated so that the flux through it goes to zero in 0.34 s. The magnitude of the average emf induced (in V) in the coil during the 0.34 s is:

A) 0.0032 B) 0.32 C) 0.032 D) 0.00 E) 1.0

---

8) The net magnetic flux through any closed surface is:

A) zero B) $1/\mu_o$ C) q/ε_o D) $1/\mu_o \varepsilon_o$ E) $\mu_o J$

---

9) A flat coil of wire, having 5 turns, has an inductance L. The inductance of another coil with a similar geometry having 20 turns is:

A) 4L B) L/4 C) L D) 16L E) L/16

---

10) At a certain instant the current flowing through a 5.0-H inductor is 3.0 A. If the energy in the inductor at this instant is increasing at a rate of 3.0 J/s, then the time rate of the current (in A/s) is:

A) 0.80 B) 0.20 C) 0.10 D) 0.40 E) 0

---

11) A circuit contains an ideal 60-V battery, a 51-H inductor having no resistance, a 21-Ω resistor, and a switch *S*, all in series. Initially, the switch is open. At time $t = 0$ s, the switch is closed. When the voltage across the resistor is equal to the voltage across the inductor, the current in the inductor (in A) is:

A) 1.7 B) 0.57 C) 1.1 D) 1.4 E) 0.86

---

12) A charged oil drop with a mass of 2×10^{-4} kg is held suspended by a downward electric field of 300 N/C. The charge on the drop (in C) is:

A) $+1.5 \times 10^{6}$ B) -6.5×10^{-6} C) $+6.5 \times 10^{-6}$ D) -1.5×10^{6} E) 0

---

13) A point particle with charge q is at the center of a closed surface in the form of a cube. The electric flux through any one face of the cube is:

A) $q/6\varepsilon_0$ B) $q/4\pi\varepsilon_0$ C) q/ε_0 D) $q/4\varepsilon_0$ E) $q/16\varepsilon_0$

---

14) If 500 J of work are required to carry a 40-C charge from one point to another, the potential difference (in V) between these two points is:

A) 20000 B) depends on the path taken C) 0.08 D) 0.16 E) 12.5

---

15) A parallel-plate capacitor has a plate area of 0.2 m^2 and a plate separation of 0.1 mm. To obtain an electric field of 2.0×10^6 V/m between the plates, the magnitude of the charge (in C) on each plate should be:

A) 1.4×10^{-5} B) 7.1×10^{-6} C) 3.5×10^{-6} D) 1.8×10^{-5} E) 8.9×10^{-5}

---

16) An electron has charge $-e$ and mass m_e. A proton has charge $+e$ and mass $1840m_e$. A "proton volt" is equal to:

A) 1 eV B) (1/1840) eV C) 1840 eV D) $\sqrt{1840}$ eV E) $(1/\sqrt{1840})$ eV

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16

$\varepsilon_0 = 8.85 \times 10^{-12}$ F/m , $\mu_0 = 4\pi \times 10^{-7}$ T.m/A

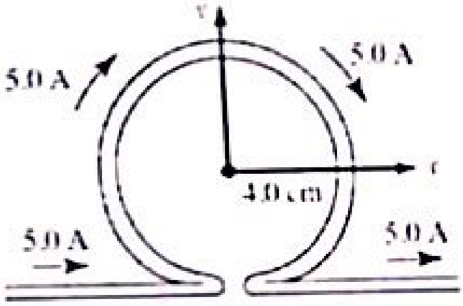
1) Two parallel long wires carry the same current and repel each other with a force F per unit length. If both these currents are doubled and the wire separation tripled, the force per unit length becomes:

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

2) Two long straight wires enter a room through a window 1.5 m high and 1.0 m wide. One carries a current of 3.0 A into the room while the other carries a current of 5.0 A out. The magnitude of the path integral $\oint \vec{B} \cdot d\vec{s}$ (in 10^{-6} T·m) around the window frame is:

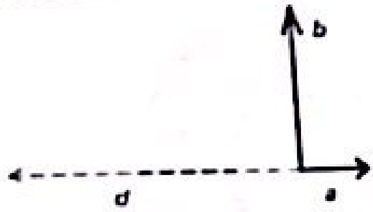
A) 6.3 B) 3.8 C) 2.5 D) 0.10 E) 0.0

3) As shown in the figure, a wire is bent into the shape of a tightly closed omega (Ω), with a circular loop of radius 4.0 cm and two long straight sections. The loop is in the *xy*-plane, with the center at the origin. The straight sections are parallel to the *x*-axis. The wire carries a 5.0-A current, as shown. The magnitude of the magnetic field (in μT) at the center of the loop is:



A) 54 B) 40 C) 25 D) 80 E) 104

4) The figure shows the cross-section of a hollow cylinder of inner radius *a* = 5.0 cm and outer radius *b* = 7.0 cm. A uniform current density of 1.0 A/ cm^2 flows through the cylinder parallel to its axis. The magnitude of the magnetic field (in 10^{-4} T) at a distance of *d* = 10 cm from the axis of the cylinder is:



A) 0.00 B) 0.50 C) 2.5 D) 4.5 E) 1.5

5) The normal to a certain 1.0 m^2 area makes an angle of 60° with a uniform magnetic field. The magnetic flux through this area is the same as the flux through a second area that is perpendicular to the same magnetic field if the second area (in m^2) is:

