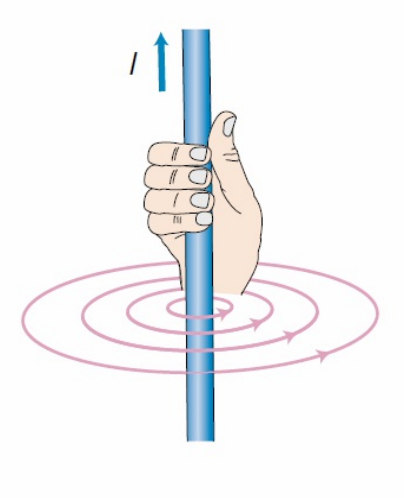
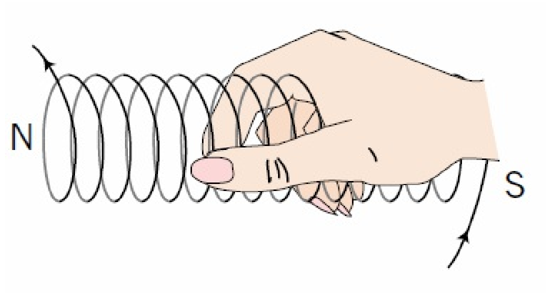
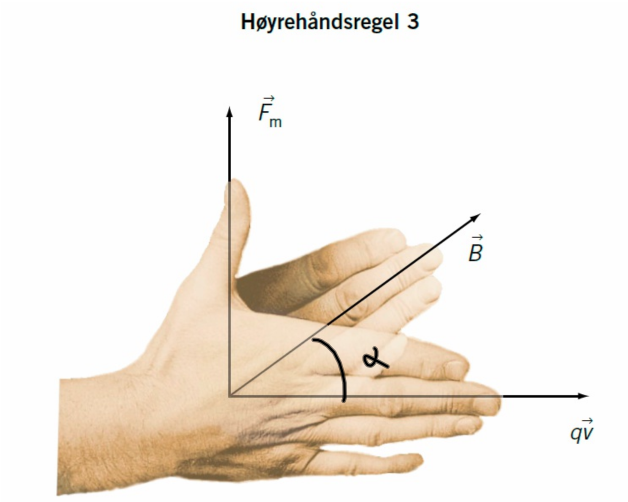
Kort repetisjon

Høyrehåndsregel 1



Høyrehåndsregel 2





$$\vec{F}_m = q\,\vec{v} \times \vec{B}$$

$$F_m = q v B \sin\alpha$$

Oppgave 4

Et proton går inn i et homogent magnetisk felt med feltstyrken $B = 2{,}0$ T. Feltet står vinkelrett på protonets bane. Farten til protonet er $4{,}0 \cdot 10^6$ m/s.

a) Hva er den kinetiske energien til protonet? Forandrer denne energien seg når protonet beveger seg inn i feltet? Grunngi svaret.

b) Bestem verdien og retningen for kraften på protonet når det går inn i feltet. Tegn en figur der du markerer retningen til farten, kraften og magnetfeltet.

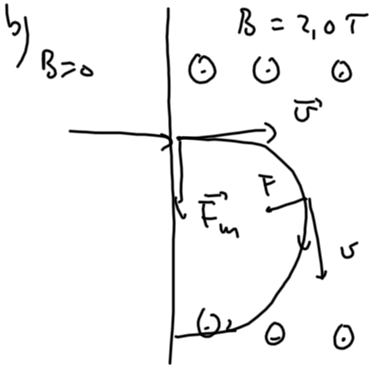
c) Hvor stor blir radien i den sirkelbanen protonet følger?

d) Hvor lang tid bruker protonet på å gå halve sirkelbanen?

tabell = $1{,}6 \cdot 10^{-27}$ kg

a) $E_k = \frac{1}{2} m v^2 =$

b)



$F_m = q v B \sin 90° =$

$q = 1{,}6 \cdot 10^{-19}$ C, $\sin 90° = 1$

c) $q v B = m \frac{v^2}{r}$ $\qquad r = \frac{m v}{q B} = \ldots$

d) $t = \frac{s}{v} = \frac{\pi r}{v} = \frac{\pi m v}{v q B} = \frac{\pi m}{q B}$

