② 1 9 10

مراجعة المغناطيسية 12 متقدم

16:49 Wednesday, 8 March 2023

→ 4	Recall that a magnetic field is represented using field lines. Identify the properties of a magnet (A magnet always has a north pole and a south pole - A single north or south pole cannot be isolated (they always come in pairs) - Opposite magnetic poles attract and like poles repel - Breaking a bar magnet in half results in two new magnets, each with a north and a south pole). - Recall that the SI unit of magnetic field strength is Tesla (T).

$T = N/A.m = N.s/C.m$

$T = N.A^{-1}.m^{-1} = N.s.C^{-1}.m^{-1}$







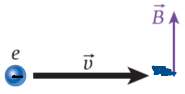
$q\Delta V = \frac{1}{2} m(v_f^2 - v_i^2)$

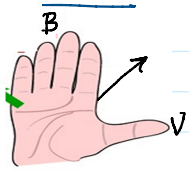
$F_{net} = m$

$q = -1.6 \times 10^{-19} C$

Consider a cathode ray tube. In this tube, a potential difference of $\Delta V = 111$ V accelerates electrons horizontally (starting essentially from rest) in an electron gun.
. Beyond the electron gun is a constant magnetic field with magnitude $B = 3.40 \times 10^{-4}$T. The direction of the magnetic field is upward, perpendicular to the initial velocity of the electrons.
What is the magnitude of the acceleration of the electrons due to the magnetic field?
(The mass of an electron is 9.11 × 10-31 kg.)

يعمل فرق الجهد $\Delta V = 111$ V على إكساب الإلكترونات عجلة أفقية (بدءًا من وضع السكون $v_i = 0$) في مدفع إلكترونات.
إذا كان أمام مدفع الإلكترونات مجال مغناطيسي منتظم شدته $B = 3.40 \cdot 10^{-4}$ T يتجه إلى أعلى عموديًا على السرعة المتجهة الابتدائية للإلكترونات.
فما مقدار العجلة التي تكتسبها الإلكترونات بسبب تأثير المجال المغناطيسي؟
(كتلة الإلكترون تساوى 9.11×10^{-31} kg).





$q\Delta V = \frac{1}{2} m(v_f^2 - v_i^2)$ ($v_i = 0$)

$(1.6 \times 10^{-19})(111) = \frac{1}{2} \times 9.11 \times 10^{-31} \times v_f^2$

$V = 6.24 \times 10^6$ m/s

$F_{net} = ma$

$qvB\sin\theta = ma$

$a = \frac{(1.6 \times 10^{-19})(6.24 \times 10^6)(3.40 \times 10^{-4})}{9.11 \times 10^{-31}}$

$a =$ ← اتجاه السارع نفس اتجاه القوة داخل الصفحة m/s^2

Chose the correct answer for each of the following questions.

1- What is the charge of a particle moving in 0.4 T uniform magnetic field, with speed of 4.5×10^{4} m/s and in a circular path, if the magnetic force that is exerted by the magnetic field on that particle is 1.2×10^{-9} N?

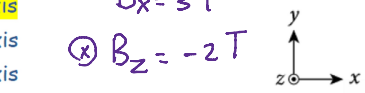
ما مقدار شحنة جسيم يتحرك في مسار دائري بسرعة 4.5×10^{4} m/s داخل مجال مغناطيسي منتظم شدته 0.4 T إذا كانت القوة المغناطيسية المبذولة من المجال على الجسيم المشحون تساوي 1.3×10^{-9} N؟

A. 6.7×10^{-14} C
B. 5.3×10^{-14} C
C. 3.6×10^{-14} C
D. 2.2×10^{-14} C

2- A -1.6×10^{-12} C charged particle moving with speed of 3.6×10^{5} m/s in the positive x direction, enters a magnetic field $\vec{B}=3\hat{x}-2\hat{z}$ T, what is the magnetic force exert by the magnetic field on the charged particle?

