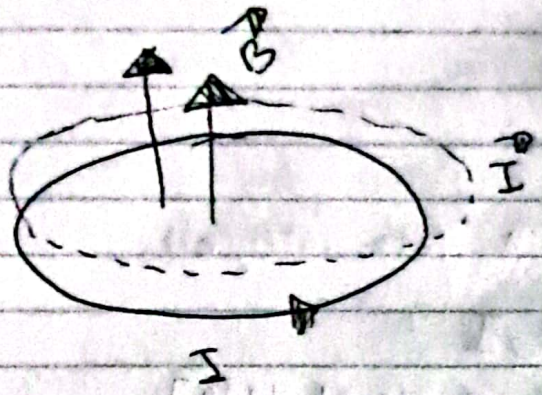
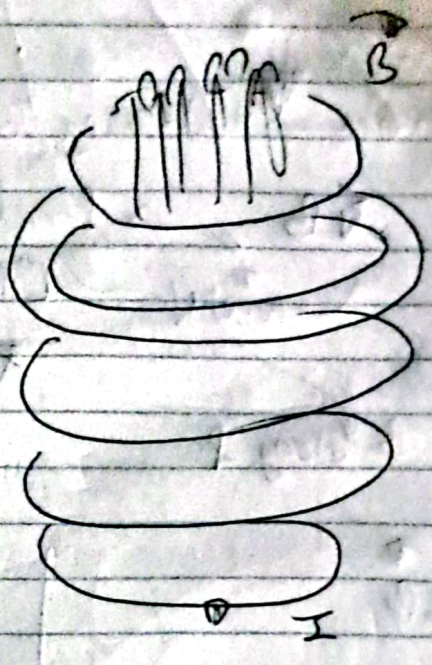
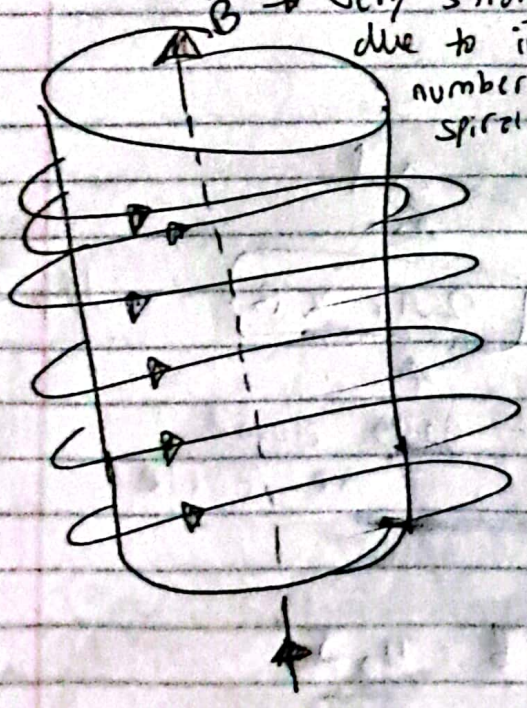
Solenoid example



full diagram



Increase in rotation of the current increases magnetic field.



B → very strong due to increasing number of spiral currents

Solenoid

Strength of B-field on a solenoid

$$B = \mu_0 n I$$

n = number of turns per unit length $= \frac{N}{L}$

$$B = \mu_0 \frac{N I}{L}$$

Ka

obate kohomada
mama hondin

ude
davi
ratri Aharaya

pan
kukul mas bittara

Ampere's law

$$\oint \vec{B} \cdot d\vec{l} = \mu_0 I$$

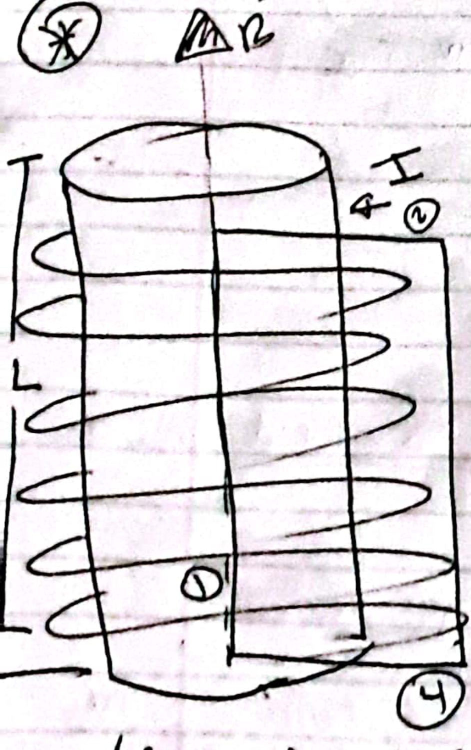
⇓

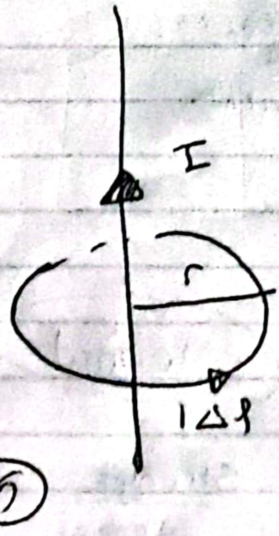
when not dealing with path integrals

$\Sigma B_{\parallel} \Delta l = \mu_0 I$ [for a closed loop]

