MAGNETS AND MAGNETISM pdf

1: magnetism | Definition, Examples, Physics, & Facts | www.enganchecubano.com

Magnetism is one aspect of the combined electromagnetic force. It refers to physical phenomena arising from the force caused by magnets, objects that produce fields that attract or repel other.

The compass, an important device for navigation, has a suspended magnet which aligns parallel to the magnetic field produced by the Earth and as a result points to the North pole The compass was documented as early as The Ching Tsung Yao describes how iron can be magnetised by heating and quenching in water. It is known that the Vikings used Lodestone to navigate. By the end of the twelfth century, Europeans were using this simple compass to aid navigation. A steel needle stroked with such a "lodestone" became "magnetic" as well. In , William Gilbert also known as Gilberd of Colchester proposed an explanation in his work De Magnet for the operation of the compass and that The Earth itself was a giant magnet, with its magnetic poles some distance away from its geographic ones i. He made an experimental model of the earth by creating a Lodestone sphere. Properties of Magnets William Gilbert also experimented on bar magnets and found the following properties: A magnet will always have two poles which we call arbitrarily North and South. I the magnet is broken in two this will create two new magnets with North N and South S poles. If a bar magnet is broken in two, at the fracture new north and south poles are formed at the point of fracture. Properties of Magnets Like poles repel each other. If a N pole is brought close to the N pole of a second magnet a repulsive force will be felt. Similarly if a S pole is brought close to the S pole of another magnet, the two magnets will repel each other. Unlike poles attract and will stick together. Magnets attract iron rich materials and like poles and the repulsion between like poles can be reduced if a strip of iron is placed between them. The Domain Theory of Magnetism How can we explain these intriguing properties? The domain theory states that inside a magnet there are small regions in which the magnetic direction of all the atoms are aligned in the same directions. These regions are known as domains. Within a domain, the aligment of the magnetic direction is the same. In the next domain it may be in a completely different direction. On average over the many domains in the magnet there there is no preferential direction for the magnetic force. However, using an external magnetic field from another magnet say, the direction of the magnetic direction in each domain can be made to align with the magnetic field the net magnetic field can be increased. Why do Magnetic Domains Form? Consider a bar magnet which has been been magnetised such that the entire magnet forms a single magnetic domain. Surface charges will appear at either end of the crystal. Associated with the surface charges is a secondary magnetic field called the demagnetising field which acts to reduce the magnetic field. The energy of the surface charges is called the magnetostatic energy. Domain Formation in a Magnet The magnetostatic energy can be reduced if the crystal forms a second domain, magnetised in the opposite direction. In this way, the separation of positive and negative surface charges are reduced decreasing the spatial extent of the demagnetising field. Naturally, one might ask, if the magnetostatic energy is reduced by the formation of domains, can they carry on forming indefinitely? To which the answer is no. The reason being that energy is required to produce and maintain the region of transition from one domain to another, the domain wall. Equilibrium will be reached when the magnetostatic energy is equal to the energy required to maintain the domain walls. However, domains are much larger than the individual molecules within the magnet. There are only 4 ferromagnetic elements at room temperature. Of these, iron Fe , nickel Ni , and cobalt Co are shown above. The fourth is gadolinium Gd. The pictures below show the formation made visible with the use of magnetic colloidal suspensions which concentrate along the domain boundaries. The domain boundaries can be imaged by polarized light, and also with the use of electron diffraction. Observation of domain boundary movement under the influence of applied magnetic fields has aided in the development of theoretical treatments. It has been demonstrated that the formation of domains minimizes the magnetic contribution to the free energy. If a magnetic field is applied to the crystal, the domains that align with the magentic field will grow as the expense of the domains that are pointing in other directions. Atomic Theory of Magnetism We are familiar with the model of the atom with a nucleus that contains the protons and neutrons and electron orbit the nucleus. Within the atom, the electrons behave as if they are magnets. Electrons, protons and neutrons all have a magnetic dipole moments however the magnetic moment of an electron is the most significant. In fact it is conveniently assigned a unit called the Bohr magneton, which is equal to the magnetic dipole moment of an electron. The Magnetic Field Magnetic field strength is given the symbol H with the unit Tesla Magnetic flux density is given the symbol B and has the unit W m-2 To measure the magnetic field caused by a current the Biot Savart law is used The magnetic field is a vector field which means that it has a magnitude and direction for each point in space. The strength and direction of the magnetic field at any point is defined in terms of the force on a moving charged particle such as an electron. The force created the magnetic field comes from the Lorentz equation without the electric field. The magnetude and direction come from the Lorentz force equation. Since a magnetic monopole has never been found, it does not make sense to talk about a magnetic point charge. Instead, lines of magnetic field form closed loops along line of equal magnetic force. The strength of the magnetic field is determined by the number of field lines passing a unit area. The more field lines the stronger the magnetic field. A unit of magnetic field strength is known as the Gauss is defined as one magnetic field line per square centimetre. The direction of the field line could be determined by using a compass needle. Its direction creates a tangent line to the magnetic field at that point. By convention the arrow tip on magnetic field lines points towards the south magnetic pole and away from the north magnetic pole. The magnetic poles alway occur in pairs, no one has ever found a magnetic monopole, though there is research into their posible existance. The image shows the field lines produced by a bar magnet. Iron fillings are sprinked on a piece of paper and the bar-magnet is placed under the paper. The iron-fillings line up and show the intensity of the magnetic field.

