CBSE Class 12 Physics Notes Chapter 4: Here are the notes for CBSE Class 12 Physics Chapter 4 Moving Charges and Magnetism. This chapter explains how moving electric charges create magnetic fields and how these fields interact with other charges and currents.

It covers key concepts like the Biot-Savart law and Ampere's Circuital Law, which describe the creation and measurement of magnetic fields. These notes are designed to help students understand the relationship between electricity and magnetism in a clear and simple way.

CBSE Class 12 Physics Notes Chapter 4 Moving Charges and Magnetism Overview

These notes are prepared by subject experts of Physics Wallah for CBSE Class 12 Physics Chapter 4, Moving Charges and Magnetism. They explain how moving electric charges create magnetic fields and the basic rules that control their interactions. The notes cover important topics like the Biot-Savart law, Ampere's Circuital Law, and how devices like solenoids and galvanometers work.

The goal is to make these complex ideas easier to understand and help students learn how electricity and magnetism are connected.

CBSE Class 12 Physics Notes Chapter 4 Moving Charges and Magnetism PDF

The PDF link for CBSE Class 12 Physics Notes Chapter 4 Moving Charges and Magnetism is available below. It is an essential resource for students seeking to deepen their understanding of the relationship between electricity and magnetism.

CBSE Class 12 Physics Notes Chapter 4 Moving Charges and Magnetism PDF

CBSE Class 12 Physics Notes Chapter 4 Moving Charges and Magnetism

Here are the notes for CBSE Class 12 Physics Chapter 4 Moving Charges and Magnetism. This chapter explain the behavior of electric charges in motion and their interactions with magnetic fields.

These notes provide a detailed overview to help students understand the core concepts and applications of magnetism in various contexts.

Force on a Moving Charge

When a charged particle moves through a magnetic field, it experiences a force known as the Lorentz force. This force acts perpendicular to both the velocity of the charge and the direction of the magnetic field. To determine the direction of this force, we use the Right-Hand Rule: point the fingers of your right hand in the direction of the velocity (v), curl them towards the magnetic field (B), and your thumb will point in the direction of the force.

The magnitude of this force is directly proportional to the charge of the particle, the speed of the particle, the strength of the magnetic field, and the sine of the angle between the velocity vector and the magnetic field vector. This means the force is maximum when the charge moves perpendicular to the magnetic field and zero when it moves parallel to the field.

Strength of Magnetic Field

The strength of a magnetic field, also known as magnetic field intensity or H, measures the contribution of an external current to the magnetic field. It is represented as a vector quantity and is measured in amperes per meter (A/m). The relationship between magnetic field intensity (H) and magnetic flux density (B) is given by the equation:

where:

- B is the magnetic flux density,
- μ is the magnetic permeability of the medium,
- M is the magnetization of the material.

This equation helps in understanding how the internal magnetization of a material and its permeability affect the overall magnetic field strength.

Biot-Savart's Law

Biot-Savart's Law describes the relationship between electric currents and the magnetic fields they generate. It provides a method to calculate the magnetic field produced by a current-carrying conductor.

According to this law, the magnetic field (B) at a point in space due to a small segment of current (I dl) is determined by the vector product of the current segment and the unit vector pointing from the segment to the point of observation.

What Is Lorentz Force?

The Lorentz force is the total force experienced by a charged particle moving through electric and magnetic fields. It combines the effects of both fields on the charge. The Lorentz force (F) is given by the equation:

F= q(v * B + E) (This acts normal to v and the work done by it is zero)

where:

- q is the charge of the particle,
- v is the velocity of the particle,
- B is the magnetic field,
- E is the electric field,
- × denotes the cross product between velocity and magnetic field.

Cyclotron Frequency

Cyclotron frequency refers to the frequency at which a charged particle orbits in a magnetic field. When a charged particle moves in a plane perpendicular to a uniform magnetic field, it experiences a centripetal force due to the magnetic field, which causes it to move in a circular path. The frequency of this circular motion is called the cyclotron frequency.

Ampere’s Circuital Law

Ampere’s Circuital Law relates the magnetic field around a closed loop to the electric current passing through the loop. The law states that the integral of the magnetic field (B) around a closed path (C) is directly proportional to the total current (I) passing through the surface (S) bounded by that path. Mathematically, the law is expressed as:

$$\oint_c B.\, dl = \mu_0 I$$

Benefits of CBSE Class 12 Physics Notes Chapter 4 Moving Charges and Magnetism

- **Comprehensive Understanding**: The notes provide a thorough explanation of fundamental concepts such as the force on a moving charge, magnetic field strength, and the Biot-Savart Law. This comprehensive coverage helps students build a solid foundation in electromagnetism.
- **Clear Explanations**: Concepts like Lorentz force, cyclotron frequency, and Ampere’s Circuital Law are broken down into simple, easy-to-understand explanations. This clarity helps students grasp complex topics more effectively.
- **Illustrative Examples**: The notes include various examples and applications, such as calculating magnetic fields and understanding the motion of charged particles. These examples help students see practical applications of theoretical concepts.
- **Mathematical Formulas**: The notes provide important formulas and equations, such as the Lorentz force equation and the formula for magnetic field strength. This inclusion is crucial for solving problems and performing calculations in exams.