جسيم مشحون شحنته -1.6×10^{-12} C ويتحرك بسرعة 3.6×10^{5} m/s في اتجاه المحور X الموجب، يدخل في المجال المغناطيسي $\vec{B}=3\hat{x}-2\hat{z}$ T ما القوة المغناطيسية التي يبذلها المجال المغناطيسي على الجسيم المشحون؟

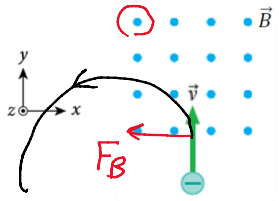
A. 1.2×10^{-6} N, in the direction of -y axis
B. 1.2×10^{-6} N, in the direction of +y axis
C. 2.1×10^{-6} N, in the direction of +y axis
D. 2.1×10^{-6} N, in the direction of -y axis



3- A charged particle enters a uniform magnetic field as shown in the figure, what is the direction of the magnetic force that will exert on the particle?

يدخل جسيم مشحون مجالاً مغناطيسياً منتظما كما هو مبين في الشكل، ما اتجاه القوة المغناطيسية التي ستؤثر في الجسيم المشحون؟

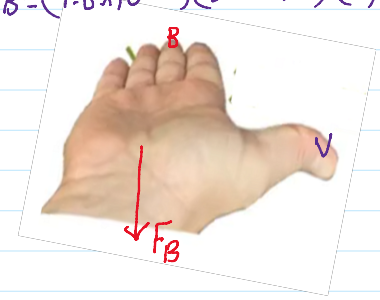
A. To the direction of +y axis
B. To the direction of -z axis
C. To the direction of +x axis
D. To the direction of -x axis

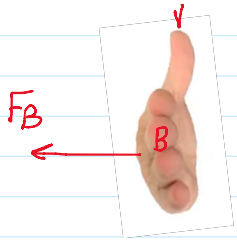


$q=?$
$F_B = q\,v\,B\sin\theta$
$q=\dfrac{(1.3\times10^{-9})}{(4.5\times10^{4})(0.4)}=$

C

$F_B = q\,v_x\,B_z\sin\theta$
$F_B=(1.6\times10^{-12})(3.6\times10^{5})(2)=$



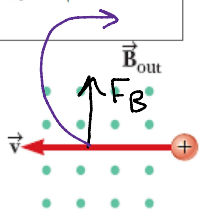


$B_x = 3\,T$
$B_z = -2\,T$

تدور عكس عقارب الساعة

4- A charged particle enters a uniform magnetic field as shown in the figure, which of the following describe the motion of the particle as it enters the magnetic field?

يدخل جسيم مشحون مجالاً مغناطيسياً منتظما كما هو مبين في الشكل، أي مما يلي يصف حركة الجسيم المشحون عند دخوله المجال المغناطيسي؟



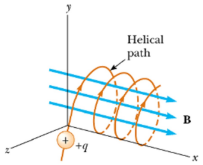
A. It will continue moving in a straight line.
B. It will move on a circular path in clockwise direction.
C. It will move on a circular path in anti-clockwise direction.
D. It will move a helical motion to the left direction.

5- A proton moves with a speed of 1.5×10^5 m/s, enters a 0.65 T uniform magnetic field at an angle of 30.0° to the magnetic field lines, what is the radius of the electron helical path that the proton will follow? ($m_p=1.67\times10^{-27}$ kg, $q_p=1.6\times10^{-19}C$)

$r = \frac{mv\sin\theta}{qB}$

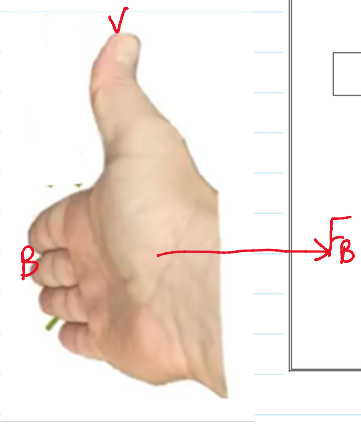
يتحرك بروتون بسرعة 1.5×10^5 m/s ويدخل بزاوية 30.0° في مجال مغناطيسي منتظم شدته 0.65 T، ما قياس نصف قطر المسار الحلزوني الذي سيسلكه البروتون؟ ($m_p=1.67\times10^{-27}$ kg, $q_p=1.6\times10^{-19}C$)

