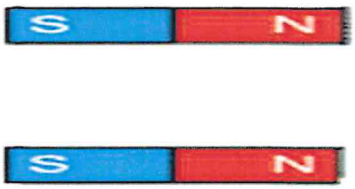
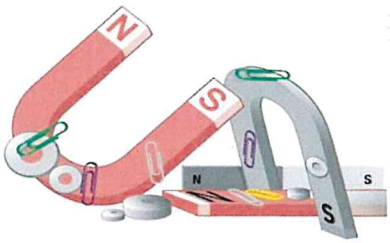
physics

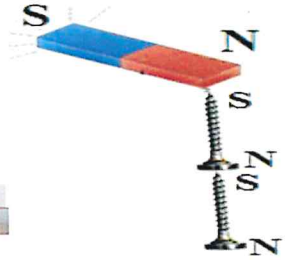
MAGNATIC EXPLIN

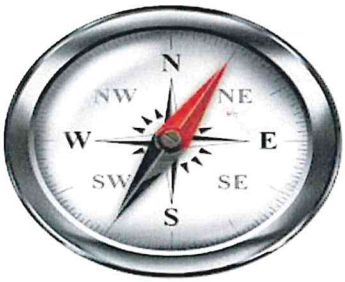
CH5

FAHED KAMAL ALSAGHBEENI

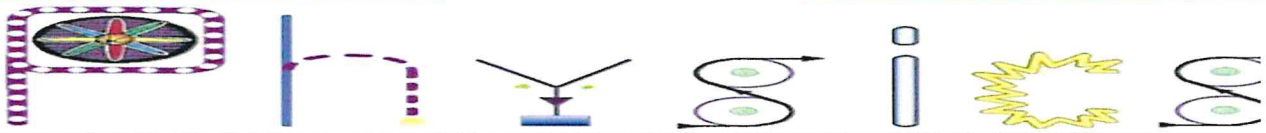








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PHYSICS

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يمكنكم الإنضمام لقناتنا الجديدة على Telegram بمسح الباركود :

او الضغط على الرابط: https://t.me/FahedKamal

Magnet. An object that attracts iron and some other materials.

المغناطيس: جسم يجذب الحديد وبعض المواد الاخر ى

Types of magnets:

1- Permanent magnets. They are magnets that do not lose their magnetization over time) such as natural magnets and industrial magnets

1- المغناطيس الدائم: وهو مغناطيس لا يفقد مغنطته بمرور الوقت .

2- Temporary magnets: They are magnets that lose its magnetization by time or by removing the impact)

2- مغناطيسات مؤقتة: وهي مغناط تفقد المغنطة بمرور الزمن أو بإزالة التأثير

Magnet properties

1- Magnet is Polarized (The magnets have north and south poles)

المغناطيس مستقطب

2- Similar (like) poles repel each other, and Unlike poles attract each other.

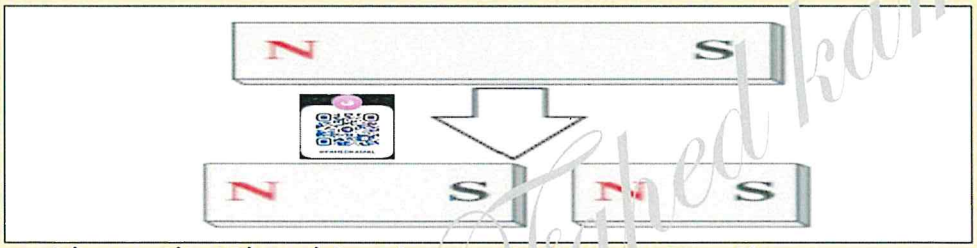
الاقطاب المتشابهة تتنافر والمختلفة تتجاذب

3- The north pole of the magnet is close to the south pole of the Earth magnet. and the south pole of the magnet is close to the north pole of the Earth magnet.

القطب الشمالي للمغناطيس قريب من القطب الجنوبي للمغناطيس الارضي. وكذلك القطب الجنوبي

4- If the magnet is divided into two parts, it produces two magnets with a north and south pole, and so on (That is, there is no single north or south pole as in the electric charge

إذا قسم المغناطيس الى قسمان ينتج مغناطيسان له قطب شمالي وجنوبي .أي لا يوجد قطب مفرد



5- Repulsion is evidence that the object isa magnet, not attraction.

التنافر هو الدليل على ان الجسم مغناطيس وليس التجاذب

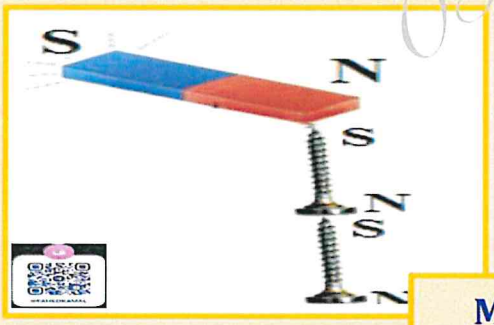
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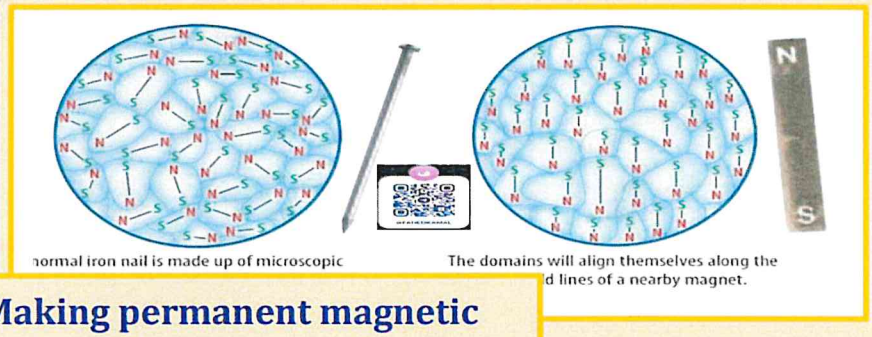
Magnet effect in other materials