parallel → B along l

↑ how much current is crossing in a closed loop





Δl
↑
$2\pi r \times B = \mu_0 I$
↑
going around the circle

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

$$\left(\frac{\mu_0 I}{2\pi r}\right)(2\pi r) = \mu_0 I$$

$\Sigma B_{\parallel} \Delta l = \mu_0 I$

$Bl + 0 + 0 + 0 = \mu_0 (NI) = \mu_0 n I$

inside ①, going out ②, on the outside ③, for outside ④

$Bl = \mu_0 N I$

$B = \frac{\mu_0 N I}{l}$

Magnetic materials

Ferromagnetic, paramagnetic, diamagnetic

- internal field gets stronger with an applied magnetic field
- opposes the internal field

paramagnetic :- spin of electron
diamagnetic :- orbit of electron

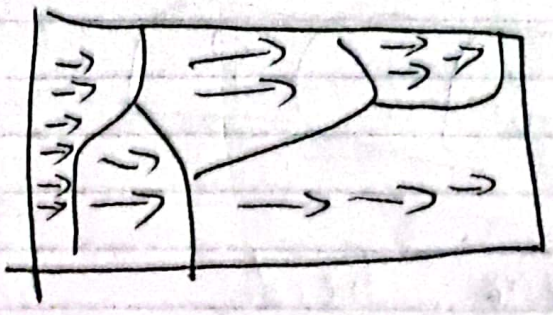
Ferromagnetic

Iron (Fe)

