O Level Physics Tutorial 18: Electromagnetism

Syllabus :
(a) draw the pattern of the magnetic field due to currents in straight wires and in solenoids and state the effect on the magnetic field of changing the magnitude and/or direction of the current

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1. Draw the pattern of the magnetic field due to currents in

   (i) straight wires and

   (ii) in solenoids

and state the effect on the magnetic field of changing the magnitude and/or direction of the current.

(b) describe the application of the magnetic effect of a current in electromagnets (e.g. circuit breakers)

2..Describe the application of the magnetic effect of a current in electromagnets in :

(i) circuit breakers
(ii) motors
(iii) generators
(iv) relays
(v) loudspeakers
(vi) hard disks
(vi) MRI machines

(c) describe experiments to show the force on a current-carrying conductor, and on a beam of charged particles, in a magnetic field, including the effect of reversing (i) the current (ii) the direction of the field

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3. Describe experiments to show, in a perpendicular magnetic field,

(a) the force on a current-carrying conductor, and
(b) in a beam of charged particles.

In each case, state the effect of reversing the direction of :

(i) the current
(ii) the direction of the field

(d) deduce the relative directions of force, field and current when any two of these quantities are at right angles to each other using Fleming's left-hand rule

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4. The left figure shows Fleming's left hand rule. Explain the meanings of the letters and arrows.

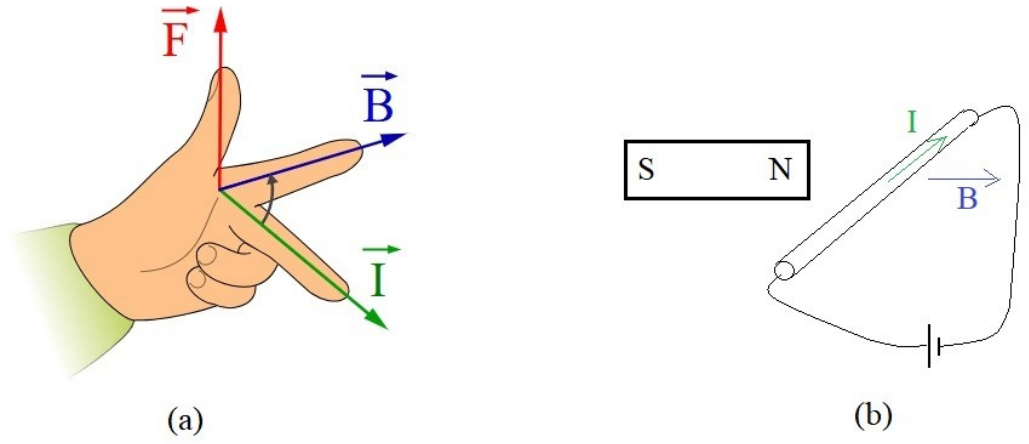

Figure 18-1

The right figure shows a wire carrying a current I. It is horizontal, and perpendicular to the magnetic field from the magnet. Find the direction of the force on the wire due to the magnetic field.

(e) explain how a current-carrying coil in a magnetic field (e.g. in a motor) experiences a turning effect and that the effect is increased by increasing (i) the number of turns on the coil (ii) the current

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5. (a) Explain how a current-carrying coil in a magnetic field in a motor experiences a turning effect.

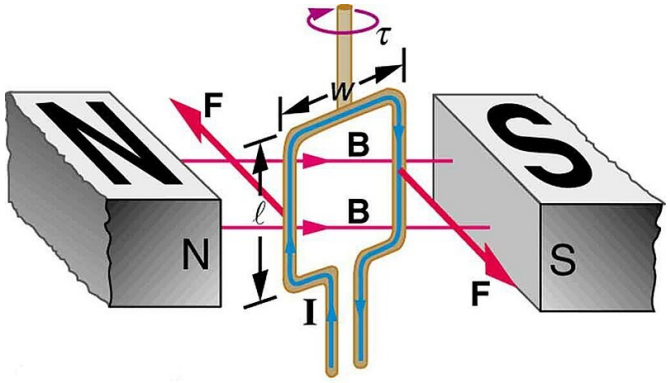

Figure 18-2

(b) Explain the effect of increased increasing

(i) the number of turns on the coil, or
(ii) the current.

(f) describe the action of a split-ring commutator in a two-pole, single-coil motor and the effect of winding the coil on to a soft-iron cylinder.

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6. (a) The split-ring commutator is labelled "position 1" and "position 2" at two different times in this figure.

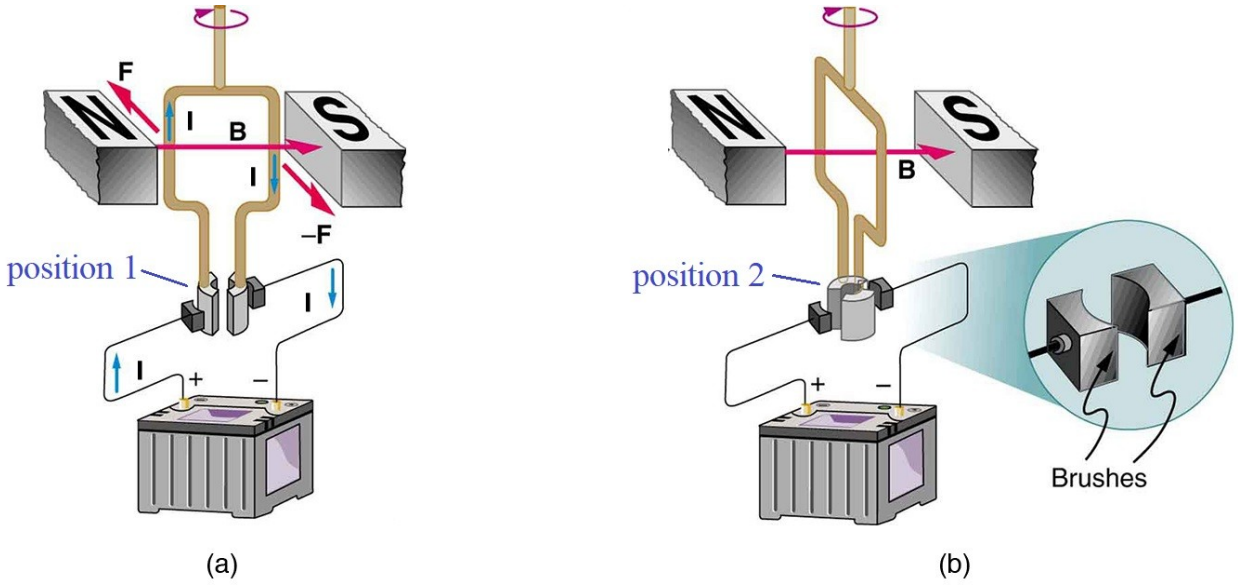

Figure 18-3

Explain why the motor needs a commutator.

(b) Why is the wire in real motor coiled round a soft-iron cylinder?

Updated 7 March 2025