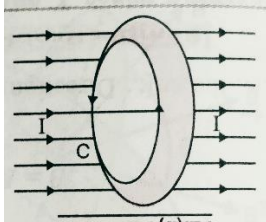


Ampere's circuital law –

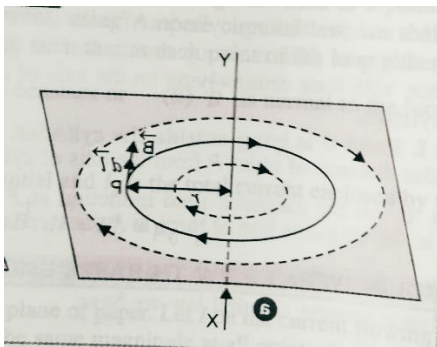
According to this law the line integral of the magnetic field around any closed path in free space is equal to μ_0 times the total current passing through the surface enclosed by the closed path .

i.e. $\oint B \cdot dl = \mu_0 I$



Proof of Ampere's circuital law –

Suppose a thin long straight conductor XY lying in the plane of paper carrying current 'I' flowing in the direction as shown in figure .



$$B = \frac{\mu_0 I}{2\pi a}$$

We take a small element of length dl of the closed path at p . The direction of B and dl is same ,

$$\oint B \cdot dl \cos\theta = \oint B \cdot dl \cos 0 =$$

$$\oint B \cdot dl = \frac{\mu_0 I}{2\pi a} \oint dl = \frac{\mu_0 I}{2\pi a} (2\pi a) = \mu_0 I \dots \text{hence proved Ampere's law .}$$