2: Magnetism | Define Magnetism at www.enganchecubano.com

Magnetism is a class of physical phenomena that are mediated by magnetic fields. Electric currents and the magnetic moments of elementary particles give rise to a magnetic field, which acts on other currents and magnetic moments.

Magnetic field The magnetic flux density also called magnetic B field or just magnetic field, usually denoted B is a vector field. The magnetic B field vector at a given point in space is specified by two properties: Its direction, which is along the orientation of a compass needle. Its magnitude also called strength , which is proportional to how strongly the compass needle orients along that direction. In SI units, the strength of the magnetic B field is given in teslas. A magnet both produces its own magnetic field and responds to magnetic fields. The strength of the magnetic field it produces is at any given point proportional to the magnitude of its magnetic moment. In addition, when the magnet is put into an external magnetic field, produced by a different source, it is subject to a torque tending to orient the magnetic moment parallel to the field. A magnet may also be subject to a force driving it in one direction or another, according to the positions and orientations of the magnet and source. If the field is uniform in space, the magnet is subject to no net force, although it is subject to a torque. A good bar magnet may have a magnetic moment of magnitude 0. Iron can have a magnetization of around a million amperes per meter. Such a large value explains why iron magnets are so effective at producing magnetic fields. Modelling magnets See also: Two definitions of moment Two different models exist for magnets: Although for many purposes it is convenient to think of a magnet as having distinct north and south magnetic poles, the concept of poles should not be taken literally: The magnet does not have distinct north or south particles on opposing sides. If a bar magnet is broken into two pieces, in an attempt to separate the north and south poles, the result will be two bar magnets, each of which has both a north and south pole. However, a version of the magnetic-pole approach is used by professional magneticians to design permanent magnets. This is a mathematical convenience and does not imply that there are actually monopoles in the magnet. If the magnetic-pole distribution is known, then the pole model gives the magnetic field H. Outside the magnet, the field B is proportional to H, while inside the magnetization must be added to H. An extension of this method that allows for internal magnetic charges is used in theories of ferromagnetism. For a uniformly magnetized cylindrical bar magnet, the net effect of the microscopic bound currents is to make the magnet behave as if there is a macroscopic sheet of electric current flowing around the surface, with local flow direction normal to the cylinder axis. For example, one method would be to compare it to an electromagnet , whose poles can be identified by the right-hand rule. Magnetism The term magnet is typically reserved for objects that produce their own persistent magnetic field even in the absence of an applied magnetic field. Only certain classes of materials can do this. Most materials, however, produce a magnetic field in response to an applied magnetic field â€" a phenomenon known as magnetism. There are several types of magnetism, and all materials exhibit at least one of them. The overall magnetic behavior of a material can vary widely, depending on the structure of the material, particularly on its electron configuration. Several forms of magnetic behavior have been observed in different materials, including: Ferromagnetic and ferrimagnetic materials are the ones normally thought of as magnetic; they are attracted to a magnet strongly enough that the attraction can be felt. These materials are the only ones that can retain magnetization and become magnets; a common example is a traditional refrigerator magnet. Ferrimagnetic materials, which include ferrites and the oldest magnetic materials magnetite and lodestone , are similar to but weaker than ferromagnetics. The difference between ferro- and ferrimagnetic materials is related to their microscopic structure, as explained in Magnetism. Paramagnetic substances, such as platinum , aluminum , and oxygen , are weakly attracted to either pole of a magnet. This attraction is hundreds of thousands of times weaker than that of ferromagnetic materials, so it can only be detected by using sensitive instruments or using extremely strong magnets. Magnetic ferrofluids , although they are made of tiny ferromagnetic particles suspended in liquid, are sometimes considered paramagnetic since they cannot be magnetized. Diamagnetic means repelled by both poles. Compared to paramagnetic and ferromagnetic substances, diamagnetic substances, such as carbon , copper , water , and plastic , are even more weakly repelled by a magnet. The permeability of diamagnetic materials is less than the permeability of a vacuum. All substances not possessing one of the other types of magnetism are diamagnetic; this includes most substances. Although force on a diamagnetic object from an ordinary magnet is far too weak to be felt, using extremely strong superconducting magnets , diamagnetic objects such as pieces of lead and even mice [19] can be levitated , so they float in mid-air. Superconductors repel magnetic fields from their interior and are strongly diamagnetic. There are various other types of magnetism, such as spin glass , superparamagnetism , superdiamagnetism , and metamagnetism. Common uses Hard disk drives record data on a thin magnetic coating Magnetic hand separator for heavy minerals Magnetic recording