An easy way to Physics: 10 Magnets, Magnetic Field, and Electric Field

Magnets

Certain minerals attract iron. They were called magnets. Today magnets can be made from certain types of steel and from some other materials. Many magnets have 2 places, where their magnetic force is greatest. These places are called magnetic poles. If we allow a magnet to turn around freely, one of its poles will turn northwards. This pole is called the north pole of the magnet (symbol N), the other pole is the south pole of the magnet (S).

Magnetic poles act on other magnetic poles: 2 north poles repel each other, 2 south poles repel each other, and a north pole and a south pole attract each other.

The force between magnetic poles becomes stronger, when they come nearer, and weaker, when they go farther away from each other.

Magnetic Field

All around the earth there is a magnetic force, that acts on a magnetic pole. This force is produced by all the magnets in the earth. For all places around the earth, we can determine the strength and the direction of the magnetic force on a magnetic pole of a certain size. This combined effect of all the other magnetic poles is called the magnetic field B. This field shows the size and the direction of the magnetic force for this special north pole. For another magnetic pole at a certain place we see the magnetic field at this place and multiply it with the strength of this pole. That gives the magnetic force on this pole. Quantities with a direction, such as v, F and B often are written in boldface **v**, **F** and **B,** with an underscore v, F and B or an arrow above: $\vec{v}$, $\vec{F}$ and $\vec{B}$.

Field lines are illustrations of magnetic fields. They don't exist in reality, but only in our imagination. Field lines are closed or they start from a north pole and end up in a south pole. They have a direction from N to S. At each point the lines are tangential to the magnetic force upon a north pole.

Electric Field

The force **F** on an electric charge q depends on the charge q and on the sum of the forces of all other electric charges in the universe. Therefore we can determine for each point in space the electric force on a charge of 1 C. This combined effect of all the other charges is the electric field E. The electric field gives the direction, towards which a positive electric charge is drawn by the field. The field E, too, has a direction, so it is written as **E**, E or $\vec{E}$. The force **F** on an electric charge q is

F = q · **E.** The unit of the electric field is 1 N/ C = 1 V / m.

Field lines of the electric field start at positive charges and end in negative charges, or they are closed. These field lines are not real, but only illustrations. The direction of the electric force is tangential to the field line.