

Comparison of electric and magnetic fields

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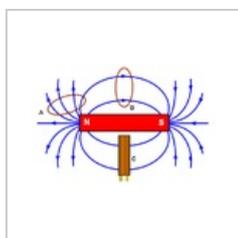


Comparison of Electrical and Magnetic Fields

Introduction

An electric field is an area where force is applied around any electrically charged object. Another name for it is electrostatic field. It is a vector field. Fields are directly proportional to the force they exert. The strength of the force decreases with distance. Electricity and magnetism are constantly interconnected and linked with each other.

A magnetic field is a region where the magnet exerts magnetic impact. Although magnetic and electric fields are associated, they have different characteristics.. A magnetic field can also be created by the spin magnetic dipole moment. The presence, strength and direction of a magnetic field is indicated by "magnetic flux lines"



Magnetic flux lines

THIS NEXT PART IS SOMEWHAT CONFUSED!

Comparison of Electric and Magnetic Fields:

Electric Field	Magnetic Field
Nature Created around electric charge	Created around moving electric charge and magnets
Units Newton per coulomb, volts per meter	Gauss or Tesla
Force Proportional to the electric charge	Force Proportional to the electric charge
Proportional to charge and speed of electric charge	Movement In Electromagnetic field Perpendicular to the magnetic field
Perpendicular to the electric field	Electromagnetic Field Capacitive Inductive Pole Monopole or Dipole
Dipole	Dipole

Application of Electric Fields in Medicine:

The main application of electric fields is treating cancer. This is called Alternating Electric Field Therapy or sometimes called Tumor Treating Fields (TTF). Insulated electrodes are used to apply a very low intensity and frequency alternating to target cancer cells. Studies show that low-Intensity electric fields derange the mitotic division of cancer cells and gradually decrease the development of the tumor cells.

How does it work?

In cases that involve malignant brain tumors, patients are fitted with electrodes that apply 200 kHz electric fields to the scalp at regular intervals for up to 18 hours per day, the brain tumors progress to advanced stages much slower than usual and sometimes even regress. The patients also live considerably longer. In vitro, the electric fields were seen to have two effects on the tumor cells. First, they slowed down cell division. Cells that ordinarily took less than an hour to divide were still not completely divided after three hours of exposure to an electrical field of 200 kHz.

What causes cell division to slow down?

In the 200-kHz case, the electric fields hamper the formation and function of a key cell structure known as the mitotic spindle. The spindle is composed of cell components known as microtubules. The microtubules in turn contain components that have a high electric dipole moment, in which there is a large separation of opposite electric charges. Therefore, parts of the mitotic spindle are greatly influenced, and apparently disrupted, by an electric field.



Electric field
interfering with
mitotic cell division

What is magnetic field therapy used for?

People use magnet therapy for a wide range of health problems, including:

•Joint problems, such as arthritis.

- Migraine headaches
- Pain, including mild to moderate pain after surgery as well as long-term (chronic) pain.
- Depression.
- Cancer
- Overstretched muscles or injuries to muscles, Ligaments, and tendons (strains and sprains).

Is magnetic field therapy safe?

Young children and pregnant women should not use magnetic field therapy, because the safety of this therapy is not proved. People who have medical devices or implants with a magnetic field, such as a pacemaker, should not use magnet therapy, because it could interfere with the function of the implant. Magnet therapy is not thought to have negative side effects or complications when it is combined with conventional medical treatment.

Disadvantages of using Magnetic fields in Medicine:

- The MRI machine produces a very strong magnetic field which can exert a very powerful force on any metallic object found in the body such as pacemaker and aneurysm clips & cochlear implants.
- Since the MRI machine is a very confined space, its not suitable for claustrophobic patients.
- It can lead to very expensive medical bills

Conclusion

In conclusion, Electrical and magnetic fields are significant and vital in the field of medicine as without them, it would be near impossible for doctors to diagnose various amounts of diseases and illnesses such as tumors, fractures, torn ligaments and muscles.

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