PHYS 2326 University Physics II – Class number

HOMEWORK- SET #1
CHAPTERS: 27,28,29

(DUE JULY 22, 2013)

Ch. 27 .==========

1. A rod of 2.0-m length and a square (2.0 mm × 2.0 mm) cross section is made of a material with a resistivity of $6.0 \times 10^{-8}\ \Omega \cdot m$. If a potential difference of 0.50 V is placed across the ends of the rod, at what rate is heat generated in the rod?

   a. 3.0 W
   b. 5.3 W
   c. 8.3 W
   d. 1.3 W
   e. 17 W

2. 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 leads?

   a. 58 J
   b. 46 J
   c. 32 J
   d. 72 J
   e. 16 J

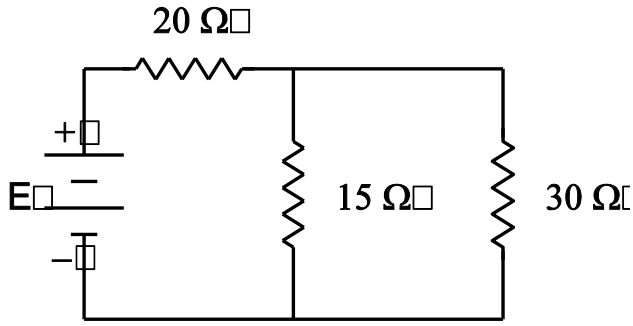
3. A rod (length = 80 cm) with a rectangular cross section (1.5 mm × 2.0 mm) has a resistance of 0.20 Ω. What is the resistivity of the material used to make the rod?

a. $6.0 \times 10^{-7}\ \Omega \cdot \text{m}$
b. $3.8 \times 10^{-7}\ \Omega \cdot \text{m}$
c. $7.5 \times 10^{-7}\ \Omega \cdot \text{m}$
d. $3.0 \times 10^{-7}\ \Omega \cdot \text{m}$
e. $4.8 \times 10^{-7}\ \Omega \cdot \text{m}$

4. The temperature coefficient of resistivity of iron is $5.0 \times 10^{-3}/\ ^\circ\text{C}$; that of carbon is $-0.50 \times 10^{-3}/\ ^\circ\text{C}$. When an iron wire and a carbon rod, each having the same 10 Ω resistance at $20\ ^\circ\text{C}$, are cooled from that temperature to $-80\ ^\circ\text{C}$, the new ratio of the resistance of the carbon rod to the resistance of the iron wire at the lower temperature is

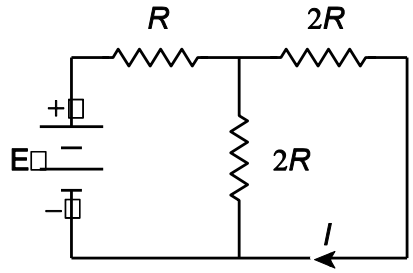
a. -0.10.
b. +1.9.
c. +2.1.
d. -10.
e. +10.

5. What is the current in the 15-Ω resistor when E = 9.0 V (E is ℰ) ?



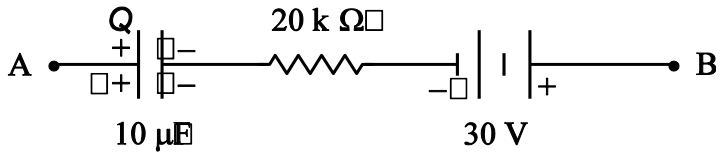
a. 0.20 A
b. 0.30 A
c. 0.10 A
d. 0.26 A
e. 0.60 A

6. Determine E (E is ℰ) when I = 0.50 A and R = 12 Ω.



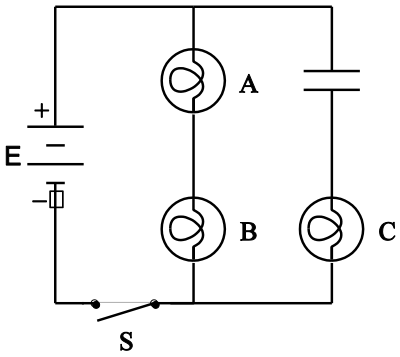
a. 12 V
b. 24 V
c. 30 V
d. 15 V
e. 6.0 V

