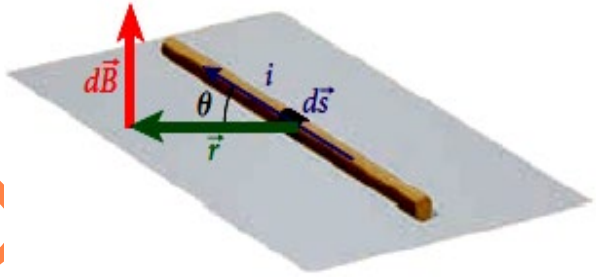
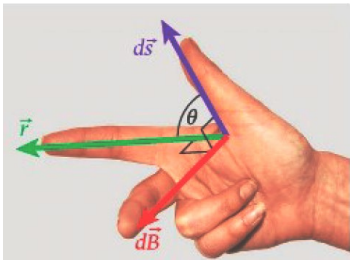
(8 – 1) Biot-Savart Law

Biot-savart's law is the general law for calculating the magnetic field due to any distribution of current .

$$dB = \frac{\mu_o}{4\pi}\frac{id\vec{s}\times\hat{r}}{r^2}$$

$$dB = \frac{\mu_o}{4\pi}\frac{i\,ds\sin\theta}{r^2}$$





$i\,ds$: current element

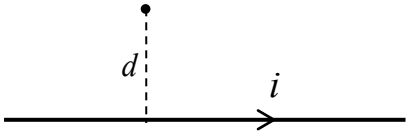
μ_o : magnetic permeability of free space $(\mu_o = 4\pi\times10^{-7}\,T.m/A)$

θ: the angle between the current element and position vector

(8 – 2) Magnetic fields due to Current Distribution

Magnetic Field from a Long , Straight Wire

$$B = \frac{\mu_o}{2\pi}\int_0^{\infty}\frac{i\,ds\sin\theta}{r^2} \Rightarrow \boxed{B = \frac{\mu_o}{2\pi}\frac{i}{d}}$$

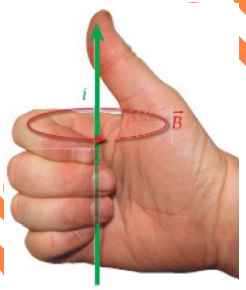


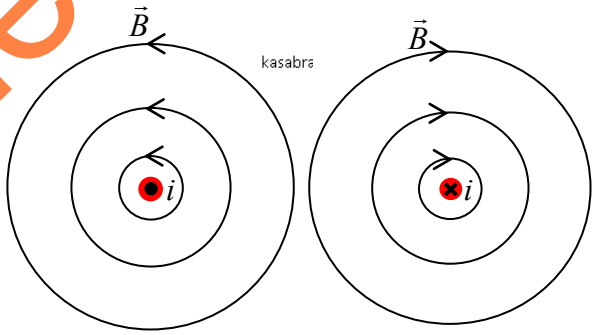
d : distance between the point and the straight wire

Magnetic Field Lines

Concentric circles surround the wire

The direction of the magnetic field lines



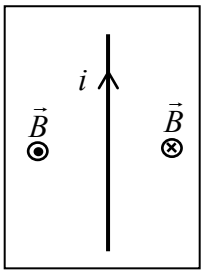


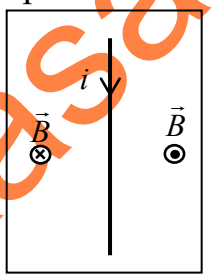
Right hand rule (3)

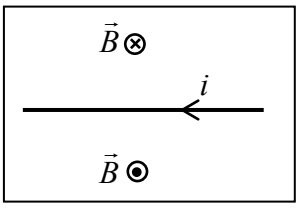
Thumbs toward the current

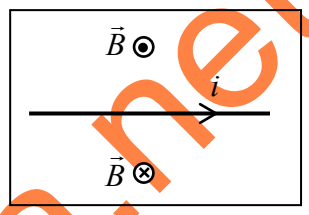
The curved Fingers toward the magnetic field

Direction of the field at a point around the wire



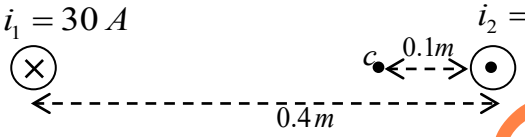






Q1) Two long straight wires perpendicular to the page as shown in the figure :

1) Calculate the magnitude of the magnetic field at the point (c) and determine its direction .



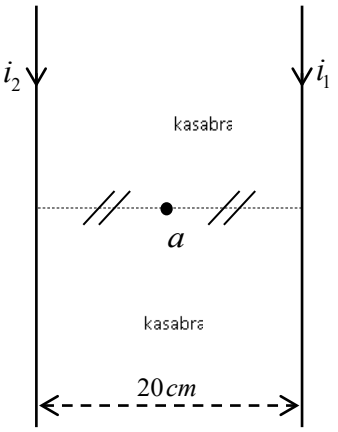
2) Find the magnitude and direction of the magnetic field acting on the wire of (i_1)

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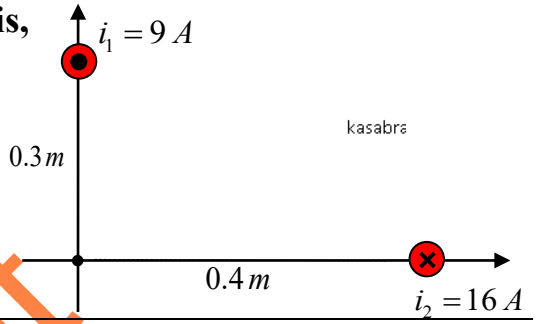
Q2) In the figure shown , $(i_1 = 50A \ , \ i_2 = 200A)$, the point (a) at the middle :

1) Calculate the magnitude of the magnetic field at the point (a) and determine its direction .

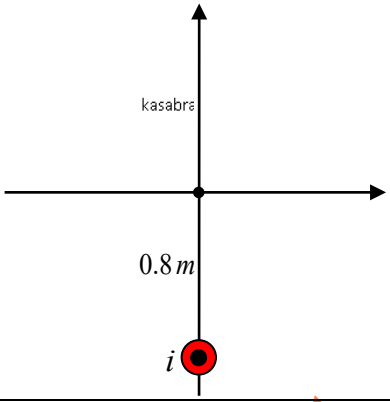
2) Calculate the magnetic force on an electron when it passes through the point (a) moving with velocity $(2.5\times10^6\ m/s)$ upward in the plane of page and determine its direction .