تأثير ا لمغناطيس في المواد الأخرى

magnet (polarized). It has north and south poles, and the proximal side of the magnet is opposite pole, while the distant end is a similar pole which leads

عند تقريب أو ملامسة المغناطيس للمادة الفلزية , فانها تصبح مغناطيسا مؤقتا (أي تصبح مستقطبة(ويتكون لها قطبان شمالي وجنوبي ,





Making permanent magnetic

صناعة المغانط الدائمة



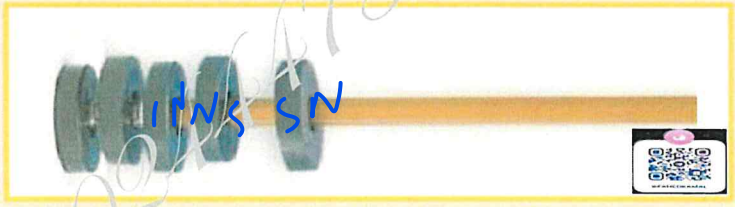
Problems

1. If you hold a bar magnet in each hand and bring your hands close together, will the force be attractive or repulsive if the magnets are held in the following ways?

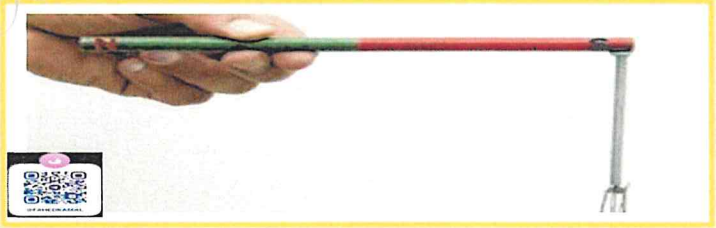
a. the two north poles are brought close together

b. a north pole and a south pole are brought together

2. Figure 4 shows five disk magnets floating above each other. The north pole of the top-most disk faces up. Which poles are on the top side of each of the other magnets?



3. A magnet attracts a nail, which, in turn, attracts many small tacks, as shown in Figure . If the north pole of the permanent magnet is the left end, as shown, which end of the nail is the south pole?



Magnetic Fields around Permanent Magnets المجال المغناطيسي للمغناطيسات الدائمة

Magnetic field: The area surrounding the magnet or around a wire or coil in which a current flows, where the effects of magnetic force are present

المنطقة المحيطة بالمغناطيس أو حول سلك أو ملف يتدفق فيه تيار حيث توجد فيها آثار القوة مغناطيسية

Magnetic field representation: The magnetic field is represented by imaginary lines called magnetic field lines.

يمثل المجال المغناطيس ي بواسطة خطوط وهمية تسمى "خطوط المجال المغناطيسي

The importance of magnetic field lines أهمية خطوط المجال المغناطيس

1 - Help us visualize the magnetic field تساعد على تصور المجال المغناطيسي

2 - Provide us with the ability to measure magnetic field strength توفر القدرة على قياس شدة المجال المغناطيسي

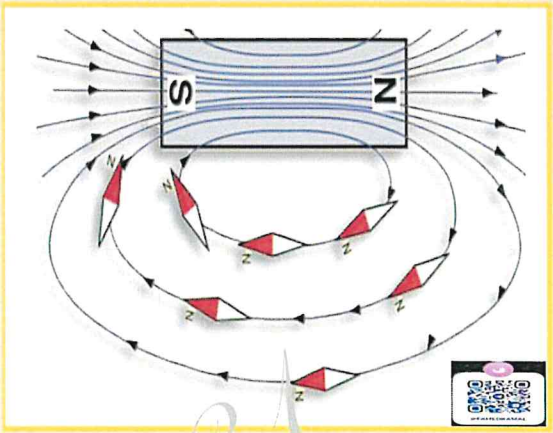
Characteristics of magnetic field lines خصائص خطوط المجال المغناطيسي

1 - Imaginary lines

2 - Concentrates and condenses at the poles of the magnet and is absent at its center. That is, the magnetic flow is as large as possible at the poles.

3 - Always graduated from the North Pole and enter the Antarctic outside the magnet, while inside the magnet, they start from the South Pole to the North Pole to form closed rings.

