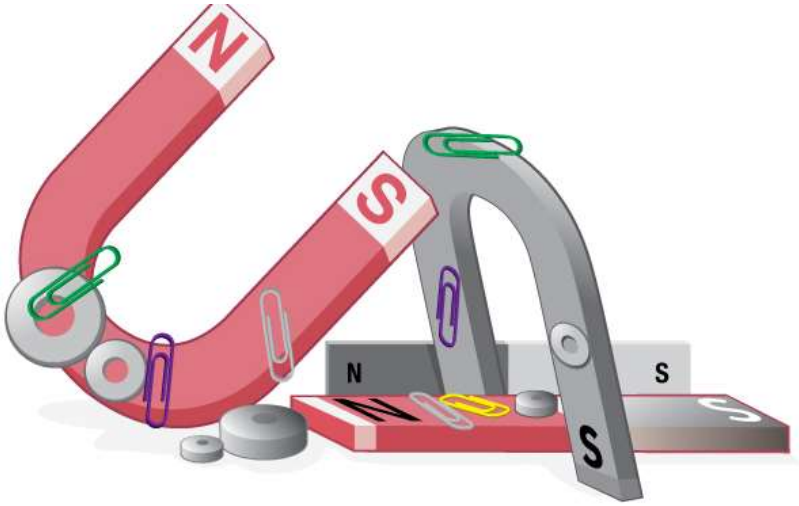


MAGNETS

MAGNETS

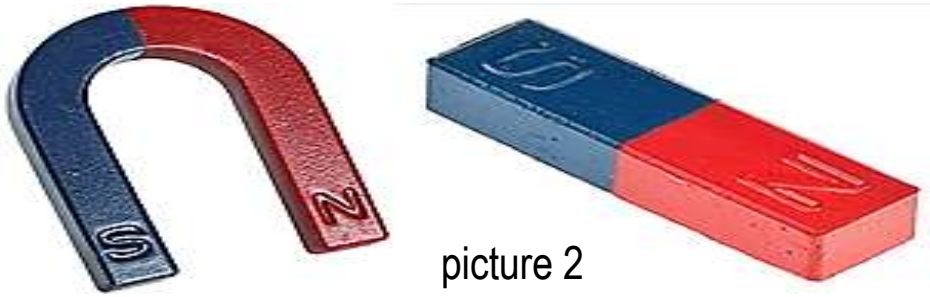
Magnet is an object that attracts iron and a few other metals
This attractive property of attracting pieces of metal is called magnetism..

picture 1

Magnetism decreases with distance from an object. Magnetism can be induced in some materials. For example, if a piece of unmagnetized iron is placed near a strong permanent magnet, the piece of iron eventually becomes magnetized (picture 1). Iron is easily magnetized but also tend to lose their magnetism easily. In contrast, cobalt and nickel are difficult to magnetize but tend to retain their magnetism.

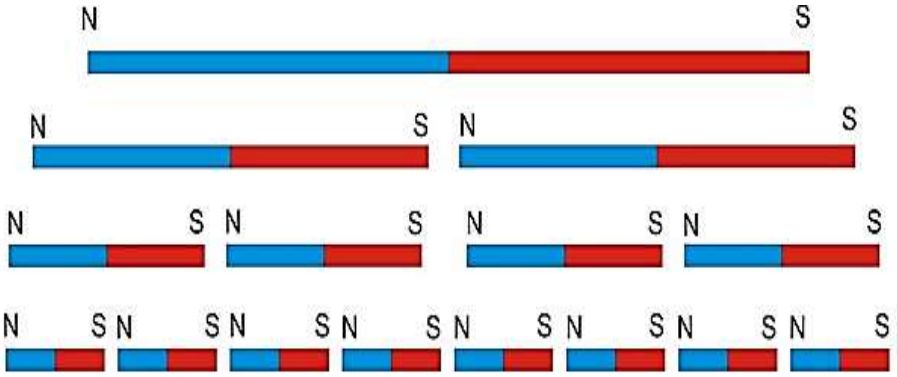
There are two types of magnets:

- **Natural magnets:** The magnets found in nature are called nature magnets. These magnets are weak and shapeless (magnetite, loadstone).
- **Artificial magnets**: Men made magnets are called artificial magnets. These magnets are strong and of different shapes. These magnets can be:
  - **permanent magnets** are those magnets which can retain their magnetism for a long period of time. A perfect example of permanent magnet are: bar magnet and horseshoe magnet (picture 2)
  - **temporary magnets** are those magnets which lose their magnetism after a short time.



picture 2

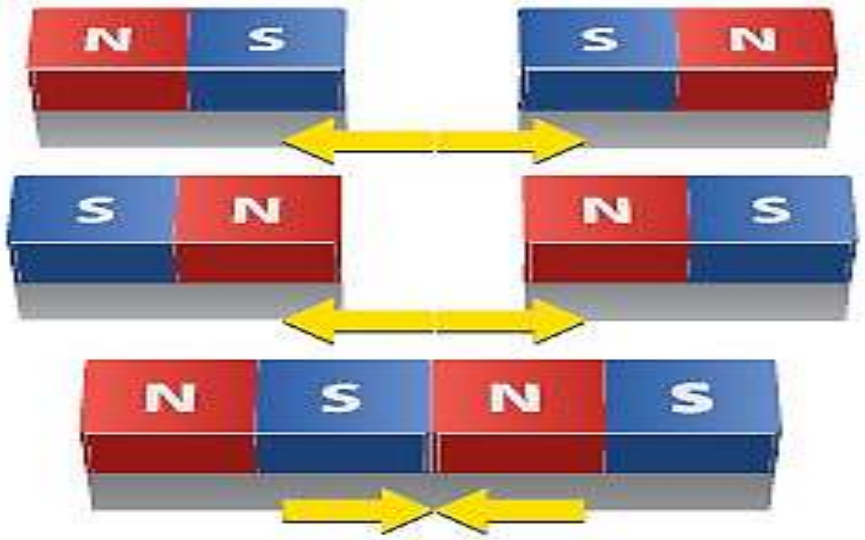
Every magnet has two poles (picture 2): north pole (N) and south pole (S).



