Magnetic field and force on a current

Distinguish magnetic units and apply Fleming's left-hand rule to the motor effect

Magnetism and motor force

Magnetic flux vs flux density

- Magnetic flux (Φ) measures total field passing through an area; SI unit is weber (Wb).
- For a uniform field normal to a flat area: Φ = BA, so B = Φ/A.
- 1 T = 1 Wb m^{-2} = 1 N A^{-1} m^{-1}; the CGS unit is gauss (1 T = 10^4 gauss).

Force on a current-carrying wire

- A current-carrying conductor can experience force in an external magnetic field.
- For straight length L at angle θ to uniform field B, force magnitude is F = B I L sin θ.
- Force is maximum when current is perpendicular to B (θ = 90°) and zero when parallel.

Fleming's left-hand rule

- Stretch thumb, forefinger and middle finger of the left hand mutually perpendicular.
- Forefinger points along Magnetic Field (B); middle finger along Current (I).
- Thumb then indicates the direction of Force or motion (F) on the conductor.

Distinguishing the hand rules

- Reverse current or field alone: force reverses. Reverse both: its direction stays the same.
- Right-Hand Thumb Rule gives the circular magnetic field around a straight current.
- Fleming's Right-Hand Rule gives induced current direction in a generator.

REMEMBER Left hand: field → forefinger, current → middle finger, force → thumb. B is measured in tesla.

Sources & practice · NIOS — Magnetic effect of electric current · OpenStax — Force on a current-carrying conductor
mindmapsforupsc.com/mindmaps/pet-magnetic-force/?lang=en