4 - Never intersect because each line has one direction

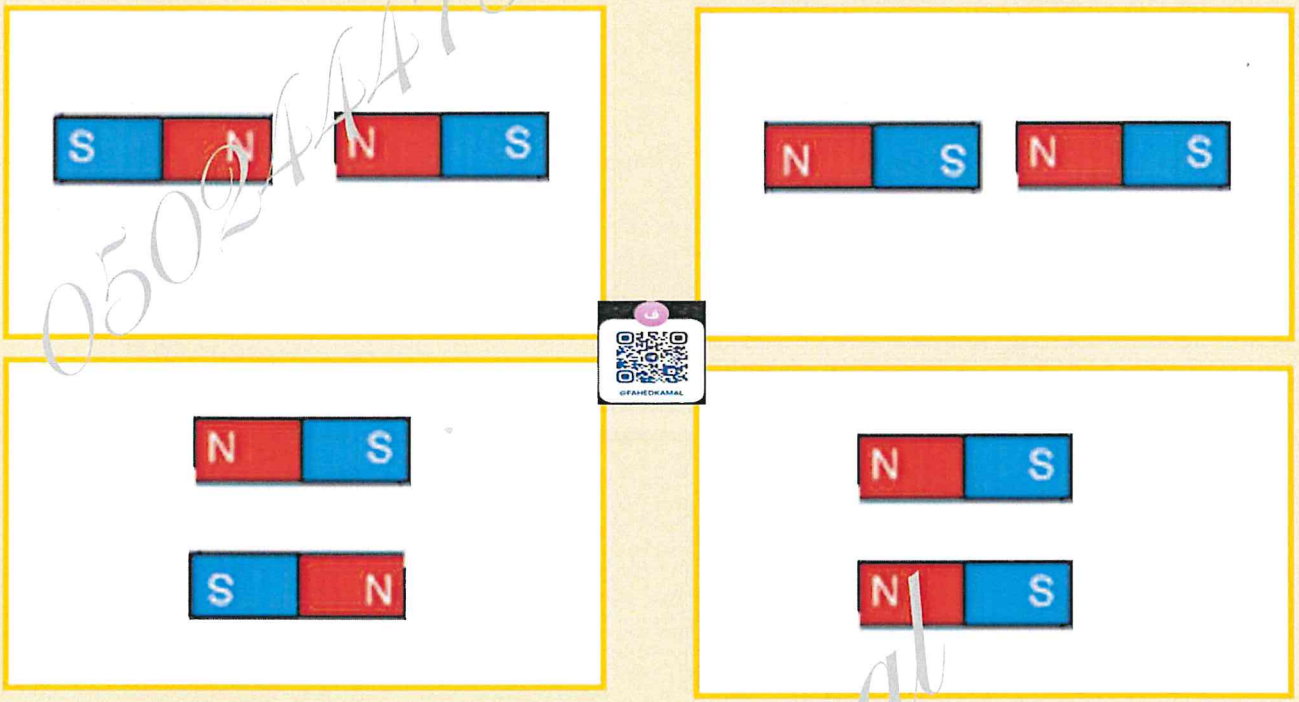


Magnetic Flow: The number of magnetic field lines that penetrate the surface. The flow across the unit spaces is directly proportional to the magnetic field strength.

عدد خطوط المجال المغناطيس ي التي تخترق السطح .والتدفق عبر وحدة المساحات يتناسب طرديا مع شدة المجال المغناطيسي

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5- Draw the resulting magnetic field from the following

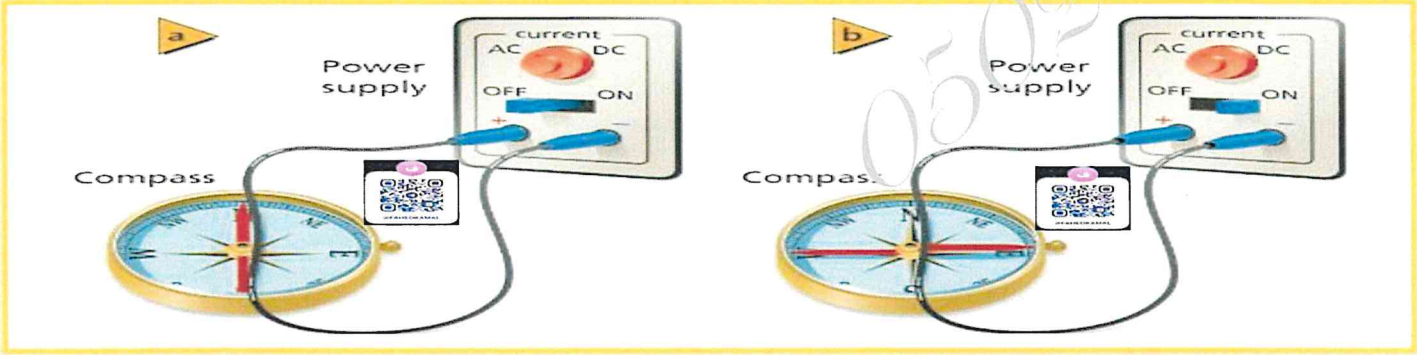


Electromagnetic

الكهرومغناطيسية

In the year 1820, the Danish physicist Hans Christian Oersted made an important discovery. He built an electric circuit with a compass aligned with a wire of the circuit. When he switched on the current, the magnetic needle turned so that it was perpendicular to the wire. When he reversed the current, the needle flipped by 180°, still perpendicular to .the wire

في عام 1820، اكتشف الفيزيائي الدنماركي هانز كريستيان أورستد اكتشافًا مهمًا. قام ببناء دائرة كهربائية ببوصلة محاذية لسلك الدائرة. وعندما قام بتشغيل التيار، دارت الإبرة المغناطيسية بحيث أصبحت متعامدة مع السلك. وعندما عكس التيار، انقلبت الإبرة بمقدار 180 درجة، ولا تزال متعامدة مع السلك.



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Symbols used to determine the direction of the magnetic field

1- Perpendicular the surface to inside

2- Perpendicular the surface to outside

3- parallel to the surface

1- عمودي على السطح للداخل

2- عمودي على السطح للخارج

3- مواز للسطح

1 - straight wire Magnetic field:

Circular Field:

The compass needle stays perpendicular to the current-carrying wire and the N-pole points in different directions around the wire .This indicates that there is a circular magnetic field that loops around a straight wire.

