Questions

Chapter 28
Magnetic Fields

28-2 The Definition of the Magnetic Field
final-062

An electron has a velocity: $v = (5 \times 10^6\ i - 3 \times 10^6\ j)$ m/s ,
and moves through a uniform magnetic field: $B = (0.5\ i + 0.3\ j)$ T.
Find the magnetic force (in Newtons) on the electron.

A) -4.8×10^{-13} k
B) 3.2×10^{-13} j
C) 2.1×10^{-13} k
D) 9.6×10^{-13} i
E) 2.1×10^{-13} j

Answer A

28-2 The Definition of the Magnetic Field
final-061

A moving charge has a velo $\vec{\mathbf{v}} = v_o \hat{\mathbf{i}}$ $(v_o > 0)$ when it enters in a region where there is a uniform magnetic field. The magnetic force acting on the char $\vec{\mathbf{F}} = F_o \hat{\mathbf{k}}$ where $F_o > 0$. Which of the following expressions correctly represents the orientation of the magnetic field? (Take $B^o > 0$).

A) $\vec{\mathbf{B}} = +B_o \hat{\mathbf{i}} + B_o \hat{\mathbf{j}}$

B) $\vec{\mathbf{B}} = -B_o \hat{\mathbf{i}} + B_o \hat{\mathbf{j}}$

C) $\vec{\mathbf{B}} = -B_o \hat{\mathbf{i}} - B_o \hat{\mathbf{j}}$

D) $\vec{\mathbf{B}} = B_o \hat{\mathbf{i}} - B_o \hat{\mathbf{j}}$

E) $\vec{\mathbf{B}} = -B_o \hat{\mathbf{i}} + B_o \hat{\mathbf{k}}$

Answer A

28-2 The Definition of the Magnetic Field
final-042

For a charged particle moving in a magnetic field, the magnetic field can
(1) change its velocity.
(2) change its speed.
(3) change its acceleration.
(4) change its kinetic energy.

A)1 and 2 only.
B)1 and 3 only.
C)1, 2, 3, and 4.
D)3 and 4 only.
E)4 only.

Answer B

28-2 The Definition of the Magnetic Field
final-041

In figure 5, an electron moves toward the west at speed of 1.0 $x10^{7}$ m/s in a downward (normal into the page) uniform magnetic field of $3.0x10^{-4}$ T. The magnetic force on the electron is

A) $1.6\ x10^{-16}$, south.
B) $4.8\ x10^{-16}$, south.
C) $4.8\ x10^{-16}$, west.
D) $1.6\ x10^{-16}$, north.
E) $4.8\ x10^{-16}$, north.

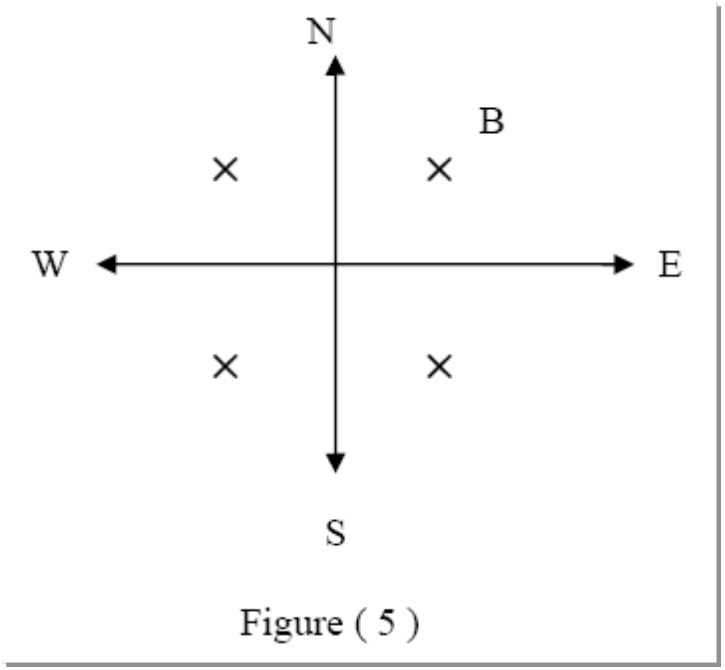


Figure (5)

Answer E

28-2 The Definition of the Magnetic Field
final-041

An electron is accelerated by a potential difference of 2.0 kV. Then it passes normally through a region of magnetic field, where it moves in a circular path with radius 0.2 m. What is the magnitude of the magnetic field?

