Magnetism

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Magnetism

- Is the study of magnetic fields and their effect on materials.
- The effect is due to unbalanced spin of electrons in atom.
- It is readily observed every day – from the simple magnet that attracts nails and other metals to cassette tapes to magnet-driven trains.

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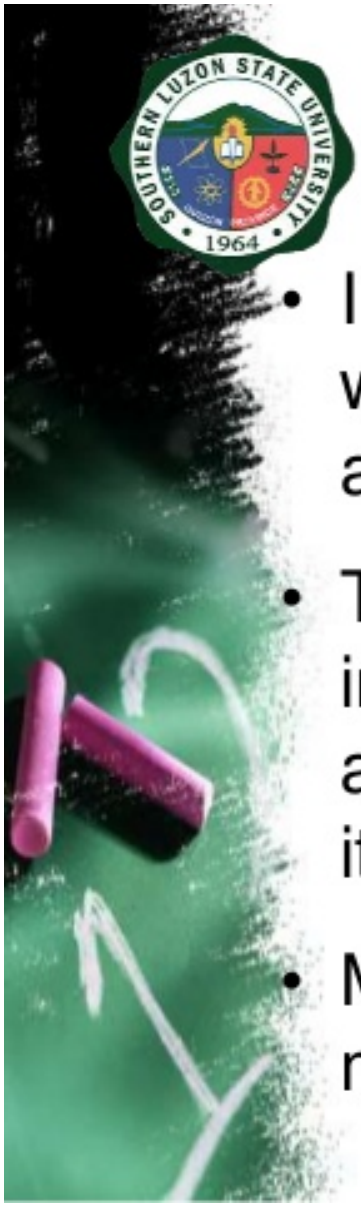
Magnetism

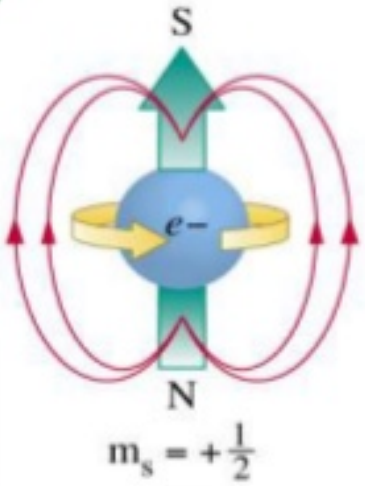
- In terms of applications, magnetism is one of the most important fields in physics.
- Large electromagnets are used to pick up heavy loads.
- Magnets are used in such devices as meters, motors, and loudspeakers.
- Magnetic tapes and disks are used routinely in sound-and video-recording equipment and to store computer data.
- Intense magnetic fields are used in magnetic resonance imaging (MRI) devices to explore the human body with better resolution and greater safety than x-rays can provide.

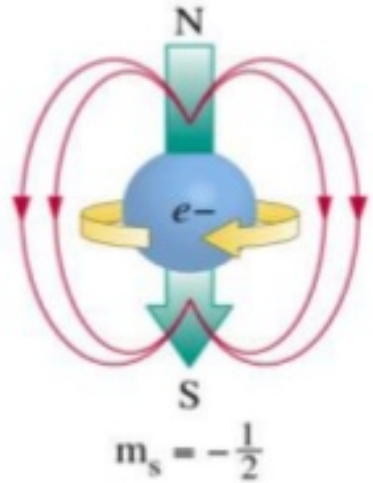


Nature of Magnetism

- In the ancient country of Lydia, in western Asia Minor, now Turkey, was a city called Magnesia.
- The Greeks discovered that certain iron ores found in the place could attract other pieces or iron, they called it magnetites.
- Magnetites are classified as natural magnet.

