Electromagnetism

PH12-13

4 inquiry questions · 15 dot points

1 What happens to stationary and moving charged particles when they interact with an electric or magnetic field?

- investigate and quantitatively derive and analyse the interaction between charged particles and uniform electric fields, including:...
- model qualitatively and quantitatively the trajectories of charged particles in electric fields and compare them with the trajectories of projectiles in a gravitational field
- analyse the interaction between charged particles and uniform magnetic fields, including:...
- compare the interaction of charged particles moving in magnetic fields to:...

2 Under what circumstances is a force produced on a current-carrying conductor in a magnetic field?

- investigate qualitatively and quantitatively the interaction between a current-carrying conductor and a uniform magnetic field $F=Il_{\perp}B=IlB\sin\theta$ to establish:...
- conduct a quantitative investigation to demonstrate the interaction between two parallel current-carrying wires
- analyse the interaction between two parallel current-carrying wires $F/l=(\mu_0/2\pi)I_1I_2/r$ and determine the relationship between the International System of Units (SI) definition of an ampere and Newton's Third Law of Motion

3 How are electric and magnetic fields related?

- describe how magnetic flux can change, with reference to the relationship $\Phi=B_{\parallel}A=BA\cos\theta$
- analyse qualitatively and quantitatively, with reference to energy transfers and transformations, examples of Faraday's Law and Lenz's Law $\varepsilon= -N\Delta\Phi/\Delta t$, including but not limited to:...
- analyse quantitatively the operation of ideal transformers through the application of:...
- evaluate qualitatively the limitations of the ideal transformer model and the strategies used to improve transformer efficiency, including but not limited to:...
- analyse applications of step-up and step-down transformers, including but not limited to:...

4 How has knowledge about the Motor Effect been applied to technological advances?

- investigate the operation of a simple DC motor to analyse:...
- analyse the operation of simple DC and AC generators and AC induction motors
- relate Lenz's Law to the law of conservation of energy and apply the law of conservation of energy to:...