Q3) Two very long straight wires run parallel to the z-axis, as shown in the figure . Calculate the magnetic field at the origin and Calculate its angle with the positive x-axis .



Q4) The magnetic field of the Earth is given by $\vec{B} = (2.6\times10^{-5}T)\hat{y}$. A very long wire carries a current $(25\ A)$ is placed parallel to the z-axis at a distance of $(0.8\,m)$ from the origin as shown in the figure then a magnetic compass needle is placed at the origin . Calculate the angle by which the compass needle is deflected from the north .

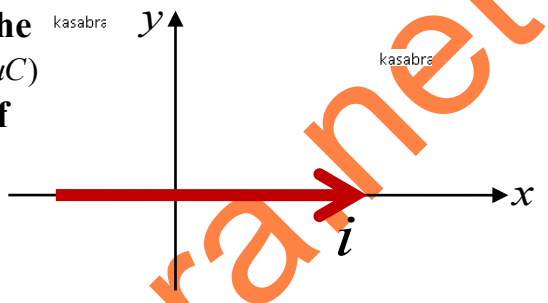


Q5) A long , straight wire is located along the x-axis. The wire carries a current of $(7.0\ A)$ in the positive x-direction . What are the magnitude and the direction of the force on a particle with a charge of $(+9.0\ \mu C)$ located at the point $(1.0\,m\ , 2.0\,m\ , 0)$ when it has a velocity of $(3.0\times10^3\ m/s)$ in each of the following directions ?

1) the positive x-direction .

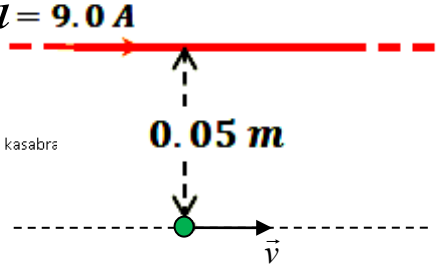
2) the positive y-direction .

3) the negative z-direction .



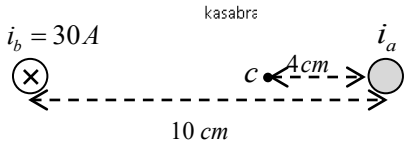
Q6) An electron is shot from an electron gun with a speed of $(4.0\times10^5\ m/s)$ and moves parallel at a distance of $(5.0\,cm)$ above a long , straight wire carrying a current of $(15\ A)$. Determine the magnitude of the acceleration of the electron at the instant it leaves the electron gun . $(m_e = 9.1\times10^{-31}\ Kg)$

Q7) A particle with a mass of $(1.0\times10^{-6}\ Kg)$ and a charge (q) is moving at a speed of $(1.0\times10^3\ m/s)$ along a horizontal path $(0.05\,m)$ below and parallel to a straight current-carrying wire , if the current in the wire is $(9.0\ A)$, calculate the particle's charge and determine its type .

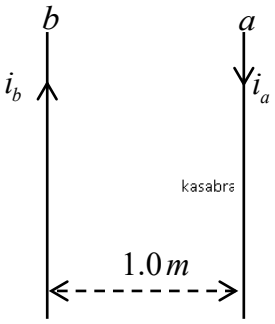


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Q8) The figure shows two very long wires run parallel to the z-axis , if the net magnetic field at point (c) equals zero , calculate the current flows in the wire (a) and determine its direction .

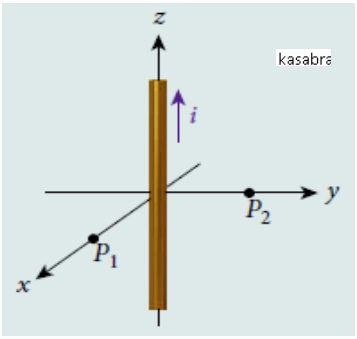


Q9) Two long, straight parallel wires are separated by a distance of $(1.0\,m)$.
If $(i_a = \frac{1}{3} i_b)$ in opposite directions as shown in the figure .
Calculate the distance of a certain point from the wire (a) at which the net magnetic field is equal to zero .



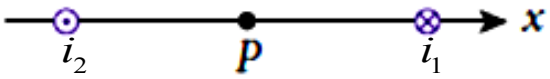
Q10) Choose the correct answer in the following :

1) As shown in the figure , what is the direction of the magnetic field at the two points (P_1) and (P_2) ?



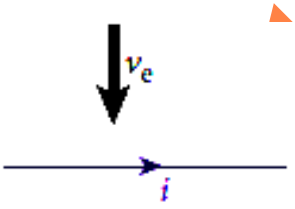
a) $P_1(+y)$ $P_2(+x)$
b) $P_1(-y)$ $P_2(+x)$
c) $P_1(-y)$ $P_2(-x)$
d) $P_1(+y)$ $P_2(-x)$

2) As shown in the figure , what is the direction of the magnetic field at point (p) ?



a) upward in the plane of the page
b) toward the right
c) downward in the plane of the page
d) toward the left

3) An electron is shot directly toward a long wire as shown in the figure , in which direction the electron will be deflected ?

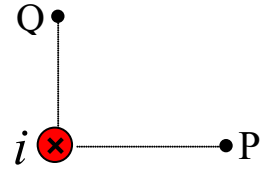


a) toward the left b) toward the right
c) out of page d) into the page

4) Assume that a lightning bolt can be modeled as a long, straight line of current . if $(15\,C)$ of charge passes by a point in $(1.5\times10^{-3}\,s)$, what is the magnitude of the magnetic field at a distance of $(26\,m)$ from the lightning bolt ?

a) $7.69\times10^{-5}\,T$ b) $421\times10^{-2}\,T$
c) $9.22\times10^{-3}\,T$ d) $5.3\times10^{-5}\,T$

5) As shown in the figure. What is the direction of the magnetic field at the two points P and Q ?



a) to the right at P and upward at Q b) upward at P and to the right at Q
c) downward at P and to the right at Q d) upward at P and to the left at Q

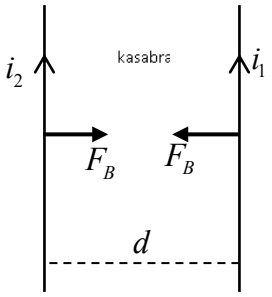
6) A current element produces a magnetic field in the region surrounding it . What is the direction of the magnetic field produced by this current element ?

a) parallel to both of current element and position vector .
b) perpendicular to both of current element and position vector .
c) perpendicular to the current element and parallel to position vector .
d) parallel to the current element and perpendicular to position vector .