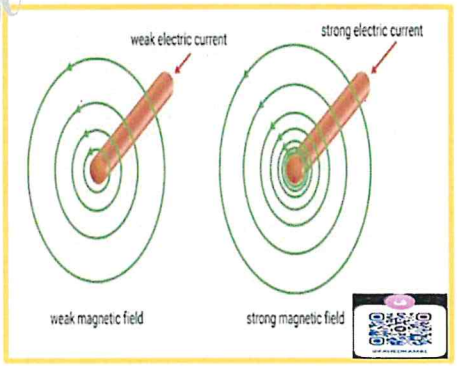
تظل إبرة البوصلة متعامدة مع السلك الذي يحمل التيار ويشير القطب N في اتجاهات مختلفة حول السلك. وهذا يشير إلى وجود مجال مغناطيسي دائري يدور حول سلك مستقيم



Strength of Current:

The magnetic field strength is directly proportional to the electric current.

قوة المجال المغناطيسي تتناسب طرديا مع التيار الكهربائي.



Distance From Wire

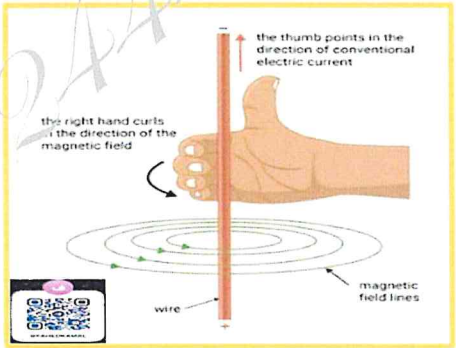
The magnetic field strength is directly proportional to the electric current.

قوة المجال المغناطيسي تتناسب طرديا مع التيار الكهربائي.



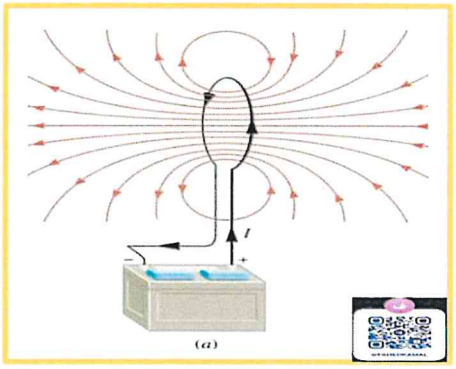
First right-Hand Rule

If you circle the wire with your right hand, your thumb will point in the direction of conventional current, your hand would curl in the direction of the magnetic field



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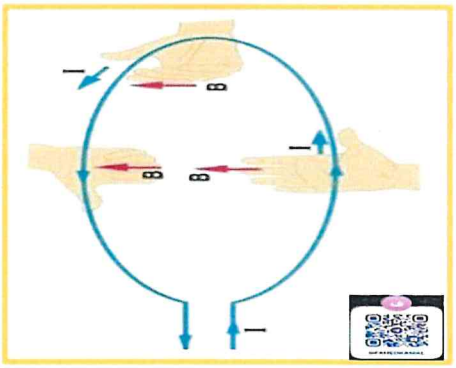
2 - Circular file (wire loop) Magnetic field المجال الناشئ عن حلقة دائرية



Stright Field in center circle:

Concentric circles around the wire coming out of One side and the other side. As for In the file center it is a regular domain.

دوائر متحدة المركز حول السلك تخرج من جهة والجهة الأخرى. أما في مركز الملفات فهو مجال منتظم.



First right-Hand Rule

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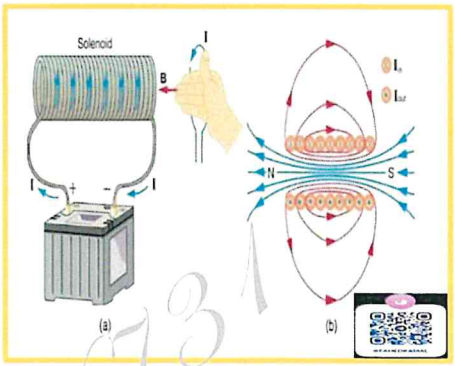
دوائر متحدة المركز حول السلك تخرج من جهة والجهة الأخرى. أما في مركز الملفات فهو مجال منتظم.

Strength of Current and reduce:

The field strength is directly proportional to the current and number of turns and inversely proportional to the radius of the coil

تتناسب شدة المجال طرديا مع شدة التيار وعدد اللفات وعكسيا مع نصف قطر الملف

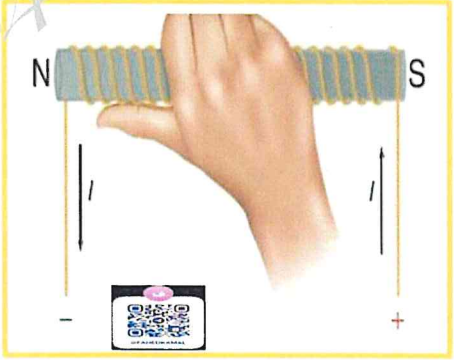
3 - The coil Magnetic field المجال الناشئ عن ملف لولبي



Stright Field in center Solenoid:

Outside the file: The resulting domain is similar to a rod Permanent magnet. Inside the file: The domain is in the form of lines Parallel to the file axis (regular domain). Except at parties.