A. 4.6×10^{-3} m
B. 3.8×10^{-3} m
C. 2.4×10^{-3} m
D. 1.2×10^{-3} m

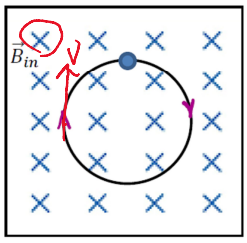


6- A charged particle is moving in a uniform magnetic field as shown in the figure, what is the type of the particle charge?

يتحرك جسيم مشحون في مجال مغناطيسي منتظم كما هو مبين في الشكل، ما نوع شحنة هذا الجسيم؟



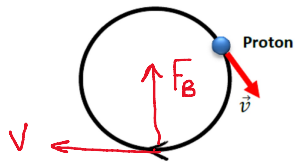
A. Negative
B. Positive
C. Neutral
D. We can't determine.



7- A proton enters a uniform magnetic field $\vec{B}$, the magnetic field exerts a magnetic force makes the proton moving in a circular path as shown in the figure, what is the direction of the magnetic field lines?

يدخل بروتون في مجال مغناطيسي منتظم، يبذل المجال المغناطيسي قوة تسبب دوران البروتون في مسار دائري كما هو موضح في الشكل، ما هو اتجاه خطوط المجال المغناطيسي؟

A. Out of the plane of the page.
B. Into the plane of the page.
C. To the right.
D. Upward.



8- A charged particle with charge of $3.2\times10^{-12}C$, enters a uniform magnetic field, the charged particle follows a helical path with radius of 2.5 m, if the perpendicular component of the charged particle momentum is 1.6×10^{-12} kg.m/s, what is the magnitude of the magnetic field?

جسيم مشحون شحنته $3.2\times10^{-12}C$ يدخل مجالا مغناطيسيا منتظما ، يتحرك الجسيم المشحون في مسار حلزوني نصف قطره 2.5 m ، إذا كانت المركبة العمودية لكمية حركة الجسيم المشحون تساوي 1.6×10^{-12} kg.m/s ما شدة المجال المغناطيسي المؤثر في الجسيم المشحون؟

A. 0.30 T
B. 0.20 T
C. 0.18 T
D. 0.07 T

9- Which of the following is an equivalent unit of Tesla?

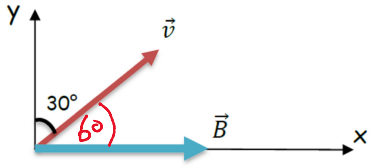
أي مما يلي يمثل وحدة مكافئة لوحدة تسلا؟

A. $N.s/C.m^2$
B. N.C/s.m
C. N/A.m
D. N.A/C.m

10- An electron moves with speed of 1.4×10^{4} m/s, the electron enters a 0.7 T uniform magnetic field as shown in the figure, what does the magnitude of the magnetic force exert on the electron?

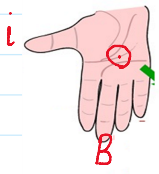
يتحرك إلكترون بسرعة 1.4×10^{4} m/s ويدخل مجالا مغناطيسيا منتظما شدته 0.7 T كما هو مبين في الشكل، ما مقدار القوة المغناطيسية المؤثرة في الإلكترون؟

A. 2.3×10^{-15} N
B. 1.4×10^{-15} N
C. 5.2×10^{-16} N
D. 7.8×10^{-16} N

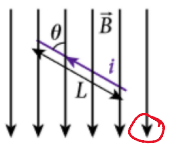


11- An isolated segment of wire of length L = 4.5 m carries a current of magnitude i = 20.0 A at an angle θ= 35.0° with respect to a constant magnetic field with magnitude B = 6.5×10^{-2} T. What is the magnitude and direction of the magnetic force on the wire?