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The magnetic force between two parallel wires

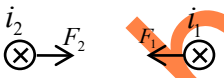
$$F_B = \frac{\mu_o\, i_1\, i_2\, L}{2\pi d}$$



d : the distance between the two wires .

The direction of force :

currents in opposite direction — Repulsion force



currents in same direction — Attractive force



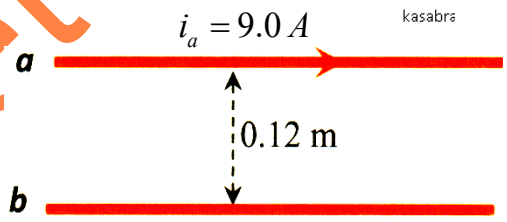
According to Newton's third law :

The force on the first wire is equal to and opposite to the force on the same length from the second wire . $\boxed{\vec{F}_{12} = -\vec{F}_{21}}$

Q11) In the figure shown, the wire (a) attracts the unit lengths of the wire (b) with a magnetic force of $(2.1\times10^{-4}\ N)$:

1) Calculate the current through the wire (b) and determine its direction .

2) What will happen to the magnitude and direction of the force on the wire (b) when the direction of current (a) is reversed ?

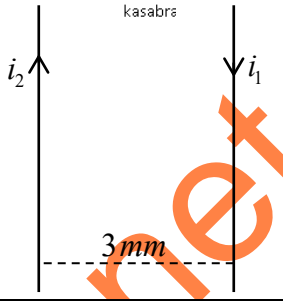


Q12) Two long parallel wires are separated by $(3.0\,mm)$ as shown in the figure . The current (i_1) is twice of the current (i_2) , the magnitude of the force on the unit length of one of the wires $(\ell = 1m)$ is equal to $(7.0\,\mu N)$)

1) what is the type of the magnetic force between the wires ?

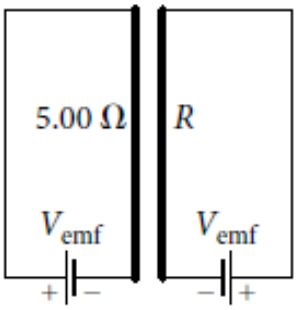
2) Calculate the magnitudes of the two currents ?

3) What will happen to the magnitude of the force between the two wires if the distance between them is reduced to the quarter ?

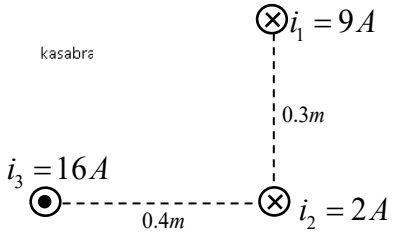


Q13) Two wires, each $(25\,cm)$ long, are connected to two separates $(9.0V)$ batteries, as shown in the figure . The resistance of the first wire is (5.0Ω), and that of the other wire is unknown (R) . If the separation between the wires is $(4.0\,mm)$, what value of (R) will produce a force of magnitude $(6.75\times10^{-5}\ N)$ between them ?

Is the force between the two wires is attraction or repulsion?

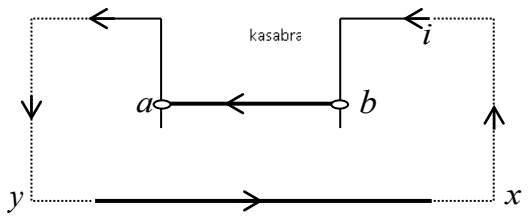


Q14) Three long , straight wires, perpendicular to the plane of the page as shown in the figure, calculate the net magnetic force on the unit lengths of the wire (i_2) and determine its direction on the figure .

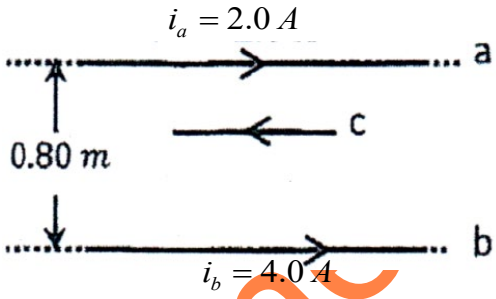


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Q15) In the shown figure, the wire (xy) is very long and the wire (ab) has a length of $(0.15\,m)$ and a weight of $(0.02\,N)$, and it can slide up and down . Calculate the current that, if it passes through the circuit, then the wire (ab) will be balanced above the wire (xy) at a distance $(1.2\,cm)$ between them .

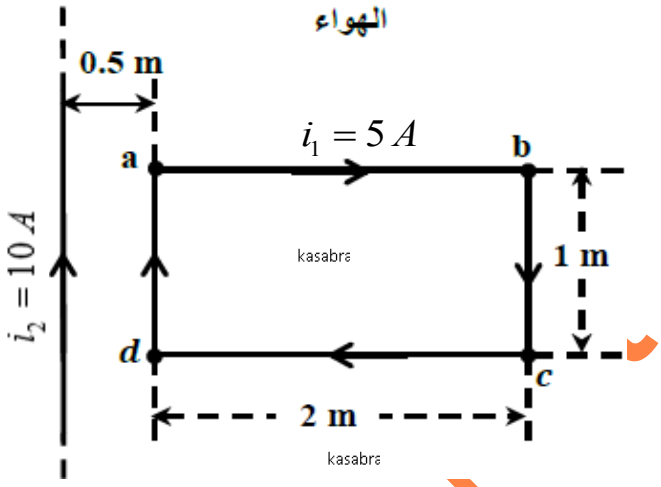


Q16) The figure shows two long wires $(b\ ,a)$ and a third wire (c) parallels to the two wires . If the net magnetic force on the wire (c) is equal to zero , calculate the distance between the wire (c) and the wire (a).



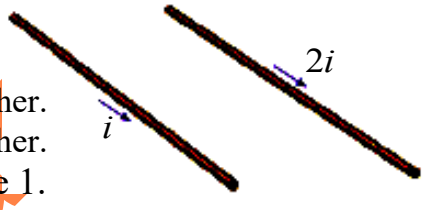
Q17) A long, straight wire has a current $(i_2 = 10\,A)$ flowing in the positive y-direction, as shown in the figure . Close to the wire there is a rectangular loop of wire that carries a current $(i_1 = 5.0\,A)$ in the direction shown .

1) Calculate the net magnetic force on the loop .



Q18) Choose the correct answer in the following :

1) In the figure shown . Which statement about the magnetic forces that the two wires exert on each other is correct .



