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Biot-Savart law and Ampere law

Formulas and units, JEE Main. Status: Reviewed on 2026-11-20.

Result	Formula	Units or note
Biot-Savart law	dB = (mu0/4 pi) I dl x r / r^3 Valid when: steady current element; field of one element, add vectors for a full wire	T (mu0/4 pi = 10^-7 T m/A)
Centre of N-turn circular coil	B = mu0 N I/(2R) Valid when: at centre of a flat circular coil of N tight turns, radius R	T
Axis of circular coil	B = mu0 N I R^2/(2 (R^2 + x^2)^(3/2)) Valid when: on axis of circular coil, x measured from its centre	T
Arc of angle phi at its centre	B = mu0 I phi/(4 pi R) Valid when: at the centre of a circular arc of radius R; phi in radian	T (phi in radian)
Ampere law	closed line integral of B . dl = mu0 I_enc Valid when: steady currents; closed loop, I_enc is the net current through it	T m (A)
Long straight wire	B = mu0 I/(2 pi r) Valid when: infinitely long straight wire, r is perpendicular distance	T
Solid cylinder, inside (r < a)	B = mu0 I r/(2 pi a^2) Valid when: inside a long solid cylinder with uniform current density	T
Long solenoid, inside	B = mu0 n I, n = N/L Valid when: deep inside a long ideal solenoid; n is turns per metre	T (n per metre)

Full lesson with worked examples:
https://www.engineeringrise.in/learn/learn/jee-main/physics/magnetic-effects-of-current-and-magnetism/biot-savart-law-and-ampere

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