media: VHS tapes contain a reel of magnetic tape. The information that makes up the video and sound is encoded on the magnetic coating on the tape. Common audio cassettes also rely on magnetic tape. Similarly, in computers, floppy disks and hard disks record data on a thin magnetic coating. All of these cards have a magnetic strip on one side. TV and computer screens containing a cathode ray tube employ an electromagnet to guide electrons to the screen. Most speakers employ a permanent magnet and a current-carrying coil to convert electric energy the signal into mechanical energy movement that creates the sound. The coil is wrapped around a bobbin attached to the speaker cone and carries the signal as changing current that interacts with the field of the permanent magnet. The voice coil feels a magnetic force and in response, moves the cone and pressurizes the neighboring air, thus generating sound. Dynamic microphones employ the same concept, but in reverse. A microphone has a diaphragm or membrane attached to a coil of wire. The coil rests inside a specially shaped magnet. When sound vibrates the membrane, the coil is vibrated as well. As the coil moves through the magnetic field, a voltage is induced across the coil. This voltage drives a current in the wire that is characteristic of the original sound. Electric guitars use magnetic pickups to transduce the vibration of guitar strings into electric current that can then be amplified. This is different from the principle behind the speaker and dynamic microphone because the vibrations are sensed directly by the magnet, and a diaphragm is not employed. The Hammond organ used a similar principle, with rotating tonewheels instead of strings. Electric motors and generators: Some electric motors rely upon a combination of an electromagnet and a permanent magnet, and, much like loudspeakers, they convert electric energy into mechanical energy. A generator is the reverse: Chemists use nuclear magnetic resonance to characterize synthesized compounds. Chucks are used in the metalworking field to hold objects. Magnets are also used in other types of fastening devices, such as the magnetic base , the magnetic clamp and the refrigerator magnet. Vinyl magnet sheets may be attached to paintings, photographs, and other ornamental articles, allowing them to be attached to refrigerators and other metal surfaces. Objects and paint can be applied directly to the magnet surface to create collage pieces of art. Magnetic art is portable, inexpensive and easy to create. Vinyl magnetic art is not for the refrigerator anymore. Colorful metal magnetic boards, strips, doors, microwave ovens, dishwashers, cars, metal I beams, and any metal surface can be receptive of magnetic vinyl art. Being a relatively new media for art, the creative uses for this material is just beginning. Many topic questions are based on magnets, including the repulsion of current-carrying wires, the effect of temperature, and motors involving magnets. M-tic uses magnetic rods connected to metal spheres for construction. Note the geodesic tetrahedron Toys: Refrigerator magnets are used to adorn kitchens, as a souvenir , or simply to hold a note or photo to the refrigerator door. Magnets can be used to make jewelry. Necklaces and bracelets can have a magnetic clasp, or may be constructed entirely from a linked series of magnets and ferrous beads. Magnets can pick up magnetic items iron nails, staples, tacks, paper clips that are either too small, too hard to reach, or too thin for fingers to hold. Some screwdrivers are magnetized for this purpose. Magnets can be used in scrap and salvage operations to separate magnetic metals iron, cobalt, and nickel from non-magnetic metals aluminum, non-ferrous alloys, etc. The same idea can be used in the so-called "magnet test", in which an auto body is inspected with a magnet to detect areas repaired using fiberglass or plastic putty. Magnets are found in process industries, food manufacturing especially, in order to remove metal foreign bodies from materials entering the process raw materials or to detect a possible contamination at the end of the process and prior to packaging. They constitute an important layer of protection for the process equipment and for the final consumer. Eliminating rolling resistance increases efficiency. Magnets may be used to serve as a fail-safe device for some cable connections. For example, the power cords of some laptops are magnetic to prevent accidental damage to the port when tripped over. Medical issues and safety Because human tissues have a very low level of susceptibility to static magnetic fields, there is little mainstream scientific evidence showing a health effect associated with exposure to static fields. Dynamic magnetic fields may be a different issue, however; correlations between electromagnetic radiation and cancer rates have been postulated due to demographic correlations see Electromagnetic radiation and health. If a ferromagnetic foreign body is present in human tissue, an external magnetic field interacting with it can pose a serious safety risk. It is for this reason that a patient with the device installed cannot be tested with the use of a magnetic resonance imaging device. Children sometimes swallow small magnets from toys, and this can be hazardous if two or more magnets are swallowed, as the magnets can pinch or puncture internal tissues; one death has been reported. MRIs generate enormous magnetic fields, and therefore rooms intended to hold them exclude ferrous metals. Bringing objects made of ferrous metals such as oxygen canisters into such a room creates a severe safety risk, as those objects may be powerfully thrown about by the intense magnetic fields. Magnetizing ferromagnets See also:

3: Magnetic force on a charge (video) | Khan Academy

News about magnets and magnetism, including commentary and archival articles published in The New York Times.

Energy used or produced per second. Charged particles are at the basis of all electricity. Static electricity is a phenomenon caused by electric charges at rest. In this section, you will study what happens when charged particles start moving collectively. In this section, we will discuss electrons as carriers of charge, but other types of particles can also carry charge. See the Technical Note: Direction of Electric Current for more details. Certain materials have some loosely held electrons, which can escape from one atom and move around easily between other atoms. We call these electrons free electrons. Materials with a lot of free electrons are called conductors. They conduct electricity well. Most metals are good conductors. When a lot of free electrons are all moving in the same direction, we call it an electric current. The amount of electric current refers to the number of electrons to be precise, their charges passing through an area per unit of time, and is measured in amperes usually called amps for short, abbreviated with a capital A. One ampere equals roughly 6. Because the electron has such a small charge, the coulomb abbreviated with a capital C is often used as unit of charge for 6. Because electrons carry a negative charge and a coulomb refers to a positive charge, some definitions are needed. These are explained in the Technical Note: Direction of Electric Current. Just like water needs a pressure difference to start flowing, electrons require an electric potential difference to make them move. The potential difference provides the energy to create movement. Electric potential difference is also called voltage and it is measured in volts abbreviated V. In the case of water, pressure can be created by a water pump or difference in height, like a water tower. In electronics, batteries and electric generators are the common sources of voltage. The presence of two different charges also creates a voltage; it gives the electric charges the energy to flow. Conductors allow current to flow through them easily, and charges do not lose much energy as they flow through these materials. Similar to how water gets slowed down when it encounters a smaller section in a pipe, electric current can encounter materials that are harder to get through. The higher the value of the resistance, the more the material hinders or resists the current, and the more energy is lost as current flows through it. The total electric energy provided by a source is the amount of charge times the voltage. A source providing a larger voltage or more charges more electrons will both result in delivering more electric energy, which, in turn, allows it to power "heavier" electric devices or appliances. Energy Consumed explains this in more detail. Direction of Electric Current Electrons, being small and light, move easily and create the bulk of electric current we encounter, like current received from wall sockets or produced by most batteries. For this reason, we will continue to discuss electricity as the flow of electrons. Sometimes, electric current is created by the flow of other charged particles, like ions atoms that have a net electric charge due to a lack or surplus of electrons. To accommodate all variations, electric current is more accurately defined as the amount of electric charge passing per unit of time, regardless of what particles carry the electric charge. So far, we have only described the amount of current. The direction is given by the sign positive or negative of the current. Conventionally, positive electric current is opposite the direction of electron flow. This is called the conventional current. This means that if you draw an arrow in the direction electrons are moving through a wire, the conventional current points in the opposite direction. If the current is represented by a positive variable referred to as the conventional current, represented by a red arrow in the figure , the arrow representing the direction of current will point opposite to the movement of the electrons represented with a blue arrow. Batteries are often used as a source of electric current. The negative terminal has a surplus of electrons, giving it a net negative charge. These electrons flow from the negative terminal to the positive terminal when there is a conductive path connecting them. The direction of conventional current is opposite thisâ€”from the positive terminal to the negative terminal, as shown in Figure 3. When conductive material connects the two terminals of a battery, electrons will flow from the negative to the positive terminal. The conventional current will point from the positive to the negative terminal. Energy Consumed Most of our appliances specify how much electric energy they require per second they are in use. This is called a power expressed in watts abbreviated W. Power represents the amount of electric energy or voltage times charge consumed by the appliances per second it is running. If you write these relationships out in equation form: And then rearrange the equations a bit try this out if you know how to do algebra you can see that electric power is equal to voltage times current: And that energy is equal to power times time: Your electric bill expresses your use of electric energy in kilowatt-hours. However, note that the electricity supplied to your house by power lines is alternating current, meaning the voltage and current change with time instead of remaining constant. This is explained in the next section. Related Science Projects Click here for a list of science projects related to electric current. Summary of Key Concepts Current can only flow in a closed circuit of conductive material. In direct current DC , electrons all move in the same direction. In alternating current AC , electrons move back and forth with a specific frequency measured in hertz Hz. Never plug a homemade circuit directly into a wall outlet; the alternating current from the wall outlet can harm you badly. AC In the Current Electricity section, you learned about electric charge, current, voltage and other related topics. But, just because you have a voltage does not mean electric current will flow. Electrons also need a complete loop of conductive material to flow, called a closed circuit. When you turn the switch "on", the switch creates a path that conducts electricity and electrons start to moveâ€”meaning electric current flowsâ€”and the light turns on. As soon as you turn the switch "off", the path is broken and electrons can no longer flow. The switch is like a drawbridge; switching it on is letting down the bridge so the electrons can cross just like cars crossing a bridge and provide energy to the light bulb. Illustration of how electric current can move through a closed loop of conductive material left figure but stops flowing whenever the loop is broken right figure. This figure shows how a light bulb lights up when it is connected to a closed circuit. Note the yellow arrows show the direction of the conventional current. So remember, in order for electric current to flow, there must be a closed loop of conductive material. There are two different ways in which electrons can move through a loop of conductive material and create an electric current: In the case of a direct current abbreviated DC , the electrons always travel around the loop in the same direction so the conventional current also has a constant direction. Figure 5, below, shows a direct current, or electrons all moving in one direction in a conductive wire. All battery-powered devices, like cell phones and flashlights, run on direct current. Note that a constant voltage will create a direct current. In the case of direct current DC , the free electrons always collectively move in the same direction. This figure is not to scale. Read the technical note , below, to get a more accurate description. In the case of an alternating current AC , electrons travel back and forth. Figure 6, below, shows an animation of alternating current. One moment they all move collectively in one direction, and the next moment they all move collectively in the opposite direction, creating an oscillating electrical current. One back-and-forth oscillation is called a cycle, and the number of cycles delivered per time unit is called the frequency. Frequency is measured in hertz Hz. Note that the voltage creating this current will alternate with the same frequency. In the case of alternating current AC , the free electrons collectively move back and forth. Remember, just like in Figure 5, this figure is not to scale. Read the technical note, below, to get a more accurate view. Power lines deliver alternating electric current to our homes. Depending on what country you are in, alternating current from power outlets is usually 50 or 60 cycles per second Hz. Most electric appliances we "plug into the wall" run on alternating current. Some appliances need an "adapter" or "converter" to convert alternating current to direct current, like a cell phone charger. Also, these electrons do not actually move in a straight line. In reality, electrons bounce all around between atoms in a conductor, as illustrated in Figure 7, below. The overall drift toward one direction creates the electric current. Remember that the direction of conventional current is opposite the direction of electron motion, as shown in the figure. Illustration of how electrons bounce around between atoms in a conductor where the overall drift in one direction creates the electric current. Note that this figure is also not to scaleâ€”electrons are much smaller than atoms, but they are so tiny that it is impossible to draw an accurate to-scale figure where you can see the electrons. To understand the difference between AC and DC, you can also make a graph of electric current versus time.