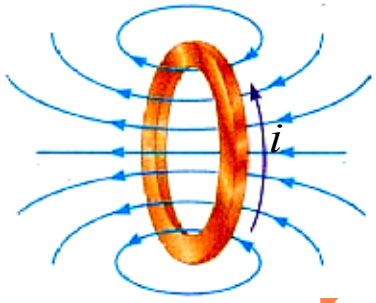
a) The two wires exert attractive forces of the same magnitude on each other.
b) The two wires exert repulsive forces of the same magnitude on each other.
c) Wire 1 exerts a stronger force on wire 2 than wire 2 exerts on wire 1.
d) Wire 2 exerts a stronger force on wire 1 than wire 1exerts on wire 2

2) Two long, straight wires are parallel to each other. The wires carry currents of different magnitudes . If the amount of current flowing in each wire is doubled, the magnitude of the force between the wires will be :

a) twice the magnitude of the original force
b) four times the magnitude of the original force
c) the same as the magnitude of the original force
d) half of the magnitude of the original force

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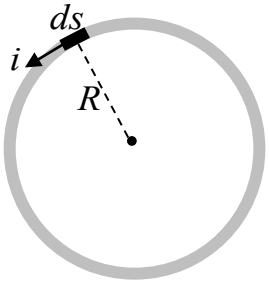
Magnetic field due to a Wire Loop



$$dB = \frac{\mu_o}{4\pi}\frac{i\,ds}{R^2}$$

$$B = \frac{\mu_o}{4\pi}\int\frac{i\,ds}{R^2}$$

$$\boxed{B = \frac{\mu_o\, i\, N}{2R}}$$



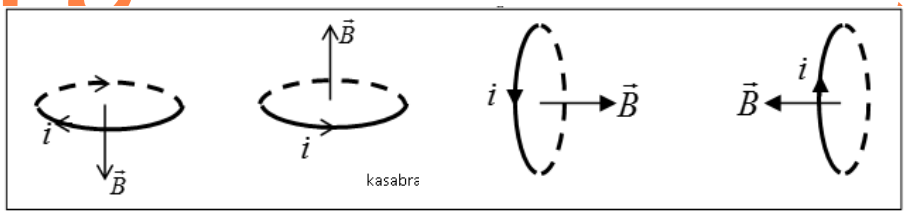
N : number of turns
R : loop radius

The Direction of $\vec{B}$ at the center :

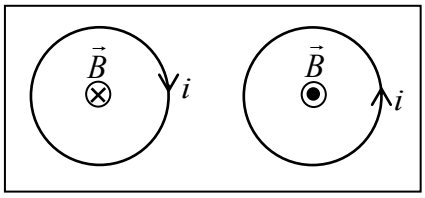
Right hand rule 2

fingers bend with (i) , thump with $\vec{B}$ (same method of $\hat{n}$)

loop is perpendicular to the plane of page



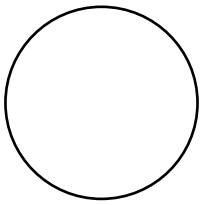
loop in the plane of page



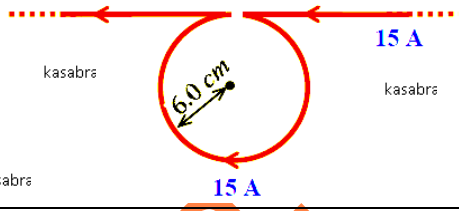
Q19) A circular coil of radius $(0.12m)$ and (150) turns are placed in the plane of the page as shown in the figure . The magnetic field at the center is equal to $(4.5\times10^{-4}T)$ in a direction out of the page due to a current (i) passes through the coil :

1) Calculate the current through the coil and determine its direction .

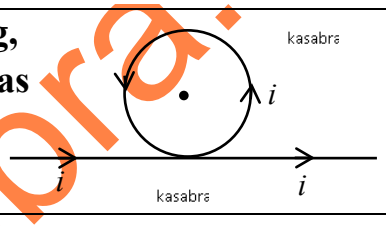
2) Calculate the magnetic force acting on a proton as it passes through the center with velocity of $(7.4\times10^{5}\ m/s)$ toward the right in the plane of page .



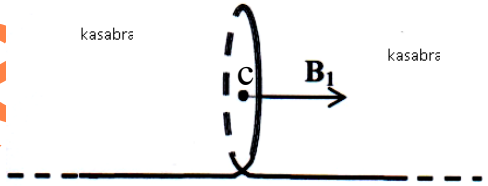
Q20) A loop with radius $(6.0\ cm)$ is formed in the middle of a long, straight insulated wire carrying a current of magnitude $(15\,A)$ as shown in the figure . Calculate the magnitude of the magnetic field at the center of the loop and determine its direction ?



Q21) A loop with radius $(8.3\,mm)$ is formed in the middle of a long, straight insulated wire carrying a current of magnitude $(26.3\,mA)$ as shown in the figure . Calculate the magnitude of the magnetic field at the center of the loop and determine its direction ?



Q22) A loop with radius $(0.021m)$ is formed in the middle of a long, straight insulated wire carrying a current of magnitude (i) as shown in the figure . the loop plane is perpendicular to the plane of page , the magnetic field produced by the circular loop at its center (c) is equal to $(B_1 = 2.24\times10^{-4}\,T)$ toward the right :



1) Calculate the current in the loop and determine its direction .

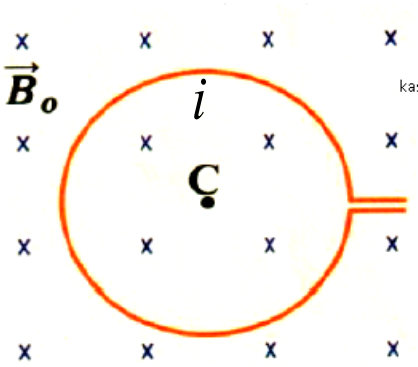
2) Calculate the magnitude of the net magnetic field at the center of the loop .

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Q23) A circular loop carries a current $(5.0\,A)$ is placed in an external constant magnetic field of magnitude $(B_o = 2\times10^{-5}\,T)$. The net magnetic field at the center of the loop is zero :

1) Determine the direction of the current in the loop .

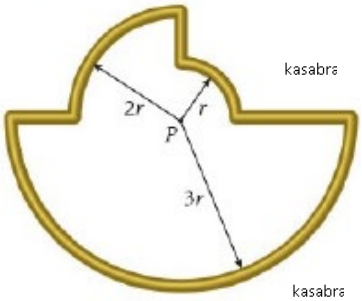
2) Calculate the radius of the loop .



