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D.3 Motion in electromagnetic fields

Checklist

What you should know

After studying this subtopic, you should be able to:

- Predict the direction of the force on a charged particle in an electric field, and calculate its magnitude.
- Understand that the acceleration of a charged particle in an electric field is affected by the magnitude (and direction) of the field and the charge and mass of the particle.
- Predict and calculate changes in the kinetic energy and electric potential energy of a charged particle that moves through an electric field.
- Describe the motion of a charged particle moving through a uniform magnetic field.
- Describe and explain the motion of a charged particle in magnetic and electric fields at right angles to each other.
- Predict the direction of the force on a charged particle in a magnetic field, describe the path taken by the particle and use the equation:

$$F = qvB\sin\theta$$

- Predict the radius of the circular path followed by a charged particle moving in a uniform magnetic field.
- Describe how the path of a charged particle moving through a magnetic field can be used to determine properties of the particle.
- Describe that a current-carrying conductor in a magnetic field experiences a resultant magnetic force equal to the sum of the forces experienced by all the charged particles moving through it.
- Predict the direction of the force on a current-carrying conduction in a magnetic field, and use the equation:

$$F = BIL\sin\theta$$

- Explain that two parallel current-carrying conductors will exert a force on one another.
- Predict the directions of the forces on two parallel current-carrying conductors, and use the equation:

$$\frac{F}{L} = \mu_0 \frac{I_1 I_2}{2\pi r}$$