خارج الملف :يشبه المجال الناتج عن قضيب مغناطيس ي دائم .داخل الملف :المجال يكون على شكل خطوط متوازية بالقرب من محور الملف) مجال منتظم(.عدا عند الأطراف)



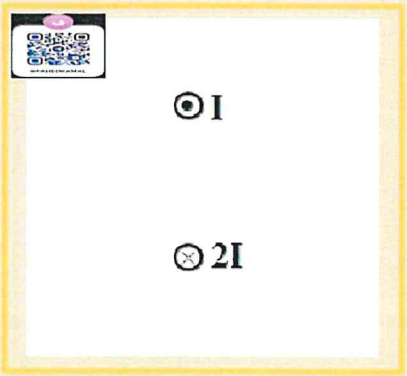
Second right-Hand Rule

The field strength is directly proportional to the current and number of turns and inversely proportional to the length of the coil

تتناسب شدة المجال طرديا مع شدة التيار وعدد اللفات وعكسيًا مع طول الملف

Problems

1 - The figure next to it shows a *I* wire running in a vertical direction at the page level and outside.

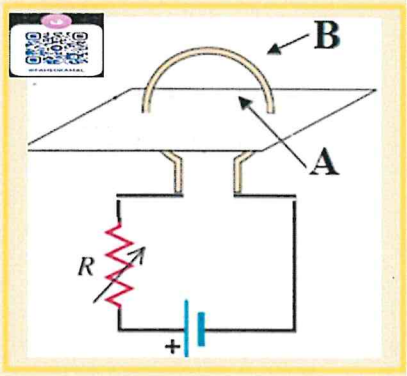


a. Draw the magnetic field of the current.

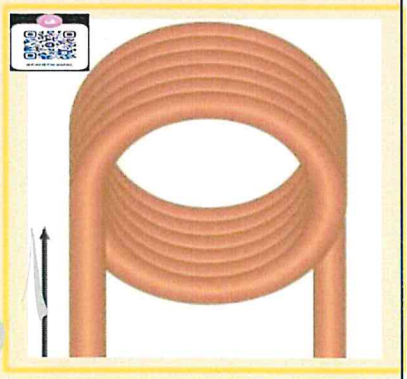
b. What is the name of the rule you used to determine the direction of the magnetic field.
Rule Name: .....

c. Draw the lines of the magnetic field when the wire passes a current of 2*I* In the opposite direction (perpendicular to the page level of the inside)

d. What effect the increase in the amount of current on the lines of the magnetic field.
.....



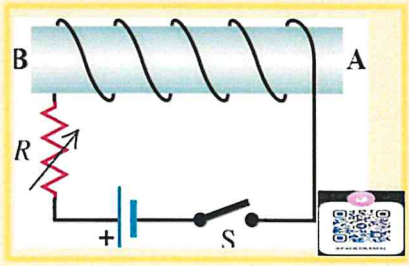
2 - A wire loop (circular file) in which an electrical current is passed as shown in the adjacent shape.
a. Draw the magnetic field generated in the wire loop and select its direction.
b. Select the type of magnetic poles that are formed on the sides of the circular coil.
A : .... **B :** ....



3 - Figure shows the end view of an electromagnet with current flowing through it.
a. What is the direction of the magnetic field inside the loops?
b. What is the direction of the magnetic field outside the loops?

4 - The next to it shows an electric magnet (a coil in which a current is flowing).

a. Draw the magnetic field generated by the coil and specify its orientation.

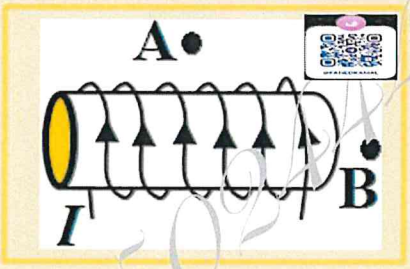


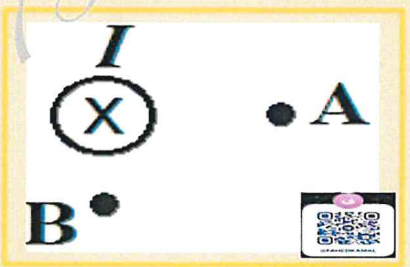
b. Identify the magnetic poles formed. **A :** .... **B :** .....

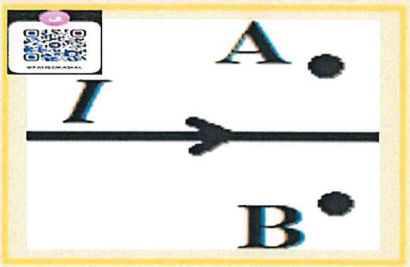
c. What is the name of the rule you used to determine the direction of the field and the typs of poles „ Rule Name: .....

Problems

5 - Determine the direction of the magnetic field at the points A , B . of each of the following figures:







6 - A long, straight, current-carrying wire runs from north to south.

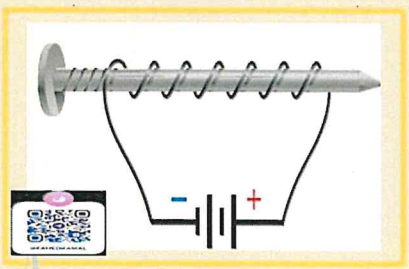
a. A compass needle placed above the wire points with its north pole toward the east. In what direction is the current flowing?

b. If a compass is put underneath the wire, in which direction will the compass needle point?