A)6.0×10^{-4} T.
B)2.1×10^{-4} T.
C)7.5×10^{-4} T.
D)3.2×10^{-4} T.
E)0.4×10^{-4} T.

Answer C

28-2 The Definition of the Magnetic Field
final-041

A charged particle is placed in a region of space and it experiences a force only when it is in motion. It can be conclude that the region encloses

A)An electric field only.
B)Both a gravitational field and an electric field .
C)Both a magnetic field and an electric field.
D)Both a magnetic field and a gravitational field.
E)A magnetic field only .

Answer E

28-2 The Definition of the Magnetic Field
final-042

An electron enters a region that contains a magnetic field directed into the page as shown in figure 7. The velocity of the electron makes an angle of 30 degrees with the +y axis. What is the direction of the magnetic force on the electron when it enters the field?

A)at an angle of 30 degrees below the positive and in the plane of the page.
B)upwards and out of the page.
C)at an angle of 30 degrees above the positive and in the plane of the page.
D)at an angle of 60 degrees above the positive and in the plane of the page.
E)at an angle of 60 degrees below the positive and in the plane of the page.

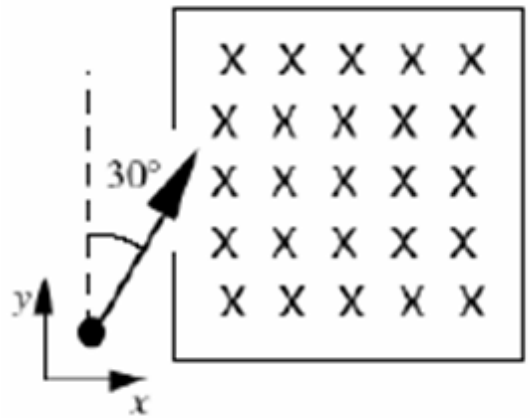


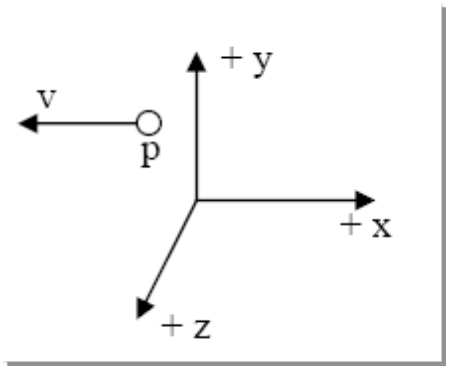
Figure 7

Answer A

28-3 Crossed Fields
final-062

The following figure shows a proton moving at a constant speed of 300 m/s along the negative x-axis through uniform electric and magnetic fields. The electric field is directed along the positive y-direction and has a magnitude of 900 N/C. What is the magnitude and direction of the magnetic field?

A) 0.3 T, along the negative x axis
B) 3.0 T, along the positive z axis
C) 0.3 T, along the negative x axis
D) 3.0 T, along the negative z axis
E) 0.1 T, along the negative y axis



Answer D

28-3 Crossed Fields
final-061

An electron with a velocit $\vec{\mathbf{v}} = 5.0\times10^{7}\hat{\mathbf{i}}\ (\mathrm{m/s})$ enters a region of space where perpendicular electric and magnetic fields are present. The $\vec{\mathbf{E}} = -10^{4}\hat{\mathbf{j}}\ (\mathrm{N/C})$is . What magnetic field (in Tesla) will allow the electron to go through undeflected?