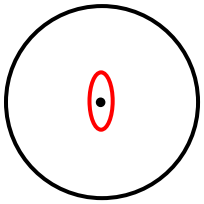
Q24) Calculate the magnetic field in the center of a wire semicircle like that shown in the figure , with a radius $(10\,cm)$, if the current in the wire is $(12\,A)$.



Q25) The loop shown in the figure is carrying a current of $(3.96\,A)$. The magnitude of the magnetic field at point P inside the loop is $(7.21\times10^{-7}\,T)$. Calculate the value of (r) ?



Q26) A loop of wire of radius $(25\,cm)$ has a smaller loop of radius $(0.9\,cm)$ at its center, with the planes of the two loops perpendicular to each other. When a current of $(14\,A)$ is passed through both loops , calculate the torque on the smaller loop due to the magnetic field produced by the larger loop .



Q27) Choose the correct answer in the following :

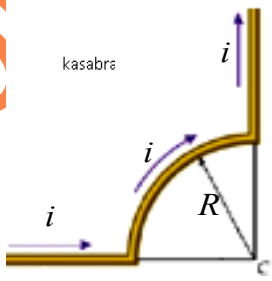
1) What is the magnitude of the magnetic field at point (c) due to the current passing through the wire ?

a) $\dfrac{\mu_o\, i}{6\,R}$

b) $\dfrac{\mu_o\, i}{8\,R}$

c) $\dfrac{\mu_o\, i}{12\,R}$

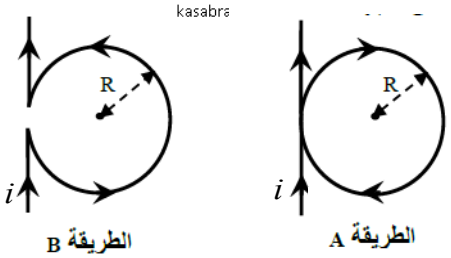
d) $\dfrac{\mu_o\, i}{2\,R}$



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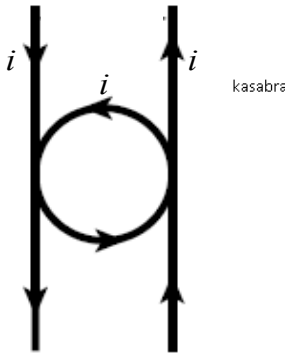
2) In which figures will the net magnetic field at the center of the circular loop be greater ?

a) figure A
b) figure B
c) The two methods are equal
d) Not enough information is given in the figure



3) Parallel wires carry a current (i) in opposite directions as shown in the figure . A circular loop of radius (R) has the same current flowing in a counterclockwise direction . what is the net magnetic field at the center of the loop , as a function of (i) and (R) ?

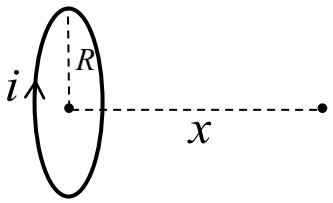
a) $\frac{\mu_o i}{R}(\frac{3}{\pi})$
b) $\frac{\mu_o i}{2R}(1+\frac{1}{\pi})$
c) $\frac{\mu_o i}{R}(1+\frac{2}{\pi})$
d) $\frac{\mu_o i}{2R}(1+\frac{2}{\pi})$



Magnetic field at a point along the axis of the loop

$$B=\frac{\mu i N R^2}{2(x^2+R^2)^{3/2}}$$

x : the distance between the point and the center .



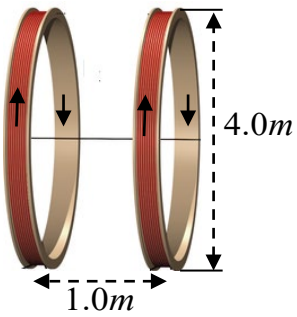
Helmholtz coil

It is a two identical wire coils carry the same current .
It is used to generate uniform magnetic field .



Q28) Two (50) turn coils , each with a diameter of $(4.0\,m)$ are placed $(1.0\,m)$ apart, as shown in the figure. A current of $(7.0\,A)$ is flowing in the wires of both coils , the direction of the current is clockwise for both coils when viewed from the left .

1) Calculate the net magnetic field at the center of the right coil .

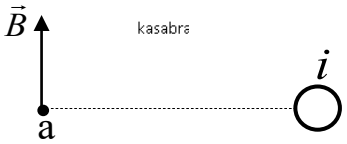


2) Calculate the magnetic field in the center between the two coils .

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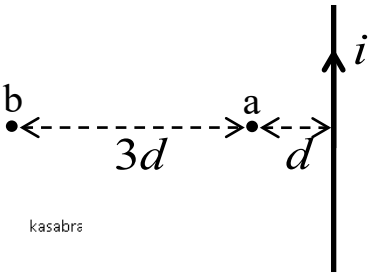
Q29) Choose the correct answer in the following :

1) A long straight wire is perpendicular to the plane of page and a current (i) passes through it, the direction of the magnetic field at point (a) is upward as in the figure , what is the direction of the current passing through the wire .



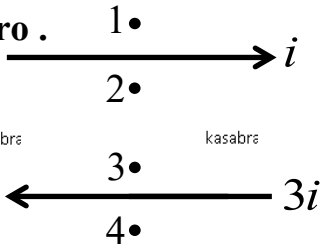
a) into the page b) out of page
c) east d) west

2) In the figure shown , what is the ratio of the magnitude of the field at point (a) to the magnitude of the field at point (b) .



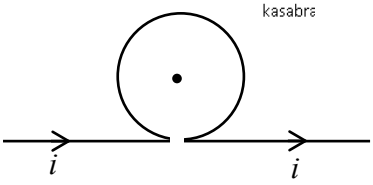
a) $\frac{1}{3}$ b) $\frac{1}{4}$ c) 3 d) 4

3) In the figure shown, at which point the magnetic field may be equal zero .



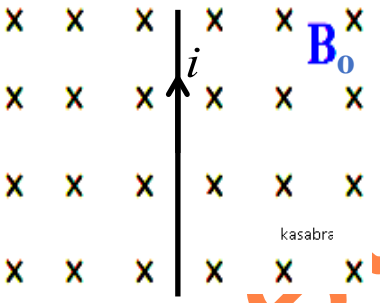
a) point 1
b) point 2
c) point 3
d) point 4

4) A circular loop is formed in the middle of a long , straight wire carrying a current (i) as shown in the figure .
What is the direction of the magnetic field at the center of the Loop ?



a) upward b) downward
c) into the page d) out of page

5) A uniform magnetic field $(B_o = 4\times10^{-5}\,T)$ into the page as shown in the figure . A long straight wire is placed in the pane of the page and a current of magnitude $(60\,A)$ passes through it upward , Determine the position and the distance of the point where the magnetic field is zero .