4: Magnet and Compass - Magnetic Field | Magnets | Compass - PhET Interactive Simulations

Magnets have a north pole and a south pole. Like poles repel but opposite poles attract. Electromagnets, motors, bells and compasses use magnetic fields.

This is what we are most familiar with when our magnet picks up a bunch of paperclips. Iron, cobalt, nickel, gadolinium, dysprosium and alloys containing these elements exhibit ferromagnetism because of the way the electron spins within one atom interact with those of nearby atoms. They will align themselves, creating magnetic domains forming a temporary magnet. If a piece of iron is placed within a strong magnetic field, the domains in line with the field will grow in size as the domains perpendicular to the field will shrink in size. Diamagnetism When a diamagnetic material is placed near a magnet, it will be repelled from the region of greater magnetic field, just opposite to a ferromagnetic material. It is exhibited by all common materials, but is very weak. People and frogs are diamagnetic. Metals such as bismuth, copper, gold, silver and lead, as well as many nonmetals such as graphite, water and most organic compounds are diamagnetic. For example, here are some photos of a very strong neodymium-iron-boron magnet sitting in a dish with a shallow amount of water covering the magnet. Looking at the reflection of the light above the sink off of the surface of the water, you can see how the reflection is distorted because the water is concave just above the magnet, and flat everywhere else. The fuzzy object in the two photos on the right is the magnet; the camera is focused on the reflected light. This is because the magnet has pushed the water away since water is repelled by strong magnetic fields. Paramagnetism When a paramagnetic material is placed near a magnet, it will be attracted to the region of greater magnetic field, like a ferromagnetic material. The difference is that the attraction is weak. It is exhibited by materials containing transition elements, rare earth elements and actinide elements. Liquid oxygen and aluminum are examples of paramagnetic materials. What are magnets used for? There are hundreds and hundreds of uses which you will discover here at "Magnet Man" and in the links. For the most part, magnets are used to hold, separate, control, convey and elevate products and to convert electrical energy into mechanical energy or convert mechanical energy into electrical energy. Some more unusual uses for magnetics are: A shop in Downtown Disney full of magnets!

5: Magnets and Magnetism |How Magnets Are Used | Magnetism and Electricity |

Introduction to magnetism. This is the currently selected item. Magnetic force on a charge. What is magnetic force? But even these large magnets you deal with.