A) $\vec{\mathbf{B}} = +(2.0\times10^{-4})\hat{\mathbf{k}}$

B) $\vec{\mathbf{B}} = +(2.0\times10^{-4})\hat{\mathbf{j}}$

C) $\vec{\mathbf{B}} = -(2.0\times10^{-4})\hat{\mathbf{i}}$

D) $\vec{\mathbf{B}} = -(2.0\times10^{-4})\hat{\mathbf{k}}$

E) $\vec{\mathbf{B}} = +(5.0\times10^{-4})\hat{\mathbf{k}}$

Answer A

28-3 Crossed Fields
final-042

A charged particle is projected with velocity v into a region where there exists a uniform electric field of strength E perpendicular to a uniform magnetic field of strength B. If the velocity of the charged particle is to remain constant, the minimum velocity must be

A)of magnitude B/E and perpendicular to both E and B.
B)of magnitude E/B and parallel to B.
C)of magnitude E/B and parallel to E.
D)of any magnitude but at 45 degrees to both E and B.
E)of magnitude E/B and perpendicular to both E and B .

Answer E

28-3 Crossed Fields
final-041

An electric field and a magnetic field normal to each other. The electric field is 4.0 kV/m and the magnetic field strength is 2.0 mT. They are act on a moving electron to produce no force, calculate the electron speed.

A)1.2 x10^6 m/s.
B)3.0 x10^9 m/s.
C)2.0 x10^6 m/s .
D)5.2 x10^7 m/s.
E)8.0 x10^6 m/s.

Answer C

28-4 A Circulating Charged Particle
final-062

An electron moving perpendicular to a 50 μT magnetic field goes through a circular trajectory. What is the time required to complete one revolution?

A) 4.20×10^{-7} s
B) 3.22×10^{-7} s
C) 7.15×10^{-7} s
D) 8.40×10^{-7} s
E) 1.50×10^{-7} s

Answer C

28-4 A Circulating Charged Particle
final-042

An electron is accelerated from rest through a potential difference of 500 Volts, then injected into a uniform magnetic field. Once in the magnetic field, it completes one revolution in 4.0 nano-s. What is the radius of the orbit?

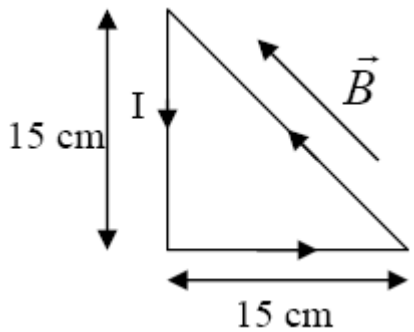
A)1.0 mm
B)16.8 mm
C)4.2 mm
D)8.4 mm
E)13 mm

Answer D

28-5 Magnetic Force on a Current-Carrying Wire
final-062

The following figure shows a loop of wire carrying a current of 2.0 Ampere is in the shape of a right triangle with two equal sides, each 15 cm long. A 0.7 T uniform magnetic field is parallel to the hypotenuse as shown in the figure. The resultant magnetic force on the two equal sides has a magnitude of:

A) zero
B) 0.21 N
C) 0.44 N
D) 0.50 N
E) 0.75 N

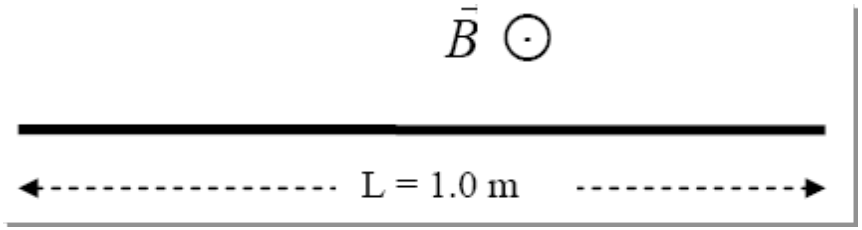


Answer A

28-5 Magnetic Force on a Current-Carrying Wire
final-062

The following figure shows a straight horizontal length of copper wire of mass m = 50 g and length L = 1.0 m lies in a uniform magnetic field B = 0.5 T directed out of the page. What is the magnitude and direction of the current in the wire to balance the gravitational force?