A) 2.0 B) 0.87 C) 1.0 D) 0.50 E) 1.2

6) The energy density (in J/m^3) in the magnetic field 25 cm from a long straight wire carrying a current of 12 A is:

A) 7.3×10^{-5} B) 0 C) 3.6×10^{-4} D) 1.2×10^{-4} E) 3.7×10^{-5}

* physics 2 final *
* fall 2019 *

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1) $\frac{F}{L} = f = \frac{\mu_0 I^2}{2\pi r} \Rightarrow \frac{\mu_0 (2I)^2}{2\pi * 3r} = \frac{4}{3} * \frac{\mu_0 I^2}{2\pi r} = \frac{4f}{3}$

---

2) $\int \vec{B} \cdot \vec{ds} = \mu_0 I_{ins} = \mu_0 (5-3) = 2 * \mu_0 = 2.5 * 10^{-6}\ T.M$

---

3) $\Sigma B = B_{loop} - B_{wire}$

$= \frac{\mu_0 I}{2r} - \frac{\mu_0 I}{2\pi r} = 78.54 * 10^{-6} - 25 * 10^{-6}$

$= 54 * 10^{-6}\ T.$

---

4)

$$B = \frac{\mu_0 I_{ins}}{2\pi r}$$

→ من عنا ١٠ عم رح نعامله كـ الـ infinit wire.

$\Rightarrow J = \frac{I}{A}$

$I_{ins} = J * A$

$= 10^4 * 7.54 * 10^{-3}$

$= 7.54 * 10^1 = 75.4\ A$

$\Rightarrow A = \pi b^2 - \pi a^2$

$= 7.54 * 10^{-3}\ m^2.$

$\Rightarrow B = \frac{4\pi * 10^{-7} * 75.4}{2\pi * 10 * 10^{-2}}$

$= 1.5 * 10^{-4}\ T.$

$\phi_1 = \phi_2 \Rightarrow B A_1 \cos\theta_1 = B A_2 \cos\theta_2$

$\Rightarrow 1 * \cos 60 = A_2 * \cos 0$

$= \frac{1}{2} = A_2 \Rightarrow A_2 = 0.5 m^2$

---

6) $u = \frac{B^2}{2\mu_0} \Rightarrow B = \frac{\mu_0 I}{2\pi r} = \frac{4\pi * 10^{-7} * 12}{2\pi * 25 10^{-2}} = 9.6 10^{-6}$

$\Rightarrow u = \frac{(9.6 10^{-6})^2}{2\mu_0} = 3.7 * 10^{-5} \ J/m^3.$

---

7) $\mathcal{E}_{ind} = -N \frac{\Delta\phi}{\Delta t} \Rightarrow$

$\Delta\phi = \phi_2 - \phi_1$ $\phi_2 = \text{Zero}!$

$= -\phi_1$

$= -(AB \cos 0) = 0.23 * 0.047 = -0.01081$

$\Rightarrow \mathcal{E}_{ind} = -\frac{10 * -0.01081}{0.34}$

$= 0.32 V$

Q9) $L_1 = \mu_0 n^2 A = 25 \mu_0 A$

$L_2 = \mu_0 n^2 A = 400 \mu_0 A = \boxed{16 L_1}$

---

8) The Net Magnetic flux through any ~~cstu~~ closed surface is equal to ZERO

---

9) ~~$L = 20 * \frac{\Delta\phi}{\Delta t} \Rightarrow 4 * 5 * \frac{\Delta\phi}{\Delta t} = 4L \Rightarrow L_2 = 4L$~~

---

10) $U = \frac{1}{2} L I^2 = 0.5 * 5 * 9 = 22.5 J \Rightarrow \frac{U}{\Delta t} = 3 J/s.$

$\Rightarrow \frac{22.5}{3} = \Delta t$

$\Delta t = 7.5 s.$

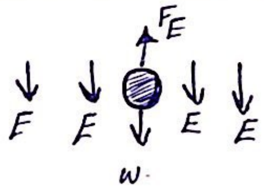
$\Rightarrow \frac{I}{\Delta t} = \frac{3}{7.5} = 0.4 A/s$

series => I is the same => V is divided.

$V_{eq} = V_R + V_L \Rightarrow 60 = V_R + V_L \Rightarrow V_R = V_L = 30V.$

$\Rightarrow I_L = I_R = \frac{30}{21} = 1.4 A$

12) $F_E = mg = 2 \times 10^{-4} \times 9.8 = 1.96 \times 10^{-3} N.$



$q = \frac{F_E}{E} = \frac{1.96 \times 10^{-3}}{300} = \ominus 6.5 \times 10^{-6} C$

القوة عكس المجال.

13) $\underset{\text{for 1 face}}{\Phi} = \frac{q_{ins}}{6 \epsilon_0}$

14) $W_{a \to b} = q V_{a \to b} \Rightarrow 500 = 40 \times V_{a \to b}.$

$V = 12.5 V$

15) $E = \frac{\sigma}{\epsilon_0} \Rightarrow 2 \times 10^6 = \frac{\sigma}{8.85 \times 10^{-12}} \Rightarrow \sigma = 1.77 \times 10^{-5}$

$\Rightarrow \sigma = \frac{q}{A} \Rightarrow 1.77 \times 10^{-5} = \frac{q}{0.2} \Rightarrow q = 3.5 \times 10^{-6} C.$

16) 1ev $\Rightarrow$ (PV = eV)

Sanfoor_Mohandes
2018
power_Unit
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