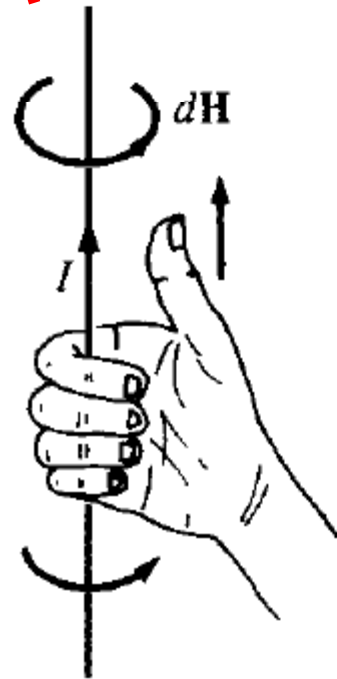


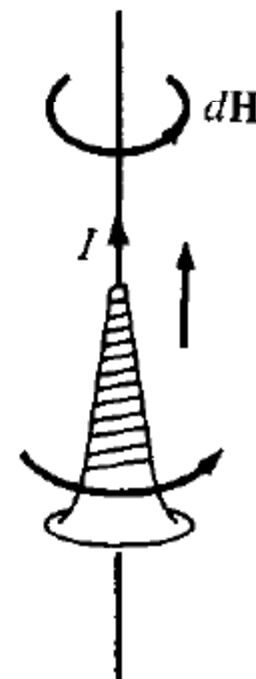
Biot-Savart's Law

$$d\mathbf{H} = \frac{I d\mathbf{l} \times \mathbf{a}_R}{4\pi R^2} = \frac{I d\mathbf{l} \times \mathbf{R}}{4\pi R^3}$$

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(a)



(b)

Biot-Savart's Law Formula

$$\mathbf{H} = \frac{I}{4\pi r} (\cos \alpha_2 - \cos \alpha_1) \mathbf{a}_\phi$$

$$\mathbf{a}_\phi = \mathbf{a}_\ell \times \mathbf{a}_\rho$$

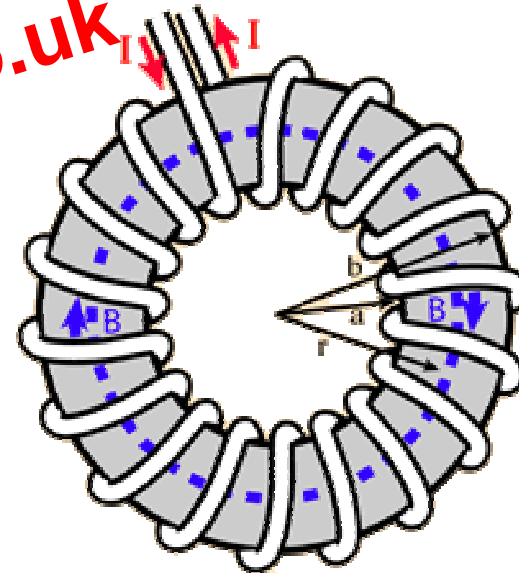
$$\mathbf{H} = \frac{I}{2\pi\rho} \mathbf{a}_\phi$$

Ampere's Circuit Law

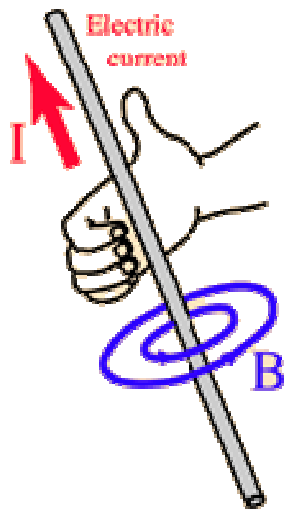
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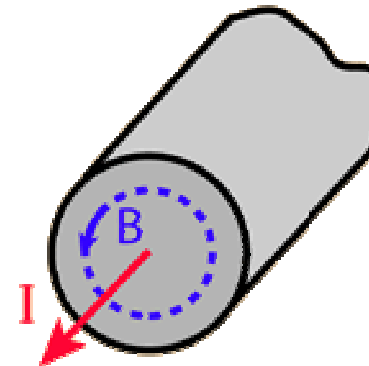
Magnetic field inside a long solenoid.



Magnetic field inside a toroidal coil.



Magnetic field from a long straight wire.



Magnetic field inside a conductor.

Example 1

Calculate

(a) B at $(7, 5, 10)$

(b) The flux through the square loop



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described by

$$5 \leq \rho \leq 9,$$

$$4 \leq z \leq 8,$$

$$\phi = 90^\circ$$