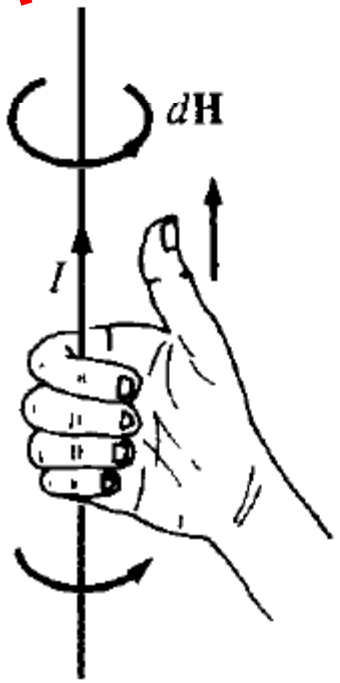
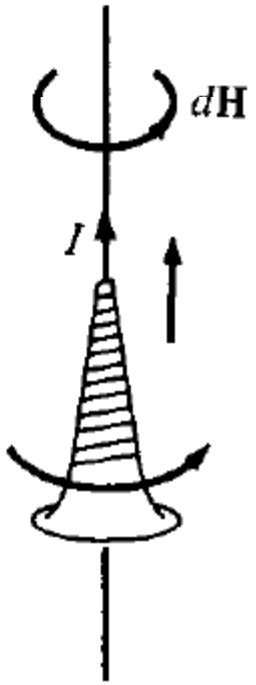
Biot-Savart's Law

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



(a)



(b)

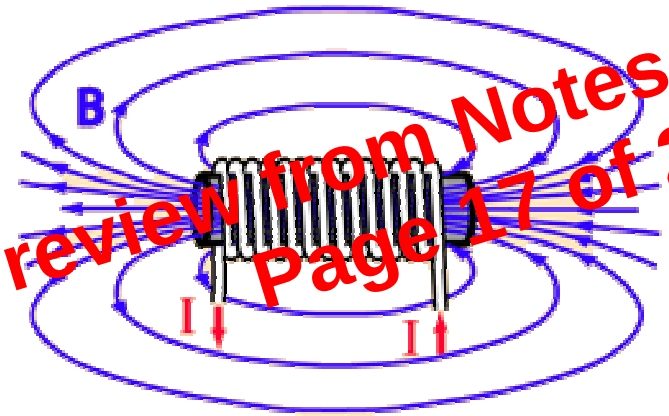
Biot-Savart's Law Formula

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

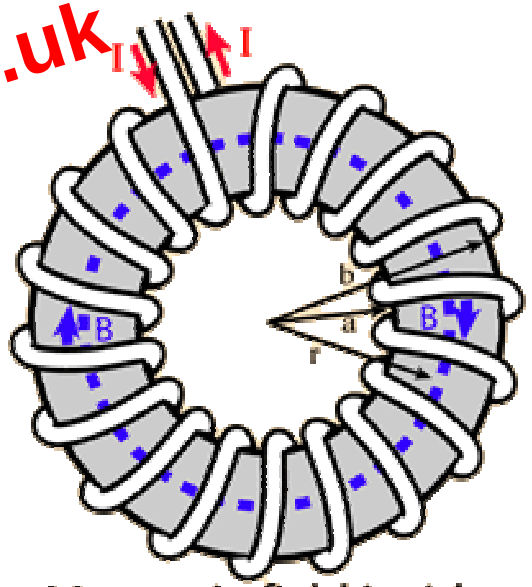
$$\mathbf{a}_\phi = \mathbf{a}_\ell \times \mathbf{a}_\rho$$

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

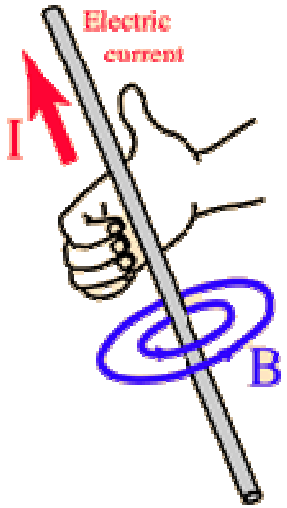
Ampere's Circuit Law



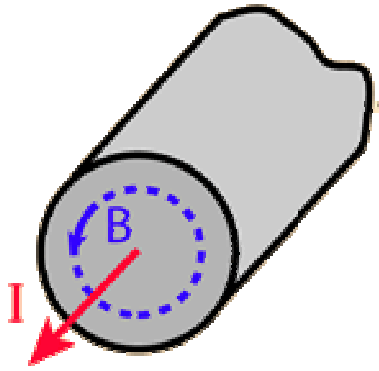
Magnetic field inside a long solenoic.



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 described by

$$5 \le \rho \le 9,$$

$$4 \le z \le 8,$$

$$\phi = 90^o$$