Not only is magnetism a fascinating natural phenomena, it also has many practical uses. Magnets are used in all kinds of inventions: This article explains magnetism for kids, and also lists the different types of magnet, and the various uses of magnets. Did you know that the Earth is one big magnet? Magnetism makes a compass needle point north. Useful when you need to know which direction to travel! Have you ever used a fridge magnet to hold a piece of paper to the fridge door? Magnetism is what is holding the magnet to the fridge. What Is A Magnet? Magnets are objects made out of magnetic materials that produce a magnetic field. Magnets pull other objects made of magnetic materials towards them. They will either attract or repel other magnets. A fridge magnet is a permanent magnet. It keeps its magnetism, so you can always find your shopping list! Two Poles Magnets always have two poles: Each pole of a magnet is attracted to the opposite pole of another magnet e. What Do You Mean? If you put the north pole of one magnet near the south pole of another magnet you will be able to feel them pulling towards each other. However, if you put the north pole of one magnet to the north pole of another, or the south pole of one magnet to the south pole of another, then you will be able to feel them pushing away from each other. If you can get hold of some magnets try it for yourself. Ferromagnetic Materials Some materials are naturally highly magnetic, and can be made into magnets. Ferromagnetic materials include iron, nickel, cobalt and most of their alloys an alloy is a mixture of a metal and another element , such as steel. The magnet on a fridge magnet is a permanent magnet: Two types of permanent magnet. Above is a bar magnet, below is a horseshoe magnet. Two common types of permanent magnets are the bar magnet and the horseshoe magnet. Bar magnets are narrow rectangular in shape, and their north and south poles are at opposite ends of the bar. One of the tips is the north pole, the other the south pole. These include plastics, copper, and gases. Electromagnets A large electromagnet at work! Another type of magnet is an electromagnet. Electromagnets work because an electric current produces a magnetic field. He noticed that a freely hanging compass needle moved when brought close to a wire carrying an electric current. If the wire carrying the electric current is coiled, the magnetic affect is stronger. If the wire is coiled around a piece of iron then the effect is stronger still. The first electromagnet was invented by British scientist William Sturgeon in , who wrapped wire around a horseshoe-shaped iron bar. Magnetic Domains Inside a piece of magnetic material, there are many tiny magnetic regions called domains. Each has a north and a south pole, just like any magnet. Before the material is made into a magnet, these domains are all pointing in different directions, cancelling each other out. However, if the domains in the material are aligned, then the material becomes a magnet. The domains are all pointing in the same direction, and the material is magnetized. How To Make A Magnet Any magnetic substance can be made into a magnet by having its domains aligned into north and south poles. To do this another magnet is stroked across the material. If the magnet was then beaten with a hammer it would lose its magnetism, because the domains would be shaken out of alignment. Magnetic Fields A magnetic field is the magnetic effect of a magnet. It is invisible, but can be detected with a compass or another magnet. If you could see the magnetic field of a magnet, it would look like a series of curved lines going between the north and south poles. The video below shows this being done. Uses Of Magnets Magnets and electromagnets have many uses in the modern world. From the simplest fridge magnets, to advanced computer data storage systems, we rely on magnets and magnetism to perform a wide range of tasks. Compasses One of the first uses of magnetism was to make compasses. Using a compass, an explorer will always know which way is north, and therefore the direction in which he is headed. Computer Hard Drives Magnetism for kids: At the heart of a computer hard drive is a spinning disc with a magnetic surface. The data is stored on the disc in the form of magnetic patterns. Speakers The electric audio signal is turned into sound waves using magnetism. Speakers use magnetism to convert electrical sound information into sound waves. The electrical signal is passed through a coil that is attached to the speaker cone. The coil is hung between the poles of a permanent magnet. The coil becomes an electromagnet and is forced to move by the magnet, which in turn vibrates the speaker cone and produces sound. Magnetism For Kids Conclusion We hope that you have enjoyed learning about magnetism. There are magnets in televisions, telephones, doorbells, cars, and many, many other places too. You can read more science articles here.

6: 8 Strange Facts About Magnets and Magnetism | Apex Magnets Blog

A magnet is a piece of rock or metal that can pull other metals towards it. The force of magnets is called magnetism. Together with gravity and electricity it is a basic force of nature.

Magnets and Magnetism A magnet is a piece of rock or metal that can pull other metals towards it. The force of magnets is called magnetism. Together with gravity and electricity it is a basic force of nature. Early humans discovered magnets and magnetism thousands of years ago. They found out that certain types of rock, called loadstone, pulled iron and other metal objects towards it. After some time they found out that thin pieces of such a rock would always point in one direction if you hung it on a piece of thread. The ends of such a metal are the poles of a magnet. All magnets have a magnetic field around them, the force between the two poles. Magnets attract or repel other metals. This is because every magnet has two poles: North and south poles attract each other but two north poles or two south poles push each other apart. Our planet is also a big magnet with a North and a South Pole. The magnetic North Pole, for example, is in northern Canada. Compasses always point to the magnetic poles, not to the geographic ones. Magnetism comes from electrons , the tiny particles that fly around the nucleus of an atom. They are negatively charged and produce a very weak magnetic field. When many of these electrons point towards the same direction they can pull metals to them. It is also possible to make a magnet by taking an existing one and rubbing another piece of metal with it. If you keep rubbing the new piece of metal in the same direction its electrons will start to point in that direction , thus creating a new magnet. If a magnet keeps its magnetic field all the time we call it a permanent magnet. However , not all magnets are permanent. Some objects become magnets only when electricity passes through them. They are called electromagnets. There are many examples of such electromagnets in everyday life: Magnetism and electricity In the s scientists discovered that magnetism and electricity had similar features. Just like magnets have two poles, electricity has positive and negative charges. A positive and a negative charge attract each other and two negative or two positive charges repel each other. After they had found this out they started making useful tools and machines with the help of electricity and magnetism. The Danish physicist Oersted sent electricity through a wire and put a compass near it. To his surprise the compass needle moved. Soon after that the first electromagnet was made by making a wire into a coil and sending electricity through it. Magnetic field lines go from pole to pole where the magnetic force is strongest Use of magnets The first magnetic instruments were compasses which sailors used to guide them on their journeys. Today, magnets can be found in many areas of everyday life. They are in washing machines, hold doors shut and work in generators and electric motors. Credit cards have magnetic strips on them that give you financial information. Magnetic audio and videotapes as well as disks have many tiny magnetic particles which are used to store sounds, pictures and other information. In medicine a magnetic resonance imaging machine MRI can create exact pictures of organs and bones inside the human body. It is much better and more exact than x-rays. Powerful electromagnets are attached to big cranes that can move iron and steel. In some parts of the world trains travel on tracks that are magnetized. These trains, called maglev, are lifted above the tracks and do not have any contact with them. They travel at speeds of up to km an hour. Magnets in animals Scientists have also discovered that some animals, like pigeons , dolphins and turtles may have some magnetic particles in their body. Superfast maglev train in Japan - Saruno Hirobano.

