gradeup

GK & Science One-Liners PDF

Important Facts About Magnetism

Prep Smart. Score Better. Go gradeup

www.gradeup.co

Important Facts About Magnetism

Magnet

- A magnet is a material which can attract iron objects
- A **natural magnet** is an ore of iron (Fe_3O_4) called magnetite or lodestone
- A magnet which is prepared artificially is called an **artificial magnet e.g. a** bar magnet, a horseshoe magnet etc.
- A freely suspended magnet always aligns itself into **North-South direction**. Like magnetic poles repel and unlike magnetic poles attract each other
- A current-carrying coil containing a soft iron core is called an **electromagnet**
- An electromagnet is utilised in the electric bell, telegraph receiver, telephone diaphragm, transformer, dynamo etc.
- **Permanent magnets** are **made of steel** and **temporary magnet** or electromagnets are made of **soft iron** because steel cannot be magnetised easily but when it is magnetised one time, cannot be demagnetised easily. The soft iron can be magnetised or demagnetised easily

Properties of Magnet

- **Attractive property:** A magnet can attract small pieces of magnetic substances like iron, steel, cobalt, nickel etc. The attraction is maximum at poles. Unlike poles attract and like poles repel
- **Directive property:** A magnet, when suspended freely, aligns itself approximately along the geographical N-S line
- **Magnetic poles exist in pairs** If a magnet is cut into two equal parts transverse to its length, then N and S-poles of the magnet do not get separated

Magnetic Field

- The space in the surrounding of a magnet or a current-carrying conductor in which its magnetic effect can be experienced is called magnetic field.
- **Magnetic lines of force** is an imaginary line drawn in the magnetic field at which a magnetic North pole will move if it is free to do so.
- A tangent drawn at any point of a magnetic line of force represents the direction of magnetic field at that point.
- The **magnetic flux** linked with a surface is equal to the total number of magnetic lines of force passing through that surface normally. Its unit is Weber.
- Magnetic flux, f = **A.** = BA cos q
- **Magnetic Force Acting on a Charge**
- **Moving in Uniform Magnetic Field**

The magnetic force on a moving charge in a magnetic field is given by F = Bqv sin q

where, B = magnetic field, q = charge, v = speed

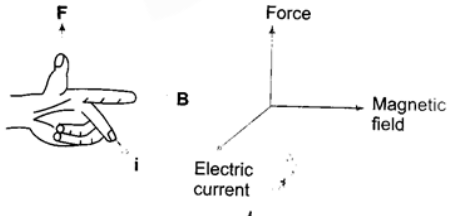
q = angle between the direction of motion and magnetic field.

Magnetic Force Acting on a Current-Carrying Conductor Placed in Uniform Magnetic Field

- If a conductor carrying element / is placed in a magnetic field, the magnetic force on it is given by F = Bill sin q

where, l = electric current flowing through the conductor q = angle between the direction of the current and magnetic field.

The direction of this force can find out by Fleming's left-hand rule which is given below.



• If we stretch the thumb, then the forefinger and the middle finger of the left hand in such a way that all three are perpendicular to each other and if forefinger represents the direction of magnetic field, middle finger represents the direction of current flowing through the conductor, then thumb will represent the direction of magnetic force.

Earth's Magnetism

• The earth has its own magnetic field and it resembles that of a magnetic dipole located at the centre of the earth. The pole near the geographic North of the earth is called the magnetic North pole. Similarly, the pole near the geographic South pole is called the magnetic South pole.

• The Earth's magnetic field diverts charged particle coming from space towards its poles and saves living beings from being severely harmed.

• **Magnetic compass** A magnetic needle which always directs in North-South (N-S) direction.

• **Neutral point** A point in a magnetic region where the net magnetic field is zero.

Magnetic Storm

Local disturbances in the earth's magnetic field which can damage telecommunication which is probably caused by a lump of charged particles emanating from the sun is known as the magnetic storm.

Coil Places in Uniform Magnetic Field

When a coil having N number of turns, each of area of cross-section A carrying current *I* is placed in a uniform magnetic field B, then a torque acts on it, which tries to rotate it.

Torque, $\tau = NB/A \sin q$

Moving Coil Galvanometer

• A moving coil galvanometer is used **to detect the presence of current and the direction of current in any circuit.**

• When current is passed through a coil, suspended in a magnetic field, a torque acts on it. As coil rotates, a restoring torque acts on phosphor bronze strip due to twist produce in it. In equilibrium, both torques become equal the pointer stops for a short moment and coil starts to rotate in opposite direction.

Ammeter and Voltmeter

• An ammeter is an instrument used to measure electric current. It is always connected in series. The resistance of an ideal ammeter is zero.

• A galvanometer can be converted into an ammeter by connecting a low resistance in parallel.

• A voltmeter is a device used to measure the potential difference between two points in an electric circuit.

• The resistance of an ideal voltmeter is infinity. It is always connected in parallel.

• A galvanometer can be converted into a voltmeter by connecting a high resistance in series.

• A small resistance connected in parallel with the load resistance to reduce the amount of electric current through the resistor is called shunt.

Magnetic Substances

• There are three types of magnetic substances **Paramagnetic, Diamagnetic and Ferromagnetic**

Paramagnetic Substances

• Those substances which are feebly magnetised in the direction of the magnetic field when placed in the strong magnetic field, are called **paramagnetic substances**. **For example**- Aluminium, platinum, chromium, manganese, solutions of salts of iron, nickel, oxygen etc.

• These substances are attracted towards the strong magnetic field in a non-uniform magnetic field

• The magnetism of these substances decreases with increase in temperature

Diamagnetic Substances

- Those substances which are feebly magnetised in the opposite direction of the magnetic field when placed in a strong magnetic field, are called **diamagnetic substances**. **For example** Gold, Silver, zinc, copper, mercury, water, alcohol, air, hydrogen etc.
- These substances are attracted towards the weak magnetic field in a **non-uniform magnetic field**
- The magnetism produced in these substances does not change with increase or decrease in temperature

Ferromagnetic Substances

- Those substances which are strongly magnetised in the direction of the magnetic field when placed in it, are called **ferromagnetic substances**. **For example** – iron, nickel, cobalt, etc.
- The magnetism produced in these substances decreases with increase in temperature and at a particular temperature, called Curie temperature.
- At the Curie temperature, a paramagnetic substance becomes diamagnetic.
- The Curie law is Xm ∝1/T (where **Xm**= magnetic susceptibility of a paramagnetic substance and T = temperature)
- Curie temperature for iron is 770^{o}C and for nickel is 358^{o}

gradeup

Gradeup Green Card

Features:

- 350+ Full-Length Mocks
- 30+SSC & Railways Exams Covered
- Tests Available in English & Hindi
- Performance Analysis & All India Rank
- Previous Year Question Papers in Mock Format
- Available on Mobile & Desktop

GET IT ON Google Play

www.gradeup.co