

DIA, PARA & FERROMAGNETISM

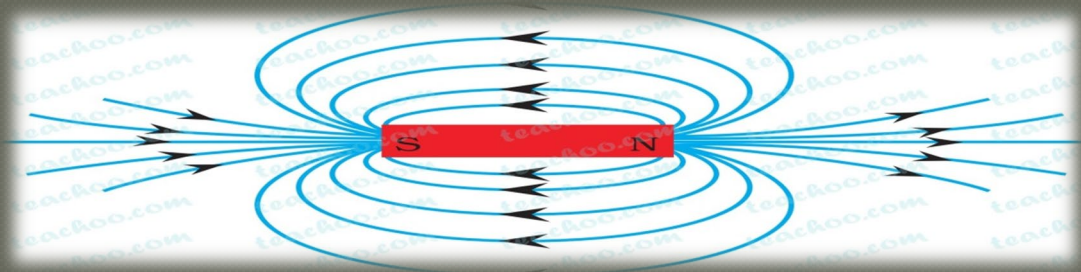
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MAGNET, MAGNETISM & MAGNETIC POLES

- A SUBSTANCE WHICH ATTRACTS MAGNETIC SUBSTANCES IS CALLED MAGNET & THIS PROPERTY IS CALLED MAGNETISM
- **MAGNETIC POLES:** THE POINTS INSIDE THE MAGNET WHERE THE ATTRACTION IS MAXIMUM ARE CALLED MAGNETIC POLES.

Every magnet has two poles

- a) North pole
- b) South pole



Magnetic properties of materials

- Faraday discovered that almost all the substances are affected by magnetism.
- Some are attracted while some are repelled
- According to the behavior substances are divided into three classes :
 1. Diamagnetic substances
 2. Paramagnetic substances
 3. Ferromagnetic substances

DIAMAGNETIC SUBSTANCES

- ⦿ Are those substances which when placed in a magnetic field are feebly (weakly) magnetized in a direction opposite to that of magnetizing field.
- ⦿ Property of DIAMAGNETISM- individual atoms or molecules do not possess any net magnetic moment of their own
- ⦿ i.e., they are non polar atoms
- ⦿ Examples: BISMUTH, ANTIMONY, Au, Ag, Pb, Hg, water, air, alcohol, hydrogen etc..

PARAMAGNETIC SUBSTANCES

- ⦿ Are those substances which when placed in a magnetic field are feebly (weakly) magnetized in a direction of magnetizing field.
- ⦿ Property of PARAMAGNETISM- individual atoms or molecules has a net non zero magnetic moment.
- ⦿ i.e., they are polar atoms
- ⦿ Examples: Al, Pt, Cr, Mg, liquid oxygen etc..

FERROMAGNETIC SUBSTANCES

- ⦿ Are those substances which when placed in a magnetic field are strongly magnetized in the direction of magnetizing field.
- ⦿ Ferromagnetism depends on temperature.
- ⦿ Examples: Fe, Ni, Co etc..

THANK YOU

PROPERTIES

<i>S. N</i>	<i>Properties</i>	<i>Diamagnetic</i>	<i>Paramagnetic</i>	<i>Ferromagnetic</i>
1	Definition	It is a material in which there is no permanent magnetic moment.	It has permanent magnetic moment.	It has enormous (more) permanent magnetic moment.
2	Spin or magnetic moment or dipole alignment.	No spin alignment.	Random alignment	Parallel and orderly alignment.
3	Behavior	Repulsion of magnetic lines of force from the centre of the material.	Attraction of magnetic lines towards the centre.	Heavy attraction of lines of force towards the centre.
4	Magnetized direction	Opposite to the External magnetic field.	Same direction as the External magnetic field.	Same direction as the External magnetic field.

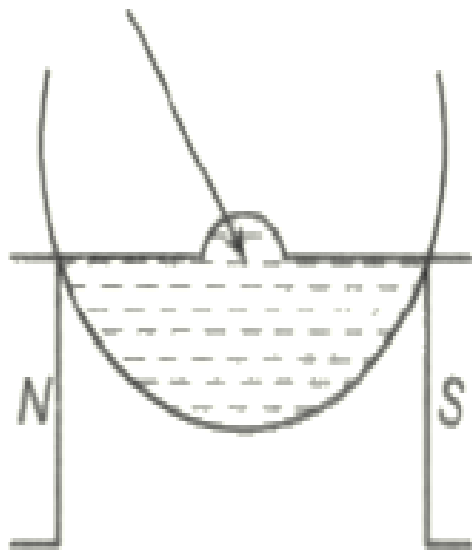
PROPERTIES

5	Permeability	It is very less	It is high	It is very high
6	Relativity permeability	$\mu_r < 1$	$\mu_r > 1$	$\mu_r \gg 1$
7	Susceptibility	Negative	Low positive	High positive
8	Magnetic phase transition	At 0 K, diamagnetic material is Superconductor. When we increase its temperature it becomes a normal conductor.	When temperature is less than the curie temp, it is converted in to Diamagnetic.	When temperature of the material is greater than it Curie temperature it is converted into Paramagnet.

PROPERTIES

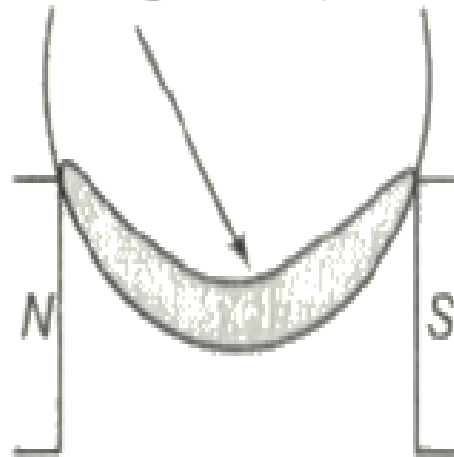
Shape of diamagnetic liquid in a glass crucible and kept over two magnetic poles.

Diamagnetic Liquid



Shape of paramagnetic liquid in a glass crucible and kept over two magnetic poles.

Paramagnetic Liquid



No liquid is ferromagnetic.