7: Introduction to magnetism (video) | Khan Academy

Temporary magnets like this are called electromagnetsâ€”magnets worked by electricityâ€”and they hint at a deeper connection between electricity and magnetism that we'll come on to in a moment. Like permanent magnets, temporary electromagnets come in different sizes and strengths.

As early as the Swiss-born mathematician Leonhard Euler suggested that the same ether that propagates light is responsible for electrical phenomena. In comparison with both mechanics and optics, however, the science of electricity was Fundamentals Basic to magnetism are magnetic fields and their effects on matter, as, for instance, the deflection of moving charges and torques on other magnetic objects. Evidence for the presence of a magnetic field is the magnetic force on charges moving in that field; the force is at right angles to both the field and the velocity of the charge. This force deflects the particles without changing their speed. The deflection can be observed in the torque on a compass needle that acts to align the needle with the magnetic field of Earth. The needle is a thin piece of iron that has been magnetizedâ€"i. One end of the magnet is called a north pole and the other end a south pole. The force between a north and a south pole is attractive, whereas the force between like poles is repulsive. The magnetic field is sometimes referred to as magnetic induction or magnetic flux density; it is always symbolized by B. Magnetic fields are measured in units of tesla T. Another unit of measure commonly used for B is the gauss , though it is no longer considered a standard unit. A fundamental property of a magnetic field is that its flux through any closed surface vanishes. A closed surface is one that completely surrounds a volume. These lines always close on themselves, so that if they enter a certain volume at some point, they must also leave that volume. In this respect, a magnetic field is quite different from an electric field. Electric field lines can begin and end on a charge, but no equivalent magnetic charge has been found in spite of many searches for so-called magnetic monopoles. The most common source of magnetic fields is the electric current loop. It may be an electric current in a circular conductor or the motion of an orbiting electron in an atom. Associated with both these types of current loops is a magnetic dipole moment , the value of which is iA, the product of the current i and the area of the loop A. In addition, electrons, protons , and neutrons in atoms have a magnetic dipole moment associated with their intrinsic spin; such magnetic dipole moments represent another important source of magnetic fields. A particle with a magnetic dipole moment is often referred to as a magnetic dipole. A magnetic dipole may be thought of as a tiny bar magnet. It has the same magnetic field as such a magnet and behaves the same way in external magnetic fields. When placed in an external magnetic field, a magnetic dipole can be subjected to a torque that tends to align it with the field; if the external field is not uniform, the dipole also can be subjected to a force. All matter exhibits magnetic properties to some degree. When placed in an inhomogeneous field, matter is either attracted or repelled in the direction of the gradient of the field. This property is described by the magnetic susceptibility of the matter and depends on the degree of magnetization of the matter in the field. Magnetization depends on the size of the dipole moments of the atoms in a substance and the degree to which the dipole moments are aligned with respect to each other. Certain materials, such as iron , exhibit very strong magnetic properties because of the alignment of the magnetic moments of their atoms within certain small regions called domains. Under normal conditions, the various domains have fields that cancel, but they can be aligned with each other to produce extremely large magnetic fields. Various alloys , like NdFeB an alloy of neodymium , iron, and boron , keep their domains aligned and are used to make permanent magnets. The strong magnetic field produced by a typical three-millimetre-thick magnet of this material is comparable to an electromagnet made of a copper loop carrying a current of several thousand amperes. In comparison, the current in a typical light bulb is 0. Since aligning the domains of a material produces a magnet, disorganizing the orderly alignment destroys the magnetic properties of the material. Thermal agitation that results from heating a magnet to a high temperature destroys its magnetic properties. Magnetic fields vary widely in strength. Some representative values are given in the Table.

8: Magnets And Magnetism For Kids With Pictures & Examples

What is a magnet?How it can pull other things?What is magnetism?What is magnetic field? How magnets help in navigation?All about magnets, in this interesting animation video. Category.