7 - How does the strength of a magnetic field, 1 cm from a currentcarrying wire, compare with each of the following?

a. the strength of the field that is 2 cm from the wire

b. the strength of the field that is 3 cm from the wire



8 - A student makes a magnet by winding wire around a nail and connecting it to a battery, as shown in **Figure.** Which end of the nail, the pointed end or the head, will be the north pole?

9 - You have a spool of wire, a glass rod, an iron rod, and an aluminum rod. Which rod should you use to make an electromagnet to pick up steel objects? Explain.

10 - The electromagnet in problem 8 works well, but you decide that you would like to make its strength adjustable by using a potentiometer as a variable resistor. Is this possible? Explain.

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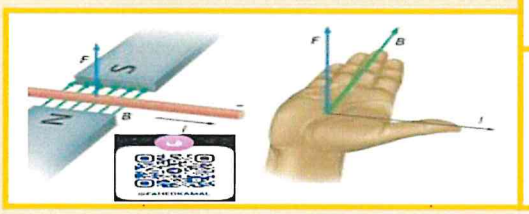
Forces on Currents in Magnetic Fields

القوة المؤثرة في سلك يحمل تيار كهربائي موضوع في مجال مغناطيسي

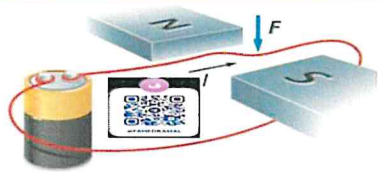
When a straight wire is placed, the length of (**L**) which passes through an electric current(*I*) the intensity of which between the poles of the magnets of its field **(B)**generates a magnetic force**(F)** that affects the thickness calculated from the relationship $F = BIl \sin\theta$ **Their direction** is determined by using the third rule of the right hand

عند وضع سلك مستقيم طوله**(L)** يمر فيه تيار كهربائي شدته (*I*) بين قطبي مغناطيس شدة مجاله**(B)** تتولد قوة مغناطيسية**(F)** تؤثر على السك تحسب من العلاقة ويحدد اتجاهها باستخدام القاعدة الثالثة لليد اليمنى

$$F = BIl \sin\theta$$



Third right hand rule



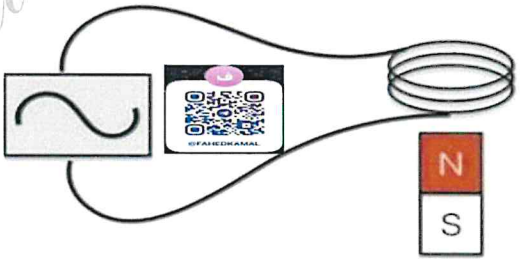
Application:

Earbuds: A wire wound on a piece of iron

And permanent magnet

سلك يتم لفه على قطعة من الحديد،

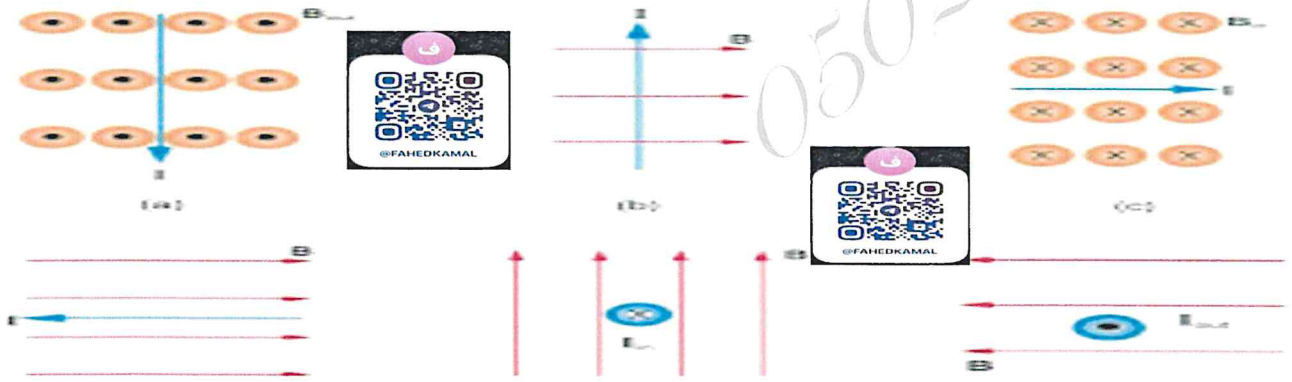
ومغناطيس دائم



Application:

Determine the direction of force affecting a wire carrying a current in a magnetic field for each of the following situations:

حدد اتجاه القوة المؤثرة في سلك يحمل تيارا موضوع في مجال مغناطيس ي لكل من الحالات التالية:



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Problems

11- What is the name of the rule used to predict the direction of force on a current carrying wire at right angles to a magnetic field? Identify what must be known to use this rule.

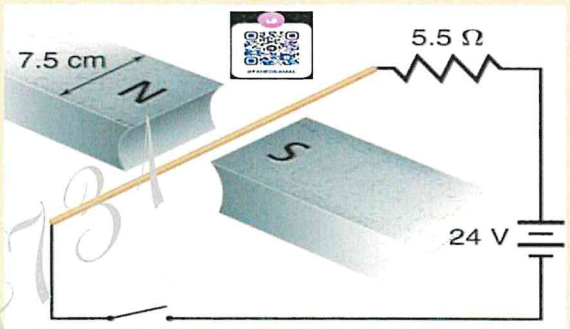
12- A wire that is 0.50 m long and carrying a current of 8.0 A is at right angles to a 0.40-T magnetic field. How strong is the force that acts on the wire?

