More applications of electromagnetism

Electromagnetism is the basic principle by which not only motors and generators work; it also governs the functioning of devices and appliances commonly employed in everyday life.

Electrical alarm bells

In **electrical alarm bells**, electromagnetic coils of wire are used to move a striker against a bell to make sound. When electricity flows through the coil, this attracts the iron striker, which strikes the bell. As soon as the striker moves towards the bell, the electrical contact breaks and the electromagnet is demagnetised. After striking the bell, the striker is returned to its original position by the spring tension and the electrical contact is made once again, and thus the cycle will continue until the switch is in the open position.

Magnetic levitation trains

High speed maglev trains use electromagnetic force to provide both magnetic levitation of the train and propulsion. Magnetic levitation is achieved by using an electromotive suspension system, in which electromagnets are fixed both on the tracks, creating a guideway that helps to keep the train in track, and under the wagons of the train. The polarities of the electromagnets create the force that lifts the train, allowing it to travel at very high speed, without noise, vibrations, and pollution.

guideway: *binario di guida*
pan: *padella*
pot: *pentola*
spring: *molla*
striker: *percussore, batacchio*
track: *rotaia*

Microphones

Microphones operate thanks to a diaphragm, interacting with an electromagnet, whose sensitivity to sound waves allows them to be translated into electrical signals. These can then be transmitted remotely, or even stored and reproduced later.

Loudspeakers

Loudspeakers consist of a coil of wire attached to a membrane, or cone, surrounded by a permanent magnet. A current applied to the coil of wire creates a magnetic field which interacts with the permanent magnet generating a force, pushing the cone outwards. By alternating the current direction, the cone is pulled backwards, thus vibrating in and out, causing pressure variations in the air, which are sound waves.

Induction cookers

Induction cooking uses electric currents to directly heat pots and pans through magnetic induction instead of thermal conduction by gas or electricity. An electric current is passed through a coil of copper wire under the cooking surface, which creates a magnetic flux throughout the cooking pan to produce heat. To work correctly with an induction cooker, pots and pans must have an iron base, as other metals such as aluminium or copper are non-magnetic.

1 Complete the summary with the correct words.

The Most Common Applications of Electromagnetism and How They Work

Electromagnetism is the principle that allows a lot of devices that we use everyday work. Let's examine the functioning of each device in detail.
In electric bell alarms, **1.** ..... flows through a **2.** ..... of wire, which attracts a **3.** ..... that strikes a bell. After striking the bell, it returns to its original position and the electrical contact is made again.
To make maglev trains levitate, **4.** ..... are placed on the tracks and under the wagons. The polarities create a lifting **5.** ..... which allows the train levitation.
Microphones function thanks to a **6.** ..... that interacts with an electromagnet. Sound waves are transformed into electrical **7.** ..... which can be transmitted or stored.
In loudspeakers, the **8.** ..... field of the coil interacts with the **9.** ..... magnet. The coil is attached to a membrane, called cone, that is pushed outwards. When the **10.** ..... of current is reversed, the cone is pushed **11.** .....; the in and out vibrations of the cone are **12.** ..... waves.
In induction cookers, **13.** ..... is produced by electric current flowing through a coil of copper wire placed under the cooking surface, which creates a magnetic **14.** .....

2 Read the text and complete the sentences.

How Credit Cards Work

Have you ever wondered how people pay for groceries, vending machines and gas without cash? Millions of debit and credit cards are swiped every day; in fact, in 2016, card payments totalled an enormous value of 5.98 trillion dollars.
On the back of the credit card there is a black strip called a mag stripe. This is made of ferromagnetic material that is laminated onto the card. Looking closer, there are tiny magnets, twenty millionths of an inch in size, which are all oriented in specific directions that carry personal information. To read this information, the credit card is swiped through a card reader. The card reader is made up of a solenoid, which is a cylindrical coil of wire. When a current passes through the wire of the solenoid, it creates a magnetic field. When a card is swiped, each tiny magnet of the stripe moves through the reader and the magnetic flux changes, changing the voltage and the direction of the induced current. A program in the card reader processes the changes in current and translates it into readable information. This then allows or denies the transaction.
Next time you go to swipe a card and make a purchase or even just open a door, impress someone by telling them the electromagnetism steps behind it.

Adapted from: *https://www.youtube.com/watch?v=LS4okPmwaEk – "How credit cards work" posted by Talia Toland*

1. The black strip on the back of the card is called .....
2. This strip is made of ..... laminated into the card.
3. The black strip contains very small ....., as big as twenty millionths of an .....
4. They are oriented in specific directions and carry .....
5. To ....., the credit card is swiped through a card reader.
6. A card reader is made up of a ....., which is a cylindrical coil of wire.
7. When a current passes through the wire, it creates a .....
8. As the credit card is swiped, each magnet of the stripe .....
9. This causes the change of the ....., changing the ..... and direction of the induced current.
10. A program in the ..... processes the changes in current and translates them into readable .....