8.3 - Magnetic Forces

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- (1998) An electron is projected horizontally with a velocity of 2.0×10^6 ms^{-1} into a large evacuated enclosure. A magnetic field which has a flux density of 15×10^{-4} tesla is directed vertically downwards throughout the enclosure. Find
  - the radius of curvature of the electron's path.
  - how many complete loops must the electron describe before it falls by 1.0 cm under the influence of gravity?
  - What would be the effect of changing the direction of the magnetic field to upwards?
- (2000) An electron with charge e and mass m_e is initially projected with a speed v at right angles to a uniform magnetic field of flux density B .
  - Explain why the path of the electron 1 s circular.
  - Show also that the time to describe one complete circle is independent of the speed of the electron.
- (2000) Calculate the radius of the path traversed by an electron of energy 450 eV moving at right angles to a uniform magnetic field of flux density 1.5×10^{-3} T.
- (2009) Develop an equation for the torque acting on a current carrying coil of dimensions lxb placed in a magnetic field. How is this effect applied in a moving coil galvanometer?
- (2009) A galvanometer coil has 50 turns, each with an area of 1.0 cm^2 . If the coil is in a radian field of 10^{-2} T and suspended by a suspension of torsion constant 2×10^{-9} Nm per degree, what current is needed to give a deflection of 30° ?
- (2009) Give a general form expressing the force exerted on the wire carrying current i if its length l is inclined at angle angle θ to the magnetic field B .
- (2009) A wire carrying a current of 2 A has a length of 100 mm in a uniform magnetic field of 0.8 Wb/m^2 . Find the force acting on the wire when the field is at 60° to the wire.
- (2009) A wire carrying a current of 25 A and 8 m long is placed in a magnetic field of flux density 0.42 T . What is the force on the wire if it is placed:
  - At right angles to the field?
  - At 45° to the field?
  - Along the field?

- (2013) Derive the formula for the torque acting of the rectangular current-carrying coil in a magnetic field
- (2013) Give comment on the statement that, an electron suffers no force when it moves parallel to the magnetic field, B .
- (2015) A horizontal straight wire 0.05 m long weighing 2.4 g/m is placed perpendicular to a uniform horizontal magnetic field of flux density 0.8 T. If the resistance of the wire is 7.6Ω/m, calculate the potential difference that has to be applied between the ends of the wire to make it just self-supporting.
- (2015) Two very long wires made of copper and of equal lengths are placed parallel to each other in such a way that they are 10 cm apart. If the total power dissipated in the two wires is 75 W, find the force between them if the resistivity of the copper wire is $1.69 imes 10^{-8}\Omega m$ and of diameter 2 mm.
- (2017) State the law of force acting on a conductor of length l carrying an electric current in a magnetic field.
- (2019) Determine the magnitude of force experienced by a stationary charge in a uniform magnetic field.