قطعة سلكية طولها L = 4.5 m يمر فيها تيار شدته i=20.0 A وتصنع زاوية θ=35° مع خطوط مجال مغناطيسي منتظم شدته B=6.5×10^{-2} T، ما مقدار واتجاه القوة المغناطيسية المؤثرة في السلك؟



A. 3.4 N, out of the page plane
B. 3.4 N, into the page plane
C. 4.8N, to the right
D. 4.8 N, to the left



12- What is the magnetic force on a coil with radius of 0.3 m, composed of 120 turns and carrying a current of 0.6 A, if the coil is placed in a uniform magnetic field of 0.7 T?

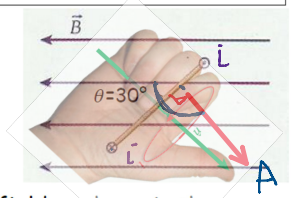
ما مقدار القوة المغناطيسية المؤثرة في ملف نصف قطره 0.3 m و يتكون من 120 لفة ويمر فيه تيار شدته 0.6 A عند وضع هذا الملف في مجال مغناطيسي منتظم شدته 0.7 T؟

A. 67 N
B. 51 N
C. 48 N
D. 95 N

13- A square coil of 20 turns has (3.0 cm, 1.0 cm) dimensions, is placed in a uniform 6.0 T magnetic field as shown in the figure, if a current of 2.3 A flows in the loop, what is the torque on the loop?

ملف مربع الشكل يتكون من 20 لفة ولها الأبعاد (3.0 cm, 1.0 cm) وضعت في مجال مغناطيسي منتظم شدته 6.0 T كما هو موضح في الشكل، إذا مر في الحلقة تيار شدته 2.3 A فما العزم المؤثر في الملف.

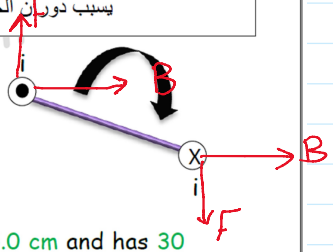
A. 7.2×10^{-2} N.m, into the plane of the page
B. 4.1×10^{-2} N.m, out of the plane of the page
C. 7.2×10^{-2} N.m, out of the plane of the page
D. 4.1×10^{-2} N.m, into the plane of the page



14- A square loop is placed is a uniform magnetic field as shown in the figure, if a net torque is exerted on the loop that make it rotates in the clockwise direction, what is the direction of the magnetic field lines?

وضعت حلقة مربعة في مجال مغناطيسي منتظم كما هو مبين في الشكل، إذا أثر المجال المغناطيسي على الحلقة بعزم يسبب دوران الحلقة في اتجاه دوران عقارب الساعة، فما هو اتجاه المجال المغناطيسي؟

A. To the right
B. To the left
C. Into the page
D. Out of the page



15- A coil is composed of circular loops of radius 5.0 cm and has 30 windings. A current Of 1.3 A flows through the coil which is placed in a uniform magnetic field of 0.9 T, what is the maximum torque on the coil due to the magnetic field

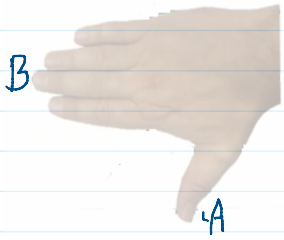
ملف يتكون من 30 حلقة دائرية نصف قطر الحلقة 5.0 cm، يمر تيار شدته 1.3 A عبر الملف الموجود في مجال مغناطيسي منتظم شدته 0.9 T ما مقدار أقصى عزم يؤثر في الملف بسبب المجال المغناطيسي؟

A. 0.28 N.m
B. 0.78 N.m
C. 1.3 N.m
D. 2.1 N.m

$\tau = N i A B \sin\theta$

$\tau = (20)(2.3)(3\times10^{-2}\times1\times10^{-2})(6.0)\sin120$

$\tau =$ N.m



الملف موازي المجال $\rightarrow \theta = 90°$

$\tau = N i A B$

$\tau = (30)(1.3)(\pi\times0.05^2)(0.9) =$ N.m

16- Which of the following statements about the direction magnetic force on a charged particle is correct?