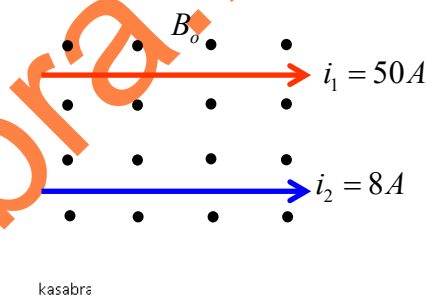


a) $0.3m$ to the right of the wire b) $0.3m$ to the left of the wire
c) $0.1m$ to the right of the wire d) $0.1m$ to the left of the wire

6) In the previous question, what is the magnitude and direction of the magnetic field at a point in a plane page and has a distance of $(0.4\,m)$ to the right of the wire .

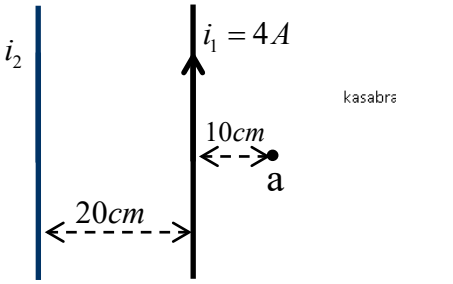
a) $7\times10^{-5}\,T$ out of page b) $7\times10^{-5}\,T$ into the page
c) $1\times10^{-5}\,T$ into the page d) $1\times10^{-5}\,T$ out of page

7) A uniform magnetic field $(B_o = 4\times10^{-5}\,T)$ out of page . Tow long straight wires are placed in the pane of the page as shown in the figure , calculate the net force on the unit length of wire (2) and determine its direction , consider the distance between the wires equal $(0.2m)$.



a) $4\times10^{-4}\,N$ upward b) $4\times10^{-4}\,N$ downward
c) $8\times10^{-5}\,N$ upward d) $8\times10^{-5}\,N$ downward

8) Two long wires in the plane of page plane , if the magnetic field at point (a) equal $(2\times10^{-6}\,T)$ into the page , what is the magnitude and the direction of the current in wire (2) .



a) $15\,A$ upward b) $15\,A$ downward
c) $9\,A$ upward d) $9\,A$ downward

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(8 - 4) Magnetic fields of Solenoids and Toroids

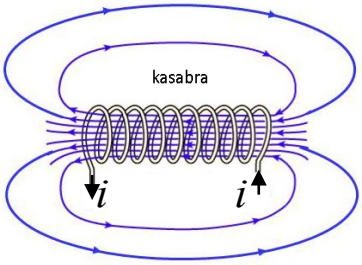
** Magnetic field of a Solenoid

Inside the solenoid : The magnetic field is uniform and greater than outside .

Outside the solenoid : The magnetic field is nonuniform and less than inside .

The ideal solenoid has a magnetic field of zero outside and a uniform constant value inside .

$$B = \mu_o\, n\, i = \frac{\mu_o\, N\, i}{L}$$



B : Magnetic field inside the solenoid .

n : number of turns per unit length : $n = \frac{N}{L}$

N : number of turns

Q30) An ideal solenoid has a length of $(0.9\,m)$. When the wire carries a $(0.2\,A)$ current , the magnetic field inside the solenoid is $(5\,mT)$. Find the number of the turns .

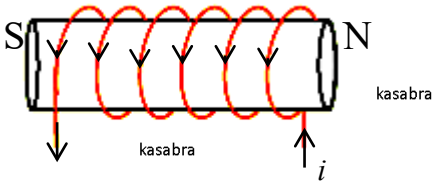
Q31) An ideal solenoid has $(200\,turns/cm)$. An electron inside the coil of the solenoid moves in a circle with radius $(3.0\,cm)$ perpendicular to the solenoid's axis. The electron moves with a speed of $(1.5\times10^{7}\,m/s)$, calculate the current that flows in the solenoid .

Electron mass : $(m_e = 9.1\times10^{-31}\,Kg)$ **Electron charge :** $|q_e| = 1.6\times10^{-19}\,C$

direction of the field inside the solenoid

right hand rule 2

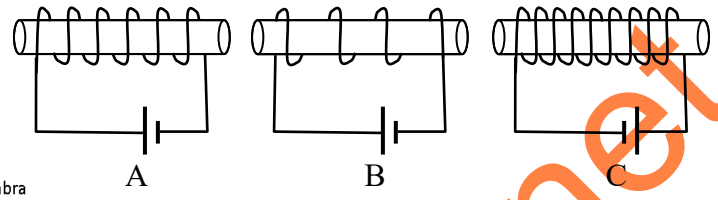
The solenoid is considered as an electromagnet with two poles



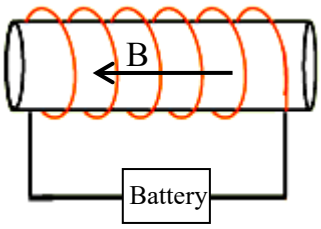
Q32) In the figure shown, there are three solenoids have equal lengths , and equal currents :

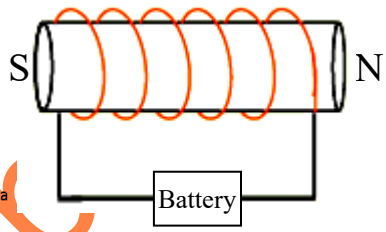
1) Determine the magnetic poles of each coil .

2) Arrange the coils in descending order according to the magnetic field inside .



Q33) Determine the direction of the current flowing in the battery in each figure .

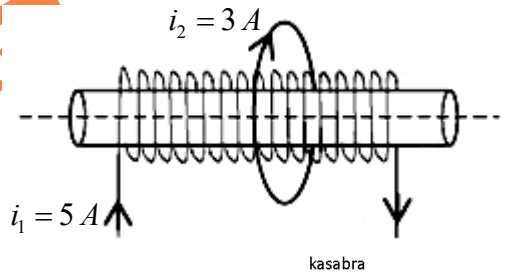




Q34) The figure shows a solenoid of (25) turns and a $(0.25\,m)$ length and a circular coil of radius $(0.1\,m)$ and (20) turns its axis applies to the axis of the solenoid :

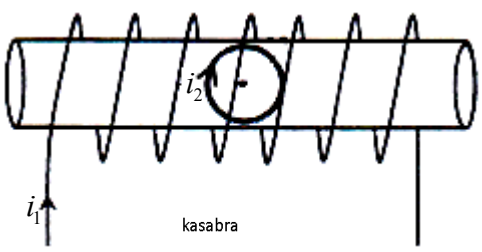
1) Calculate the net magnetic field at the center of the circular coil and determine its direction .