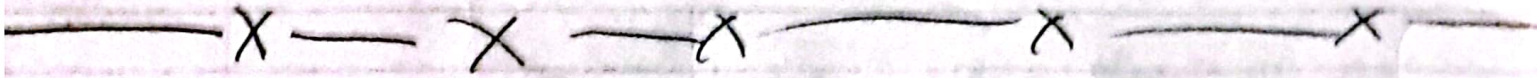
Iron bar without the magnetic field

All magnetic dipoles line up

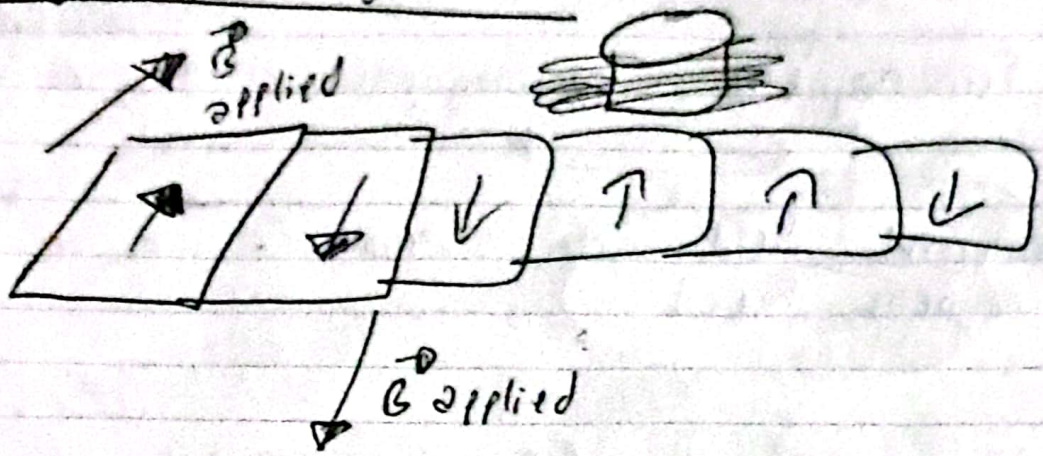
Put in B field



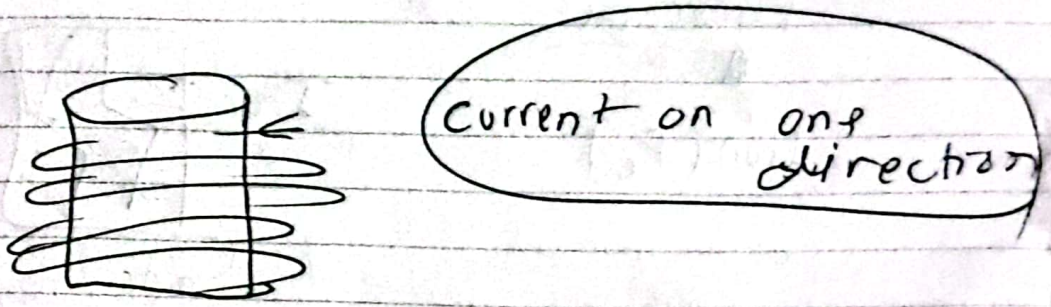
Iron bar when put in a magnetic field

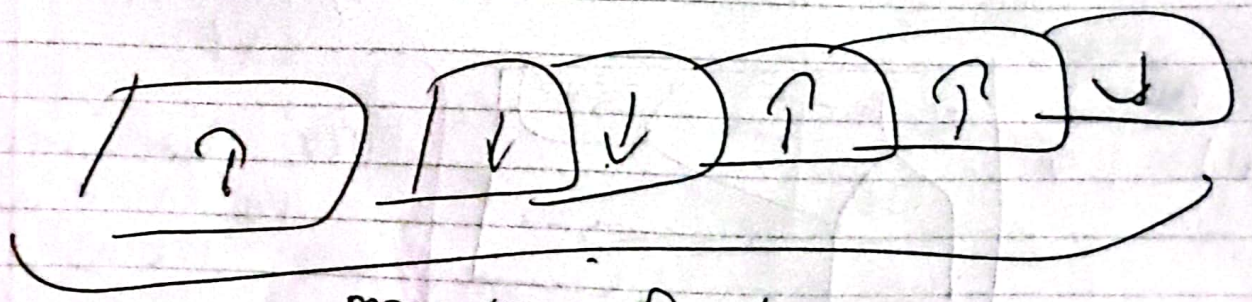


Magnetic storage example

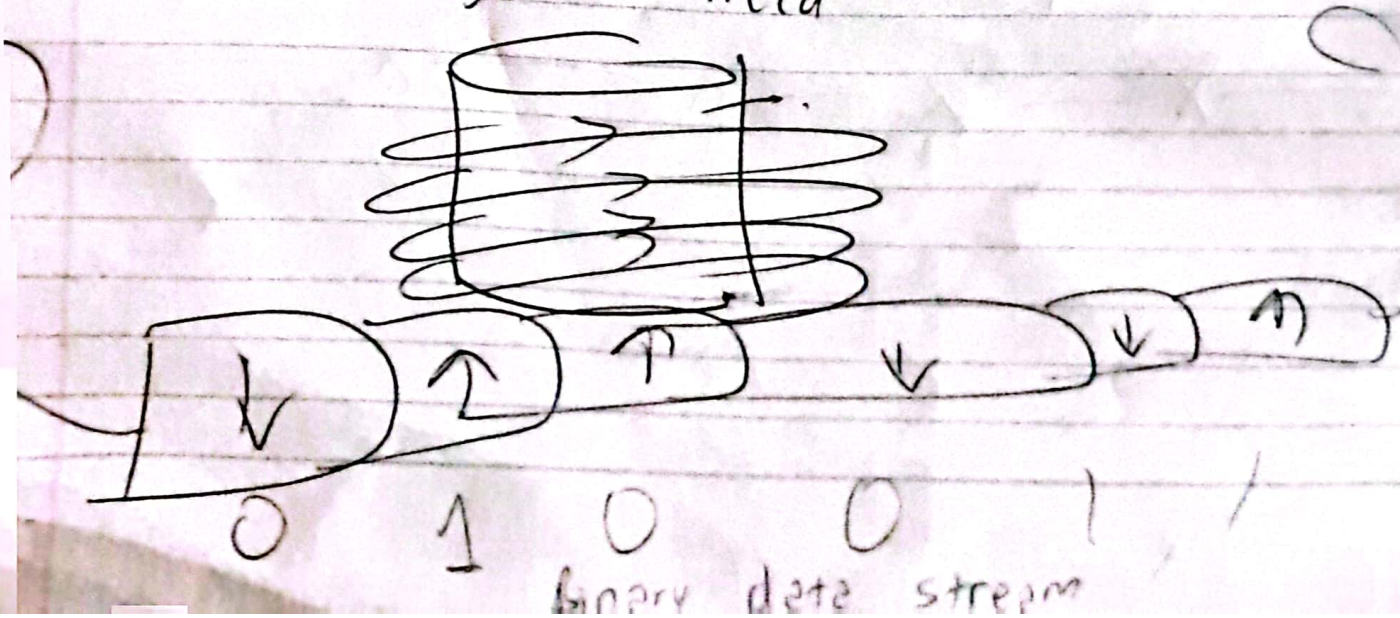


- if I apply current on one side, magnetic field will be produced where the current is flowing





magnetic Head



0 1 0 0 1 1

binary data stream