أي من العبارات التالية عن اتجاه القوة المغناطيسية المؤثرة في جسيم مشحون تعتبر صحيحة؟

A. Always in parallel to the magnetic field lines.
B. Always in parallel to the direction of the charged particle motion.
C. Always perpendicular to the magnetic field lines and motion direction.
D. Always perpendicular to the magnetic field lines only.

17- An electron enters a 0.5 T uniform magnetic field with a speed of 3.0×10^4 m/s and angle of 60° to the magnetic field lines, what is the work done by the magnetic field on the electron?

يدخل إلكترون في مجال مغناطيسي منتظم شدته 0.5 T بسرعة 3.0×10^4 m/s وبزاوية 60° مع خطوط المجال المغناطيسي، ما مقدار الشغل المبذول من المجال المغناطيسي على الإلكترون؟

A. 3.5×10^{-15} J
B. 2.1×10^{-15} J
C. 1.4×10^{-15} J
D. Zero

Mohannad Sami

18- A charged particle enters a uniform magnetic field with speed "v", if the magnitude of the magnetic field strength is doubled, how will the speed of the charged particle change?

يدخل جسيم مشحون يتحرك بسرعة v في مجال مغناطيسي منتظم، إذا تضاعفت شدة المجال المغناطيسي مرتين كيف سيغير ذلك من سرعة الجسيم المشحون؟

A. The speed will increase.
B. The speed will decrease.
C. The speed will not change.
D. The speed will increase at the beginning and then it will decrease.

Best regards …

1. Which of the following is/are true regarding the magnetic field?
   I. The spacing between the field lines represent the strength of the magnetic field
   II. The magnetic field vector is always tangent to the field lines
   III. Magnetic field lines form closed loops

أي العبارات صحيحة للمجال المغناطيسي

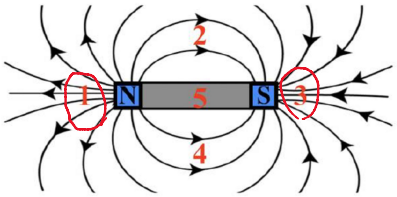
A. I only
B. I and II
C. II and III
D. I, II and III

2. The figure below shows the magnetic field around a bar magnet. At which of the five labelled point(s) is the magnetic field the

أقوى مجال مغناطيسي

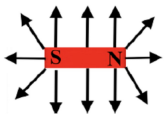
2. The figure below shows the magnetic field around a bar magnet. At which of the five labelled point(s) is the magnetic field the strongest?

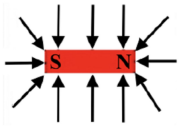
أقوى مجال مغناطيسي

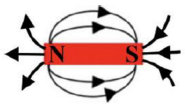


A. 2 only
B. 4 only
C. 5 only
√ D. 1 and 3

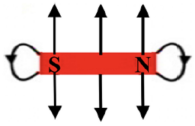
3. Which of the following diagrams is the correct representation of the magnetic field around a bar magnet?

A. 

B. 

√ C. 

D. 

E. 

$F_B = q\ v\ B \sin\theta$

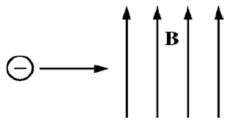
لا يؤثر المجال المغناطيسي على الشحنة بقوة - - - -

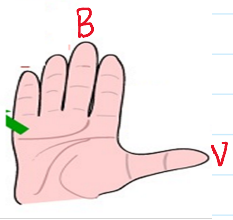
4. A uniform magnetic field does **NOT** exert a magnetic force on a charged particle if the particle___. موازية

I. moves parallel to the field
II. moves perpendicular to the field
III. is at rest ساكنة

A. I only
B. II only
C. III only
D. I and II only
√ E. I and III only

5. An electron moving to the right with constant velocity enters a region with a uniform magnetic field **B** directed toward the top of the page, as shown below. In what direction will the electron initially be deflected?