picture 3

However if you cut a magnet in half, you don't get a north pole and south pole, you get two smaller magnets (picture 3). Magnetic "monopoles" do not exist in isolation.

Magnetic poles also exert attractive or repulsive forces on each other similar to the electrical forces between charged objects. Like poles repel each other and unlike poles attract each other (picture 4). Electric charges can be isolated, but magnetic poles cannot. Magnetic poles always occur in pairs.



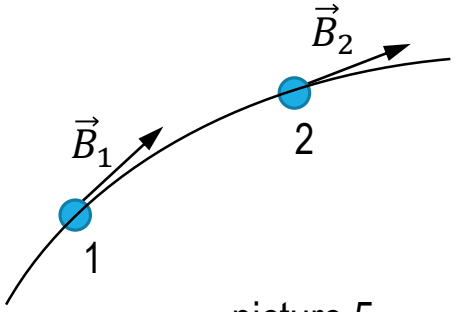
picture 4

MAGNETIC FIELD

It was useful to introduce the concept of an electric field. A charge creates an electric field around itself and any other charge that enters this electric field will experience an electric force. The same idea can be extended to magnetism. Both magnets and electric current create magnetic field around themselves and when another magnet or electric current (moving charge) enters this magnetic field it will experience a magnetic force.
Like the electric field strength , the magnetic induction is a vector, having both direction and magnitude
We denote the magnetic induction with the symbol $\vec{B}$**. The unit for the magnetic induction is the tesla.(T)**

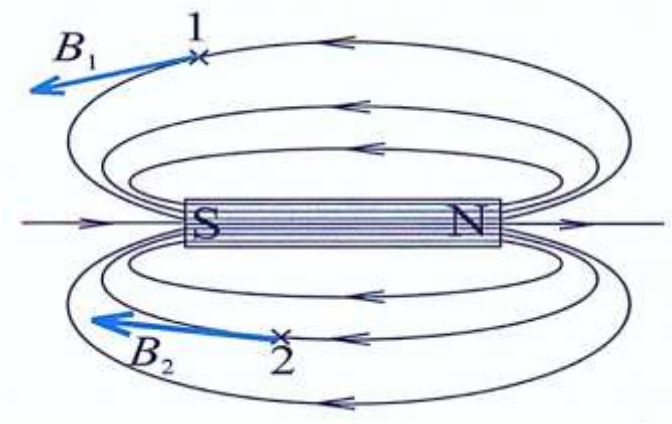
► Magnetic field lines

Just like electric field lines, magnetic field lines provide a convenient graphical representation of the magnetic field in space.
An magnetic field line is an imaginary line or curve drawn through a region of empty space so that its tangent at any point is in the direction of the magnetic induction vector at that point (picture 5).

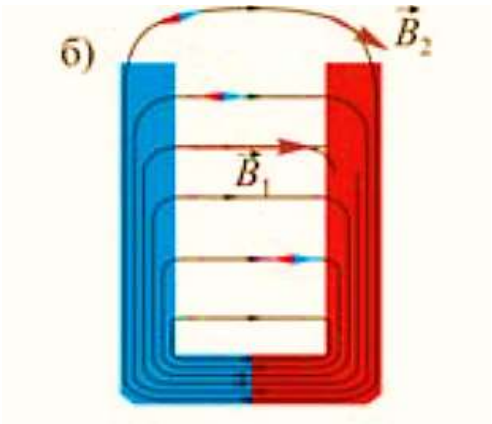


picture 5

We represent magnetic field pattern by drawing magnetic field lines:
- Magnetic field lines come out of north pole and go into south pole
- The strength of the magnetic field is given by the density of the lines - the closer the lines, the stronger the magnetic field



(a)

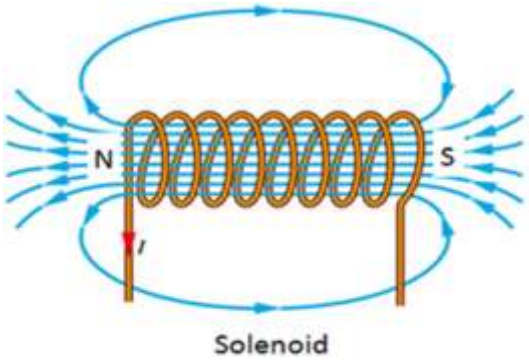


(b)

picture 6

Picture 6-a:The magnetic field lines of a bar magnet. The field is strongest near the pole of the magnet where the lines crowd together

Picture 6-b: A uniform magnetic field is obtained if two opposite poles are placed near each other.



picture 7: The magnetic field lines of a solenoid

In picture 7 current is flowing in a solenoid and a magnetic field is created inside and outside the solenoid. The current is flowing in the clockwise direction if we look along axis of the solenoid from right to left.