13- A wire that is 75 cm long, carrying a current of 6.0 A, is at right angles to a uniform magnetic field. The magnitude of the force acting on the wire is 0.60 N. What is the strength of the magnetic field?

14- A 40.0-cm-long copper wire carries a current of 6.0 A and weighs0.35 N. A certain magnetic field is strong enough to balance the force of gravity on the wire. What is the strength of the magnetic field?

15- How much current will be required to produce a force of 0.38 N on a 10.0 cm length of wire at right angles to a 0.49-T field?

16- A copper wire of insignificant resistance is placed in the center of an air gap between two magnetic poles, as shown in **Figure** The field is confined to the gap and has a strength of 1.9 T.



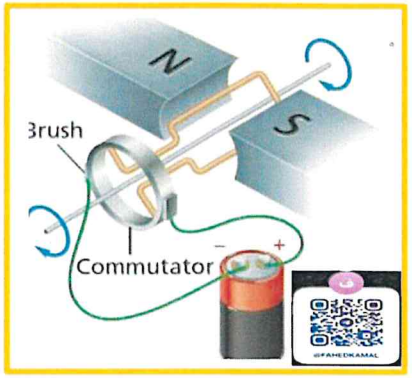
a. Determine the force on the wire (direction and magnitude) when the switch is open

b. Determine the force on the wire (direction and magnitude) when the switch is closed.

c. Determine the force on the wire (direction and magnitude) when the switch is closed and the battery is reversed.

d. Determine the force on the wire (direction and magnitude) when the switch is closed and the wire is replaced with a different piece having a resistance of 5.5 Ω

Application2:



Electric motor : a device used to convert electrical energy into rotational motor energy.

Consists of : a file of conductive material and a subject between the poles of a permanent magnets and a source of current and a cylindrical ring and two pushes

The idea of his work: the magnetic force affecting a conductor in a magnetic field and passing through an electric current

How to work: In order to get rotational movement of the file ring, the direction of the current passing through the ring must be reversed when it becomes vertical. This reversing allows the ring to continue its rotation. To reverse the trend, the continuity of the conductions should be maintained through the two-halving ring called the inverter.

المحرك الكهربائي : هو جهاز يستخدم لتحويل الطاقة الكهربائية إلى طاقة حركية دورانية.

يتكون من : ملف من مادة موصلة , موضوع بين قطبي مغناطيس دائم ومصدر تيار وحلقة اسطوانية مقسومة إلى نصفين وفرشاتان من الجرافيت

فكرة عمله : القوة المغناطيسية المؤثرة على موصل يمر به تيار كهربي و موضوع في مجال مغناطيس ي

طريقة العمل : لكي نحصل على حركة دورانية لحلقات الملف يجب أن ينعكس اتجاه التيار المار في الحلقة عندما تصبح في وضع رأس ي. وهذا الانعكاس يسمح للحلقة بمواصلة دورانها. ولعكس اتجاه التيار يجب المحافظة على استمرار التوصيلات وذلك من خلال الحلقة المقسومة النصفين وتسمى عاكس التيار.

Draw: الرسم

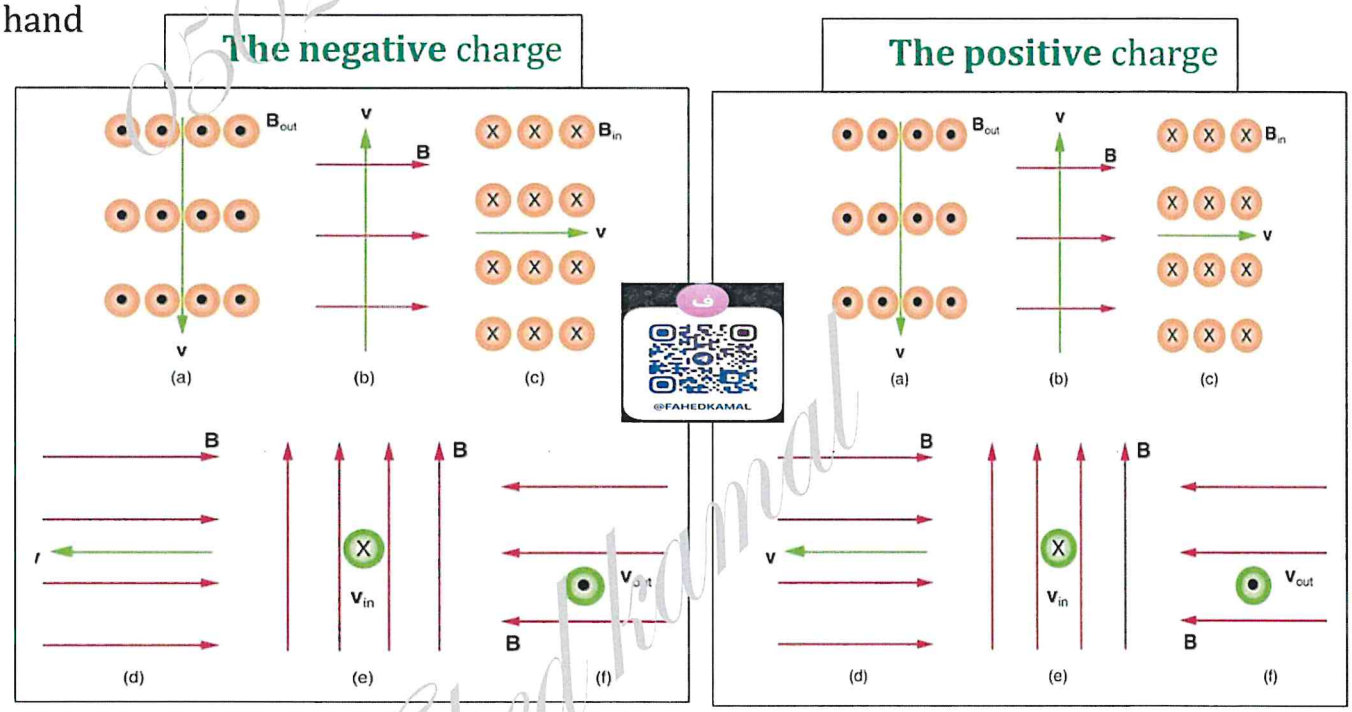
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Fahed kamal