Kraft på leder i magnetfelt

$$I = q/t = \frac{q}{l} v$$

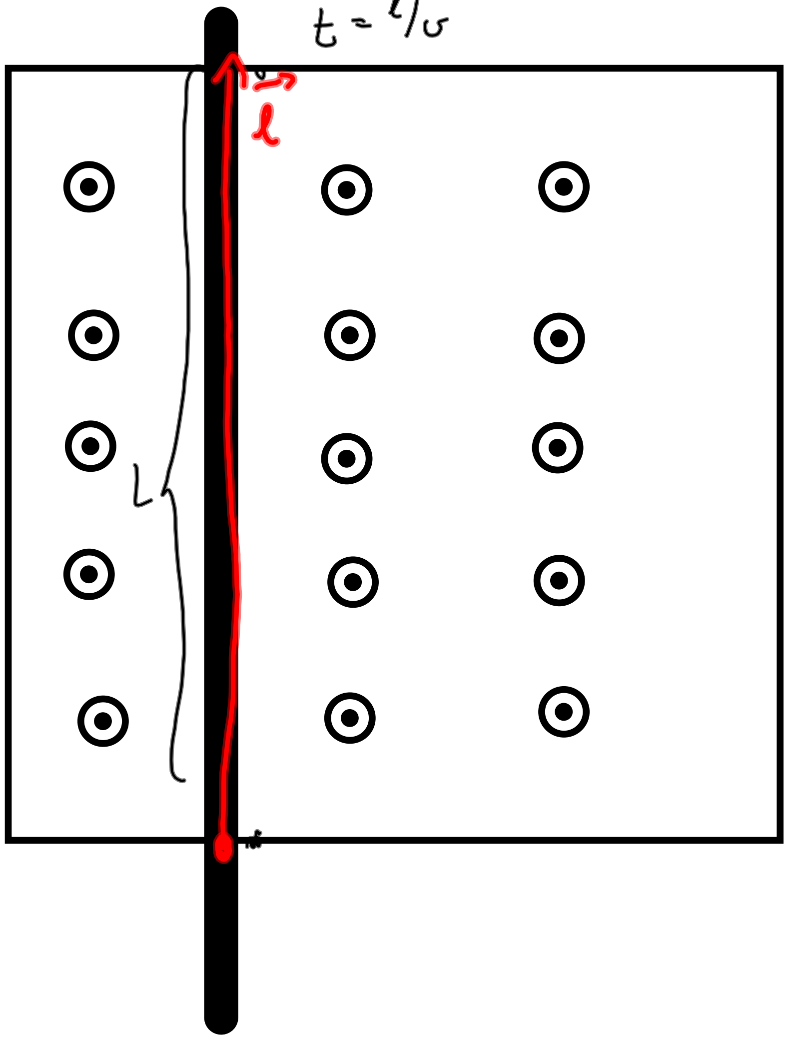
$$t = l/v$$

$$q = \frac{I l}{v}$$

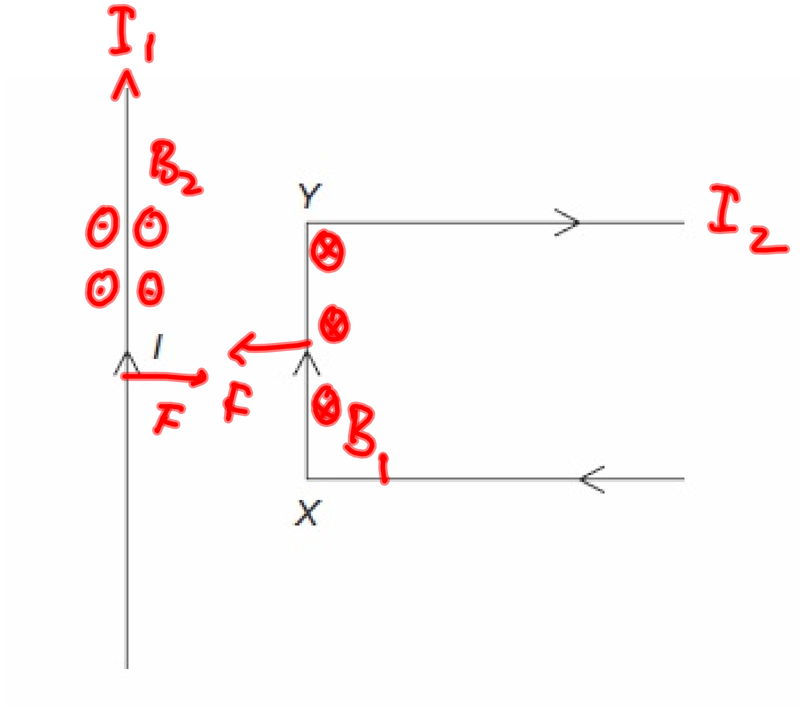
$$v \perp B$$

$$F = q v B = \frac{I l}{v} \cdot v B = I l B$$

$$\vec{F} = I \vec{l} \times \vec{B}$$



Her ser du to ledere. Lederstykket XY
blir påvirket av en magnetisk kraft.
Hvilken retning har denne kraften?



Eksempel

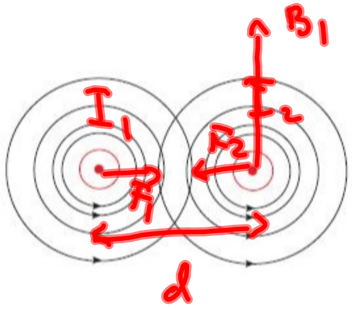
Vi har to lange, rette og parallelle ledere.

Det virker tiltrekkende krefter mellom dem, F

og på et 10 cm langt lederstykke er kraften $3{,}6 \cdot 10^{-6}$ N.

l Strømmen gjennom lederne er 1,5 A og 3,0 A. (I_1, I_2)

Avstanden mellom lederne er...