2) If the magnitude and the direction of the current in the circular coil are changed to make the net magnetic field at its center equals zero , calculate the current passing through the circular coil at that time .



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Q35) A solenoid of a length $(0.2\,m)$ and (7) turns carries a current of $(0.35\,A)$, another circular coil of radius $(0.05\,m)$ and (5) turns is placed inside the solenoid as shown in the figure , if the current flowing in circular coil is $(0.5\,A)$, calculate the net magnetic field at its center .



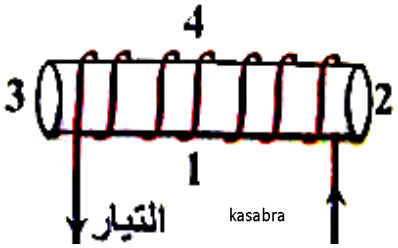
Q36) Along solenoid consists of (1000) turns per meter of thin wire through which a current of $(0.25\,A)$ is maintained . A long straight wire carrying a current of $(10\,A)$ is inserted along the axis of the solenoid . Calculate the magnitude of the magnetic field at a point $(1.0\,cm)$ from the axis ?

Q37) Choose the correct answer in the following :

1) The number of turns in a solenoid is doubled , and its length is halved . How does its magnetic field change ?

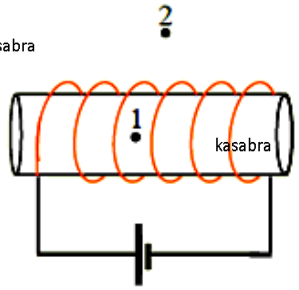
a) It doubles b) It quadruples
c) It is halved d) It remains unchanged

2) In the figure shown , which of the following is true for the poles of the resulting electromagnet :



a) 1 is a north pole , 4 is a south pole
b) 3 is a north pole , 2 is a south pole
c) 1 is a south pole , 4 is a north pole
d) 2 is a north pole , 3 is a south pole

3) In the figure shown , which of the following is true for the magnetic field at the two points (1) and (2) :



a) $(B_2 \prec B_1)$ and in opposite directions
b) $(B_2 = B_1)$ and in the same directions
c) $(B_2 = B_1)$ and in opposite directions
d) $(B_2 \prec B_1)$ and in the same directions

4) Solenoid (A) has twice the diameter, three times the length, and four times the number of turns of solenoid (B) . The two solenoids have currents of equal magnitudes flowing through them . Find the ratio of the magnitude of the magnetic field inside solenoid (A) to that of solenoid (B) .

a) $\frac{3}{2}$ b) $\frac{1}{4}$ c) $\frac{4}{3}$ d) $\frac{3}{4}$

5) Two solenoids have the same length, but solenoid (1) has (15) times more turns and $(\frac{1}{9})$ as large a radius and carries (7) times as much current as solenoid (2) . Calculate the ratio of the magnitude of the magnetic field inside solenoid (1) to that of the magnetic field inside solenoid (2)

a) 105 b) 144 c) 197 d) 123

6) A current of $(2.0\,A)$ is flowing through a (1000) turn solenoid of length $(40\,cm)$. What is the magnitude of the magnetic field inside the solenoid ?

a) $6.28\times10^{-5}\,T$ b) $3.14\times10^{-3}\,T$
c) $6.28\times10^{-3}\,T$ d) $4.56\times10^{-3}\,T$

الملف الحلقي (Toroid) ص210 و ص211 غير مطلوب

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(8 – 5) Ampere's Law

Over a closed loop called an Amperian loop it is

$$\oint \vec{B}.d\vec{s} = \mu_o\, i_{enc}$$

i_{enc} : The current within an Amperian loop .

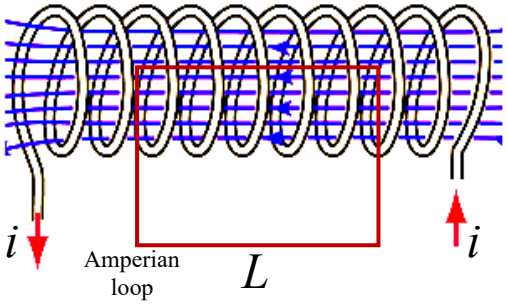
Concluding the equation of the solenoid's magnetic field by using Ampere's law

$$\oint \vec{B}.d\vec{s} = \mu_o i_{enc}$$

$$BL\cos 0^o + BL\cos 90^o + BL\cos 90^o + 0\times L = \mu_o (N\,i)$$

$$BL = \mu_o (Ni)$$

$$B = \frac{\mu_o N i}{L} = \mu_o n i$$



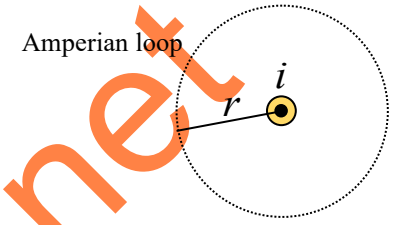
Concluding the equation of the magnetic field outside a long straight cylindrical wire using Ampere's law

$$\oint \vec{B}.d\vec{s} = \mu_o\, i_{enc}$$

$$B\oint d\,s = \mu_o\, i_{enc}$$

$$B(2\pi r) = \mu_o\, i$$

$$B = \frac{\mu_o\, i}{2\pi r}$$



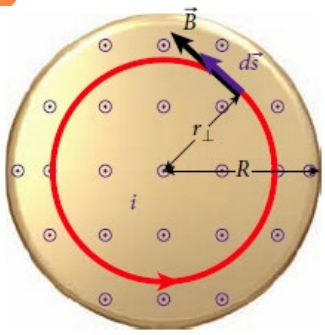
Concluding the equation of the magnetic field inside a long straight cylindrical wire using Ampere's law

$$\oint \vec{B}.d\vec{s} = \mu_o\, i_{enc} \quad , \quad i = JA$$

$$B\oint d\,s = \mu_o\, JA$$

$$B(2\pi r) = \mu_o \frac{i}{\pi R^2}(\pi r^2)$$

$$B = \frac{\mu_o\, i\, r}{2\pi R^2}$$



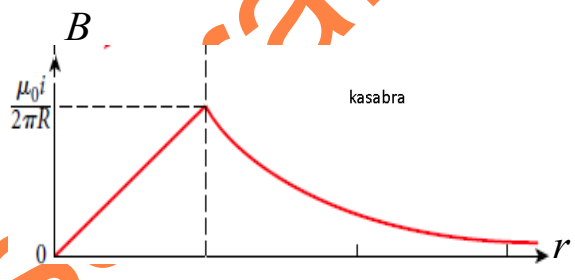
Summary of Magnetic Field Equations for a Long Straight Wire :