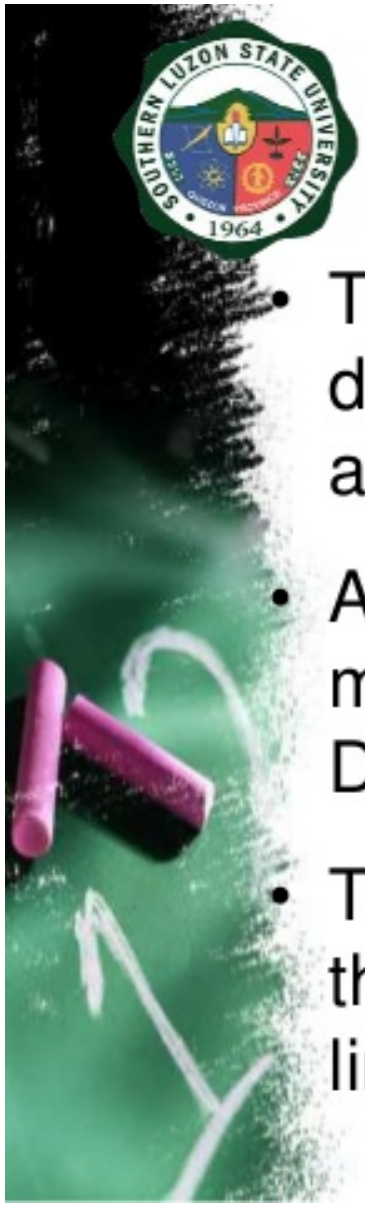
Nature of Magnetism





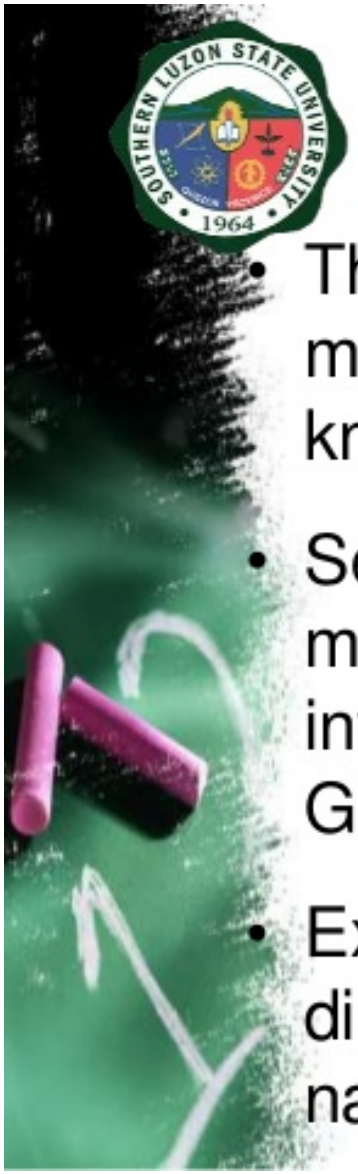
It is now believed that magnetism is due to the spin of electrons within the atoms.

Since the electron is a charged particle, the concept implies that magnetism is a property of a charged particle in motion.



Nature of Magnetism

- The power of attraction of a magnet depends on the arrangement of the atoms.
- All atoms are in themselves tiny magnet formed into groups called DOMAINS.
- The magnetic strength is increased if the domains are induced to fall into line by the action of another magnet.



General Properties of Magnet

- The properties of naturally occurring magnets (magnetites) have been known for over 2,000 years.
- Several studies on magnetism were made, but the first thorough investigation was done by William Gilbert in 1600.
- Experimental results led to the discovery of the many properties of natural and artificial magnets.

General Properties of Magnet

- The opposite end which points south is the south-seeking pole or S pole.

- Magnets come in many shapes and sizes, but each has at least two poles.

- If you cut a magnet into pieces, every piece will still have at least two poles.

Coulomb's Law

- In the MKS system of units, the unit of charge is the **coulomb**, the force is expressed in **newtons** and the distance in **meter**.

- A coulomb is a very large unit of charge. A smaller unit is the **statcoulomb**.
  - *1 coul = 3 x10^9 statcoul*
  - *1 coul = 10^6 microcoul*

General Properties of Magnet

4. Permanent magnets are magnets made from alloys of cobalt and nickel.

These magnets retain their magnetism for a long time.

General Properties of Magnet

5. Other metals like iron can be magnetized by Induction.

When a piece of iron nails touches a permanent magnet, the nails becomes a magnet.

It retains in this condition for as long as it is within the magnetic field.

The nail is a temporary magnet and its magnetism is described as induced magnetism.