7. If Q = 400 μC and the potential difference $V_A - V_B$ = –10 V in the circuit segment shown below, what is the current in the resistor?



a. 1.0 mA right to left
b. 1.0 mA left to right
c. 3.5 mA right to left
d. 3.5 mA left to right
e. None of the above

8. The circuit below contains three light bulbs and a capacitor. The emf E = 110V. At the instant the switch S is closed, which light bulb is brightest?



a. A
b. B
c. C
d. A and B
e. All three are equally bright.

---------- Chapter-29 ----------

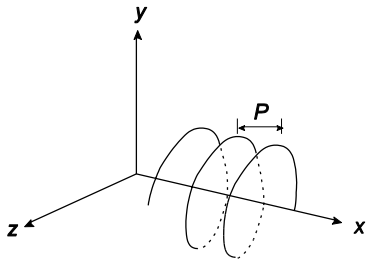
9. A particle (mass = 2.0 mg, charge = –6.0 μC) moves in the positive direction along the x axis with a velocity of 3.0 km/s. It enters a magnetic field of (2.0**i** + 3.0**j** + 4.0**k**) mT. What is the acceleration of the particle?

a. (36**j** – 27**k**) m/s^2
b. (–36**j** + 27**k**) m/s^2
c. (–24**j** + 18**k**) m/s^2
d. (24**j** – 18**k**) m/s^2
e. (24**j** – 27**k**) m/s^2

10. A 2.0-m wire carries a current of 15 A directed along the positive x axis in a region where the magnetic field is uniform and given by B = (30**i** – 40**j**) mT. What is the resulting magnetic force on the wire?

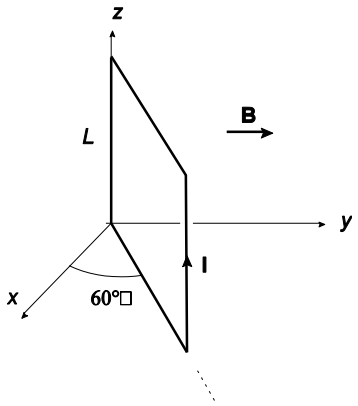
a. (+1.2 **k**) N
b. (–1.2 **k**) N
c. (–1.5 **k**) N
d. (+1.5 **k**) N
e. (+0.90 **k**) N

11. A uniform magnetic field of 0.50 T is directed along the positive x axis. A proton moving with a speed of 60 km/s enters this field. The helical path followed by the proton shown has a pitch of 5.0 mm. Determine the angle between the magnetic field and the velocity of the proton.



a. 39°
b. 51°
c. 44°
d. 34°
e. 71°

12. A square loop (L = 0.20 m) consists of 50 closely wrapped turns, each carrying a current of 0.50 A. The loop is oriented as shown in a uniform magnetic field of 0.40 T directed in the positive y direction. What is the magnitude of the torque on the loop?



a. 0.21 N · m
b. 0.20 N · m
c. 0.35 N · m
d. 0.12 N · m
e. 1.73 N · m

STUDY-GUIDE-Chapter-30

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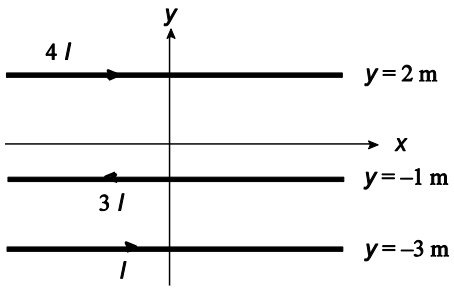
1. One long wire carries a current of 30 A along the entire x axis. A second long wire carries a current of 40 A perpendicular to the xy plane and passes through the point (0, 4, 0) m. What is the magnitude of the resulting magnetic field at the point y = 2.0 m on the y axis?