A) 1.51 A, to the right
B) 0.98 A, to the right
C) 0.35 A, to the right
D) 0.35 A, to the left
E) 0.98 A, to the left

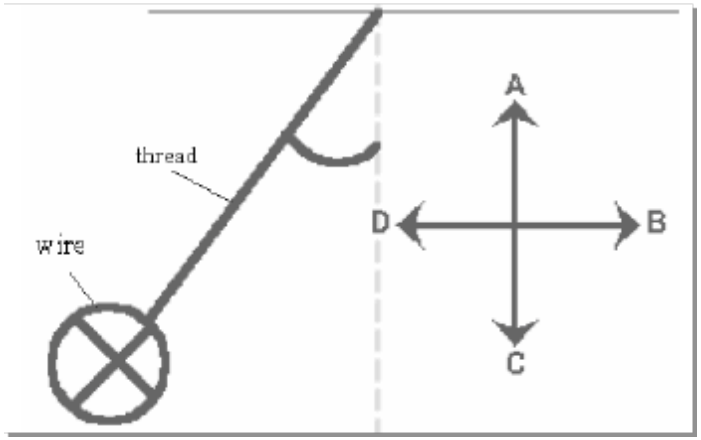


Answer E

28-5 Magnetic Force on a Current-Carrying Wire
final-061

the wire is pulled away from the vertical. Which of the arrows labeled **A** to **D** correctly indicates the direction of the magnetic field?

A) C
B) A
C) D
D) B
E) The magnetic field is oriented into the plane of the picture.

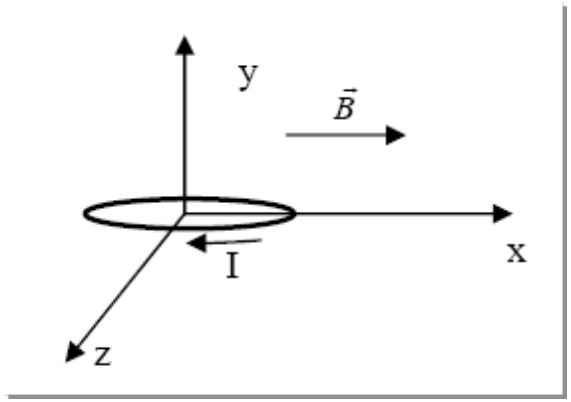


Answer A

28-6 Torque on a Current Loop
final-062

A 100 turns coil, lies in xz-plane, has an area of 2.0 m^2 and carries a current I = 0.3 A in the direction indicated in the following figure. The coil lies in a magnetic field directed along the x-axis and has a magnitude of 1.5 T. What is magnitude and direction of the torque on the coil?

A) zero
B) 90 N.m along the negative z axis
C) 30 N.m along the negative z axis
D) 30 N.m along the positive z axis
E) 90 N.m along the positive z axis



Answer E

28-6 Torque on a Current Loop
final-042

A circular coil of 160 turns has a radius of 1.90 cm and carries a current I. If the maximum torque that the coil can experience in a uniform 35.0 mT magnetic field is 0.08 N.m, what is the value of I.

A)9.6 A.
B)14.2 A.
C)2.3 A.
D)12.6 A.
E)22.0 A.

Answer D

28-6 Torque on a Current Loop
final-041

The plane of area 4.0 cm^2 rectangular loop of wire is parallel to a 2.0 T magnetic field. The loop carries a current of 6.0 A. Calculate the magnitude of the torque acts on the loop.

A)3.6 $x10^{-3}$ N.m.
B)1.0 $x10^{-3}$ N.m.
C)4.8 $x10^{-3}$ N.m.
D)2.4 $x10^{-3}$ N.m.
E)zero.

Answer C