The Force on a Single Charged القوة المؤثرة على شحنة مفردة

The force produced by a magnetic field on a single Charge (q) depends on the velocity (v) of the Charge, the strength of the field (B) and the angle between directions of the velocity and the field (θ).

$$F = Bqv \sin\theta$$

1- The Positive charge is the direction of the force out of the palm of the hand
2- The negative charge is the direction of the force inward from the palm of the hand



The shape of the charge movement with the force effect

شكل حركة الشحنة مع تأثير القوة

The movement of the charge takes the circular path if the direction of the velocity is perpendicular to the direction of the field and the Solenoid or spiral track if the direction of speed is non-vertical

تتخذ حركة الشحنة المسار الدائري إذا كان اتجاه السرعة عمودي على اتجاه المجال والمسار اللولبي او الحلزوني إذا كان اتجاه السرعة غير عمودي.

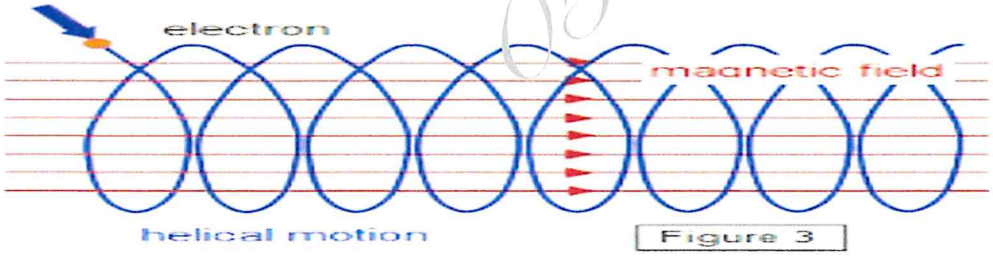
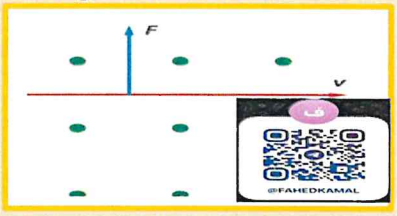


Figure 3

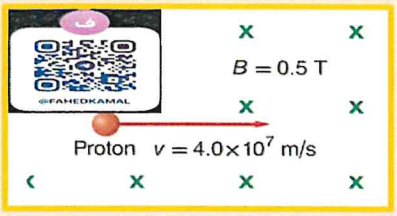
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Problems

17- In what direction does the thumb point when using the third righthand rule for an electron moving at right angles to a magnetic field?



18- An electron passes through a magnetic field at right angles to the field at a velocity of $4.0\times10_6$ m/s. The strength of the magnetic field is 0.50 T. What is the magnitude of the force acting on the electron?



19- A stream of doubly ionized particles (missing two e ectrons, and thus, carrying a net charge of two elementary charges) moves at a velocity of $3.0\times10_4$ m/s perpendicular to a magnetic field of$9.0\times10_{-2}$ T. What is the magnitude of the force acting on each ion?



20 -Triply ionized particles in a beam carry a net positive charge of three elementary charge units. The beam enters a magnetic field of $4.0\times10_{-2}$ T. The particles have a speed of $9.0\times10_6$ m/s. What is the magnitude of the force acting on each particle?

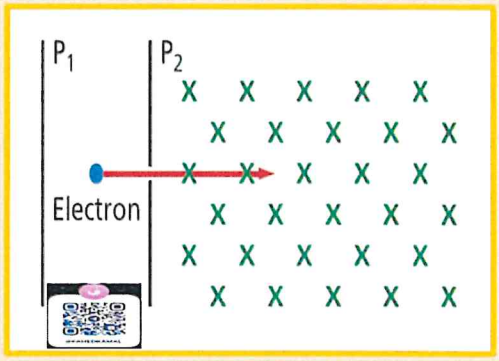


21- Doubly ionized helium atoms (alpha particles) are traveling at right angles to a magnetic field at a speed of $4.0\times10_4$ m/s. The field strength is $5.0\times10_{-2}$ T. What force acts on each particle?



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22- An electron is accelerated from rest through a potential difference of 20,000 V, which exists between plates P1 and P2, shown in Figure The electron then passes through a small opening into a magnetic field of uniform field strength, B. As indicated, the magnetic field is directed into the page.



a. State the direction of the electric field between the plates as either P1 to P2 or P2 to P1.

b. In terms of the information given, calculate the electron's speed at plate P2.

GOOD LUCK

لكم مني اطيب التمنيات بالتوفيق



يمكنكم الإنضمام لقناتنا الجديدة على Telegram بمسح الباركود :

او الضغط على الرابط: https://t.me/FahedKamal