Product was successfully added to your shopping cart. Magnets are interesting and strange materials. There are still some mysteries that scientists and researchers have yet to solve when it comes to magnets. However, some mysteries have been solved. In this blog, we have compiled a list of some of the strangest facts about magnets and magnetism. Magnets always have two poles -- even if you cut them in half. Magnetic monopoles do not exist --as far as we know. Magnets will always have two poles, a magnetic north and a magnetic south. The two remaining pieces will still have a north and a south. You can cut it dozens of times and the results will be the same. The most powerful magnet in the universe is actually a star called a magnetar. These are stars that have died off and had a supernova explosion. The magnetars are what is left over, and they are strong enough to destroy small planets if they get close enough. Luckily, there are only a dozen of these according to scientists, and they are far far far away from Earth. Strong rare earth magnets can turn some metals into magnets. Ferromagnetic materials like iron can be magnetized with a strong permanent magnet. You can try it for yourself by rubbing a magnet on a screwdriver. The screwdriver will be able to pick up magnetic objects. The Earth is like one big bar magnet. It has a magnetic north and a magnetic south, which is what the needle on a compass points to. However, this is geographically different than the actual north and south poles. Invisible magnetic field lines run from the north to south poles. Magnetic resonance imaging machines use magnets, and they generate stronger fields than the Earth. Some animals are affected by magnets. Magnets have been used to study bee communication patterns , migratory cycles and several other animal behaviors. This is because many animals can sense magnetic fields. For instance, some sharks are repelled by them and birds and turtles navigate by them. In fact, ancient mariners are said to have used lodestones to help them navigate. There are magnetic hills , said to pull cars and other large magnetic objects towards certain locations. However, researchers have found out that these are not really a magnetic anomaly as much as a topographical illusion. The list of facts about magnets could go on and on, but these are some of our strange favorites. What magnet facts do you find strange and intriguing? This entry was posted in Magnet Facts and tagged most powerful magnet , strong rare earth magnets on March 29, by Apex Magnets.

9: Magnet - Wikipedia

What is magnetism? What is a magnet? A magnet is an object made of certain materials which create a magnetic www.enganchecubano.com magnet has at least one north pole and one south pole.

Magnet Glossary Magnetism is a broad and well-researched science with a language of its own. Our magnet glossary , culled from respected resources around the internet, is your one-stop shop for clear definitions of key magnet terminology. How do they work? So you want to know about magnets, huh? What is a magnet? There are two kinds of magnets â€" the kind you find in nature and the kind that people make. Either way, a magnet is an object that creates a magnetic field. This means the object has to have at least one north pole like Santa! Read our blog post: How Do Magnets Work? A magnetic field is the magnetic space around the magnet. You want to learn more about that? What is a Magnetic Field? You know how, when you get two magnets together, they either snap together or push each other away? Still have pulling questions? What are magnetic poles? The points of a magnet that have magnetic strength are called poles. When you have more than one magnet, like or same poles repel each other and opposite poles attract each other. In other words, the north pole of one magnet will click together with the south pole of another magnet, while two north poles will push each other away. How can you tell which pole is which? An easy way to tell which is north and which is south is to set your magnet near a compass. I demagnetized my compass! Can I fix it? If your compass becomes de-magnetized points in the wrong direction , just put the South Pole of a bar magnet directly on top of the compass needle and slowly slide the magnet along the red side of the needle, toward the pointed end, and then down the side of the compass. Pull the magnet away and your compass is re-magnetized! The closer to the magnet, the stronger the magnetic field and force. Do magnets ever lose their magnetic power? There are a few things that can weaken the magnetism in a magnet, like storing it too close to heat, strong electrical currents, other magnets, or radiation. Additionally, high humidity can corrode neodymium magnets. Are magnets always magnetic? Some magnets are permanent, or always, magnetic and others are non-permanent. For example, a magnet from your refrigerator will always be magnetic. A paperclip or nail is not magnetic, but both can become non-permanent magnets when touched by a strong enough fridge magnet. What are permanent magnets made of? Permanent magnets emit a magnetic field without an external source of power. An electromagnet emits a magnetic field only when an electrical current runs through it. Can magnets be made stronger? Which magnets are the strongest? Rare earth magnets Neodymium and Samarium Cobalt are the strongest. In fact, even a neodymium magnet the size of a pencil eraser cannot be pulled off your refrigerator by hand. If you test this theory and get into trouble, try sliding it. There is more to this story. Read all about in our blog post: Who Discovered the Very First Magnet? What about the people-made magnets you mentioned? How can people make a magnet? Magnets are made by exposing objects that contain nickel, iron, or cobalt to a magnetic field. When this happens, the structure of the material is actually changed on a microscopic level â€" the molecules of the object are polarized, or rearranged, into lines. When enough of the metal is polarized, it becomes a magnet. What will magnets stick to? Magnets stick to things that include one of three types of metals â€" nickel, iron, and cobalt. How are magnets used, besides to stick my spelling test to the fridge? Well, to start with, anything that has a motor uses a magnet. TVs, computers, and microwave ovens all operate with magnets. Magnets are used to keep refrigerator doors closed. They can also be mounted on trucks that clean roadways and are sometimes placed in the stomachs of cows to catch metals! And more uses for magnets are found every day. And did you knowâ€¦ All animals, including humans â€" this means YOU, have small magnetite crystals in their brains! The earth is one big magnet! Liquid metals deep within the earth create convection currents that create magnetic force. It is believed that the magnetic force surrounding the earth is what makes life on earth possible. Magnets were once considered magical! All electricity is made from magnets. When you spin a magnet inside a coil of wire, electrons flow from the wire. All power plants use fuel to spin magnets. Place a magnet near a computer, TV, watch, clock, video, or credit card. It may damage them!

MAGNETS AND MAGNETISM pdf

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