⊗ F

A. Toward the top of the page

B. Toward the bottom of the page

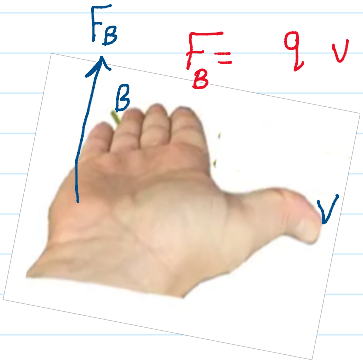
√ C. Into the page

D. Out of the page

$q = 1.6 \times 10^{-19} C$ V

6. A proton enters with a speed of 3.0×10^5 m/s into a uniform magnetic field of strength 2.5 T as shown below. What is the magnitude and direction of the magnetic force acting on the proton? B





$F_B = q\ v\ B \sin\theta$

√ A. $1.2 \times 10^{-13} N$, upward

B. $1.2 \times 10^{-13} N$, downward

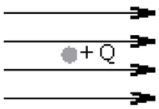
C. $2.4 \times 10^{-13} N$, upward

D. $2.4 \times 10^{-13} N$, downward

7. A stationary positive charge +Q is located in a magnetic field B, which is directed toward the right as indicated. Which of the following is true regarding the direction of the magnetic force on Q?

سحنة سالبة في مجال مغناطيسي

$F_B = 0$



A. Toward the right

B. downwards

C. upwards

√ D. There is no magnetic force

8. The force on a charged particle created by its motion in a magnetic field is maximum at what angle between the particle velocity and field?

أقصى قوة مغناطيسية

$\theta = 90$

A. 0
B. 45°
√ C. 90°
D. 180°

موازي

9. An electron which moves with a speed of $3.0 \times 10^4\ m/s$ parallel to a uniform magnetic field of 0.40 T experiences a force of what magnitude?

√ A. 0
B. $2.2 \times 10^{-24}\ N$
C. $1.9 \times 10^{-15}\ N$
D. $4.8 \times 10^{-14}\ N$

10. A charged particle is injected into a uniform magnetic field such that its velocity vector is perpendicular to the magnetic field vector. Ignoring the particle's weight, the particle will ___:

متعامد

A. move in a straight line
B. follow a spiral path
C. move along a parabolic path
√ D. follow a circular path

مسار دائري

11. Which one of the following statements best explains why a *constant* magnetic field can do *no work* on a moving charged particle?

A. The magnetic field is conservative
B. The magnetic force is a velocity dependent force
C. The magnetic field is a vector and work is a scalar quantity
√ D. The magnetic force is always perpendicular to the velocity of the particle

$F_B \perp V$

$q = -1.6 \times 10^{-19}$

12. An electron is moving in a circular orbit of radius 2 mm in a uniform 0.50 T magnetic field perpendicular to the velocity of the electron. What is the speed of the electron?

$r = 2\ mm \times 10^{-3}$
$B = 0.50\ T$
$V = ?$

$r = \frac{mV}{qB}$ $\quad 2 \times 10^{-3} = \frac{(9.11 \times 10^{-31})(v)}{(1.6 \times 10^{-19})(0.50)}$

$V =$ m/s

√ A. $1.76 \times 10^8 m/s$
B. $1.92 \times 10^8 m/s$
C. $2.15 \times 10^8 m/s$
D. $2.25 \times 10^8 m/s$

13. An electron moves in a circular trajectory with radius r in a constant magnetic field. What is the final radius of the trajectory when the magnetic field is doubled?

2B

$\frac{1}{2} \downarrow r = \frac{mv}{qB\uparrow^2}$

A. $r/4$
√ B. $r/2$
C. $2r$
D. $4r$

14. A charged particle is observed traveling in a circular path in a uniform magnetic field. If the particle had been traveling twice as fast, the radius of the circular path would be ___.