a. 4.0 μT
b. 5.0 μT
c. 3.0 μT
d. 7.0 μT
e. 1.0 μT

ANS: (b)

2. Three long wires parallel to the x axis carry currents as shown. If I = 20 A, what is the magnitude of the magnetic field at the origin?



a. 37 μT
b. 28 μT
c. 19 μT
d. 47 μT
e. 58 μT

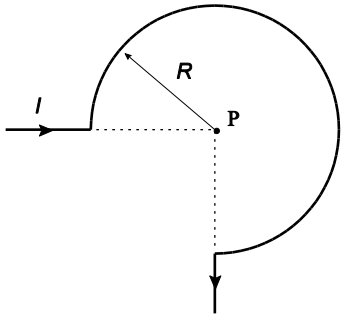
ANS (c)

3. Two long parallel wires carry unequal currents in the same direction. The ratio of the currents is 3 to 1. The magnitude of the magnetic field at a point in the plane of the wires and 10 cm from each wire is 4.0 μT. What is the larger of the two currents?

a. 5.3 A
b. 3.8 A
c. 4.5 A
d. 3.0 A
e. 0.5 A

ANS: (d)

4. The segment of wire (total length = $6R$) is formed into the shape shown and carries a current I. What is the magnitude of the resulting magnetic field at the point P?



a. $\frac{3\mu_0 I}{8R}$
b. $\frac{3\mu_0 I}{2R}$
c. $\frac{3\mu_0 I}{4R}$
d. $\frac{3\mu_0 I}{2R}$
e. $\frac{3\mu_0 \pi I}{8R}$

ANS: (a)

5. A long solenoid (1500 turns/m) carries a current of 20 mA and has an inside diameter of 4.0 cm. A long wire carries a current of 2.0 A along the axis of the solenoid. What is the magnitude of the magnetic field at a point that is inside the solenoid and 1.0 cm from the wire?

a. 78 μT
b. 55 μT
c. 48 μT
d. 68 μT
e. 2.0 μT

ANS (b)

========== Chapter-31 ==========

1. A coil is wrapped with 300 turns of wire on the perimeter of a circular frame (radius = 8.0 cm). Each turn has the same area, equal to that of the frame. A uniform magnetic field is turned on perpendicular to the plane of the coil. This field changes at a constant rate from 20 to 80 mT in a time of 20 ms. What is the magnitude of the induced emf in the coil at the instant the magnetic field has a magnitude of 50 mT?

a. 24 V
b. 18 V
c. 15 V
d. 10 V
e. 30 V

ANS: (b)

2. A rectangular wire loop (length = 60 cm, width = 40 cm) lies completely within a perpendicular and uniform magnetic field of magnitude of 0.5 T. If the length of the loop starts increasing at a rate of 20 mm/s at time $t = 0$, while the width is decreasing at the same rate, what is the magnitude of the induced emf at time $t = 4.0$ s?

a. 6.8 mV
b. 5.2 mV
c. 3.6 mV
d. 8.4 mV
e. 10 mV

ANS: (c)

3. A 5-turn square loop (10 cm along a side, resistance = 4.0 Ω) is placed in a magnetic field that makes an angle of 30° with the plane of the loop. The magnitude of this field varies with time according to $B = 0.50t^2$, where t is measured in s and B in T. What is the induced current in the coil at $t = 4.0$ s?

a. 25 mA
b. 5.0 mA
c. 13 mA
d. 43 mA
e. 50 mA

ANS: (a)

4. A long solenoid has a radius of 2.0 cm and has 700 turns/m. If the current in the solenoid is decreasing at the rate of 8.0 A/s, what is the magnitude of the induced electric field at a point 2.5 cm from the axis of the solenoid?

a. 56 μV/m
b. 8.8 μV/m
c. 88 μV/m
d. 69 μV/m
e. 44 μV/m

ANS: (a)