outside the wire : $B = \frac{\mu_o\, i}{2\pi r}$

r : distance from the center of the wire

inside the wire : $B = \frac{\mu_o\, i\, r}{2\pi R^2}$, R : radius of the wire

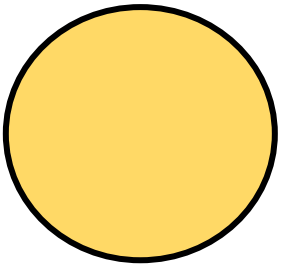
On the surface of the wire (maximum field) : $B = \frac{\mu_o\, i}{2\pi R}$



Q38) The figure shows a cross section of a long, solid, cylindrical conductor. The radius of the cylinder is $(10\,cm)$. A current of $(1.35\,A)$ is uniformly distributed throughout the conductor and is flowing out of the page . Calculate the magnitude of the magnetic field at the following positions .

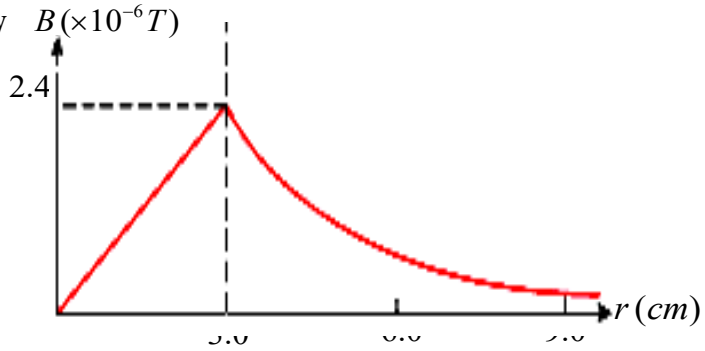
1) $r_a = 0\,cm$ **2)** $r_b = 4.0\,cm$ **3)** $r_c = 10\,cm$ **4)** $r_d = 16\,cm$

cross section of the wire



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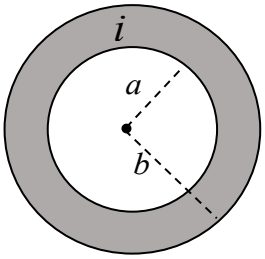
Q39) In the shown figure , the graph shows how the magnetic field change with varying the distance from the center of a long cylindrical wire carrying a current :



1) What is the radius of the wire ?

2) Calculate the current flows in the wire .

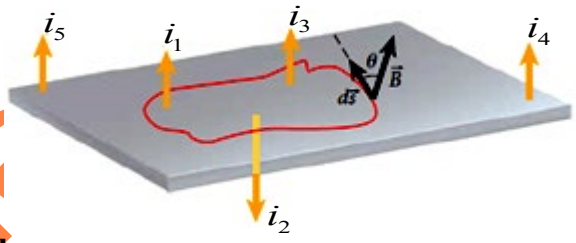
Q40) As shown in the figure, a long, hollow, conducting cylinder of inner radius $(a=5.0cm)$ and outer radius $(b=7.0cm)$ carries a current of $(100mA)$ uniformly distributed over the cylinder wall (between a and b) . Find the magnitude of the magnetic field at each of the following distances from the center of the cylinder .



1) $r=4.0cm$ **2)** $r=9.0cm$ **3)** $r=6.0cm$

Q41) Choose the correct answer in the following :

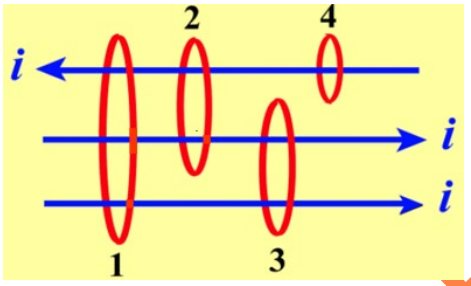
1) How much the value of $\oint \vec{B}.d\vec{s}$ along the Amperian loop shown in the figure .



a) $\mu_o(i_1-i_2+i_3)$ b) $\mu_o(i_1+i_3)$

c) $\mu_o(i_4-i_2+i_5)$ d) $\mu_o(i_1-i_2+i_3+i_4+i_5)$

2) Three wires are carrying currents of the same magnitude , in the directions shown in the figure . Four Amperian loops are shown . For which Amperian loop is the magnitude of $\oint \vec{B}.d\vec{s}$ the greatest ?



a) loop 1 b) loop 2

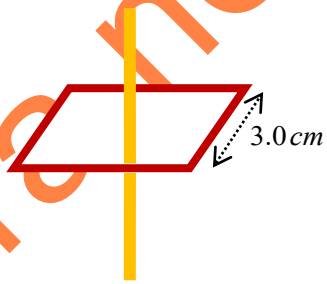
c) loop 3 d) loop 4

3) A cylindrical wire carries a constant current over its cross section . Where is the magnitude of the magnetic field the greatest ?

a) at the center of the cylinder's cross section b) in the middle of the cylinder

c) at the surface d) out of the cylinder

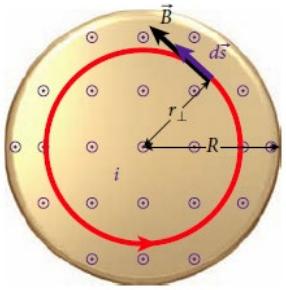
4) A square loop has sides of length $(3.0cm)$, as shown in the figure, the average value of the magnetic field measured on the sides is $(3.0G)$. Calculate the current in the wire ?



a) $2.7A$ b) $14.5A$

c) $9.68A$ d) $28.7A$

5) The following figure shows current (i) flowing in a wire with a circular cross section radius (R) . The red circle represents an Amperian loop of radius $(r_\perp)$. Referring to the figure , which of the following statements is correct ?



a) Magnetic field $(\vec{B})$ is tangential to the Amperian loop .

b) Current (i) is flowing into the page .

c) Magnetic field $(\vec{B})$ is normal to the Amperian loop .

d) Magnetic field $(\vec{B})$ points out of the page .

انتهت الوحدة 8

درس (8 – 5) و درس (8 – 6) ودرس (8 – 7) غير مطلوبة

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