2V

$^2\uparrow r = \frac{mv\uparrow^2}{qB}$

√ A. twice the original radius

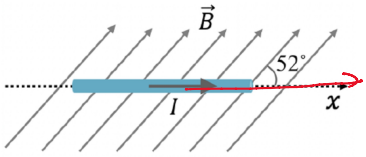
particle had been traveling twice as fast, the radius of the circular path would be ____.

√ A. twice the original radius
B. four times the original radius
C. the same as the original radius
D. one-half the original radius

15. A particle carrying a charge of +e travels in a circular path in a uniform magnetic field. If instead the particle carried a charge of +2e, the radius of the circular path would have been ____.

A. twice the original radius
B. four times the original radius
C. the same as the original radius
√ D. one-half the original radius

16. A 7.0 cm straight wire carrying a current of 4.2 A is placed in a uniform magnetic field of strength 4.25 T oriented at 52° to the x-axis as shown below.



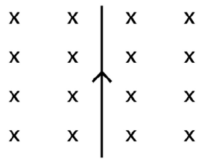
What is the magnetic force on the wire?

√ A. 0.98 N
B. 1.75 N
C. 2.12 N
D. 2.16 N

17. A 0.20 *m* long wire carries a current of 15 *A* and lies perpendicular to a magnetic field. The magnetic force on the wire is measured to be 0.060 *N*. What is the magnitude of the magnetic field?

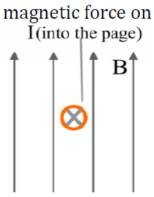
A. 0.010 *T*
√ B. 0.020 *T*
C. 0.040 *T*
D. 0.060 *T*

18. A wire carrying current toward the top of the page is in a magnetic field directed into the page as shown below. What is the direction of the force on the wire?



A. Into the page
B. Top of the page
√ C. Left of the page
D. Right of the page

19. A current-carrying wire is placed in a magnetic field *B* as shown below. What is the direction of the magnetic force on the wire?



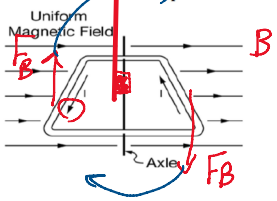
A. Downward

B. To the left

√ C. To the right

D. Upward

20. The figure below shows a rectangular loop in a uniform magnetic field, free to rotate about the axle. The loop of width 3.0 cm and length 12.0 cm carries a current of 2.0 A. The uniform magnetic field has a magnitude of 1.5 x10^{-3} T. What is the magnitude of the net torque and direction of rotation of the loop?



√ A. 1.1 x 10^{-5} Nm, clockwise

B. 1.1 x 10^{-5} Nm, counterclockwise

C. 5.5 x 10^{-6} Nm, clockwise

D. 5.5 xn10^{-6} Nm, counterclockwise

$N = 1$ $A = 3\times10^{-2} \times 12\times10^{-2}\ m^2$

$i = 2A$ $B = 1.5\times10^{-3}\ T$

$\theta = 90^\circ$

$\tau = NiAB$ (N.m)

21. A coil is composed of circular loops of radius 5.13 *cm* and has 47 windings. A current, 1.27 *A*, flows through the coil, which is inside a uniform magnetic field of magnitude 0.911 *T*. What is the maximum torque on the coil due to the magnetic field?

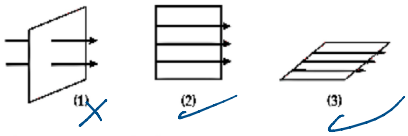
A. 0.148 Nm

B. 0.211 Nm

C. 0.350 Nm

√ D. 0.450 Nm

22. A current loop is oriented in three different positions relative to a uniform magnetic field. In position 1 the plane of the loop is perpendicular to the field lines. In position 2 and 3 the plane of the loop is parallel to the field as shown.



The torque on the loop is maximum in ____.

أقصى عزم ← الملف موازي للمجال

A. position 1

B. position 2

C. position 3

√ D. positions 2 and 3