$$F_2 = I_2 \cdot l \, B_1 = I_2 \, l \cdot k_m \frac{I_1}{d} = k_m \cdot \frac{I_1 I_2}{d} \cdot l$$

$$k_m = 2 \cdot 10^{-7} \frac{Tm}{A}$$

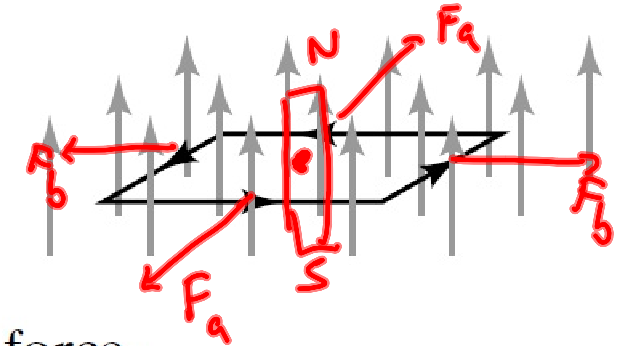
$$B_1 = k_m \cdot \frac{I_1}{d}$$

$$F = k_m \frac{I_1 I_2}{d} l \Rightarrow d = k_m \frac{I_1 I_2}{F} \cdot l$$

$$= 2{,}5 \text{ cm}$$

Samsnakk

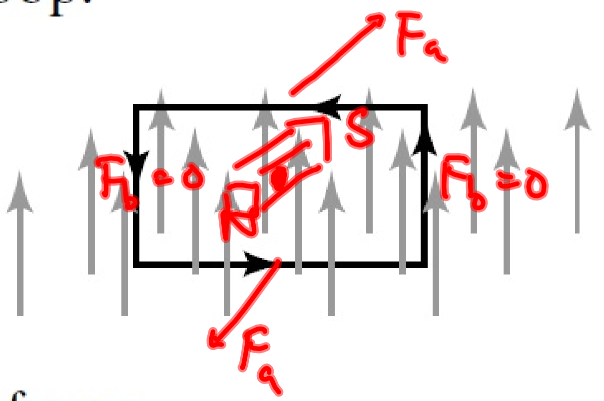
A rectangular loop is placed in a uniform magnetic field with the plane of the loop perpendicular to the direction of the field. If a current is made to flow through the loop in the sense shown by the arrows, the field exerts on the loop:



1. a net force.
2. a net torque.
3. a net force and a net torque.
4. neither a net force nor a net torque.

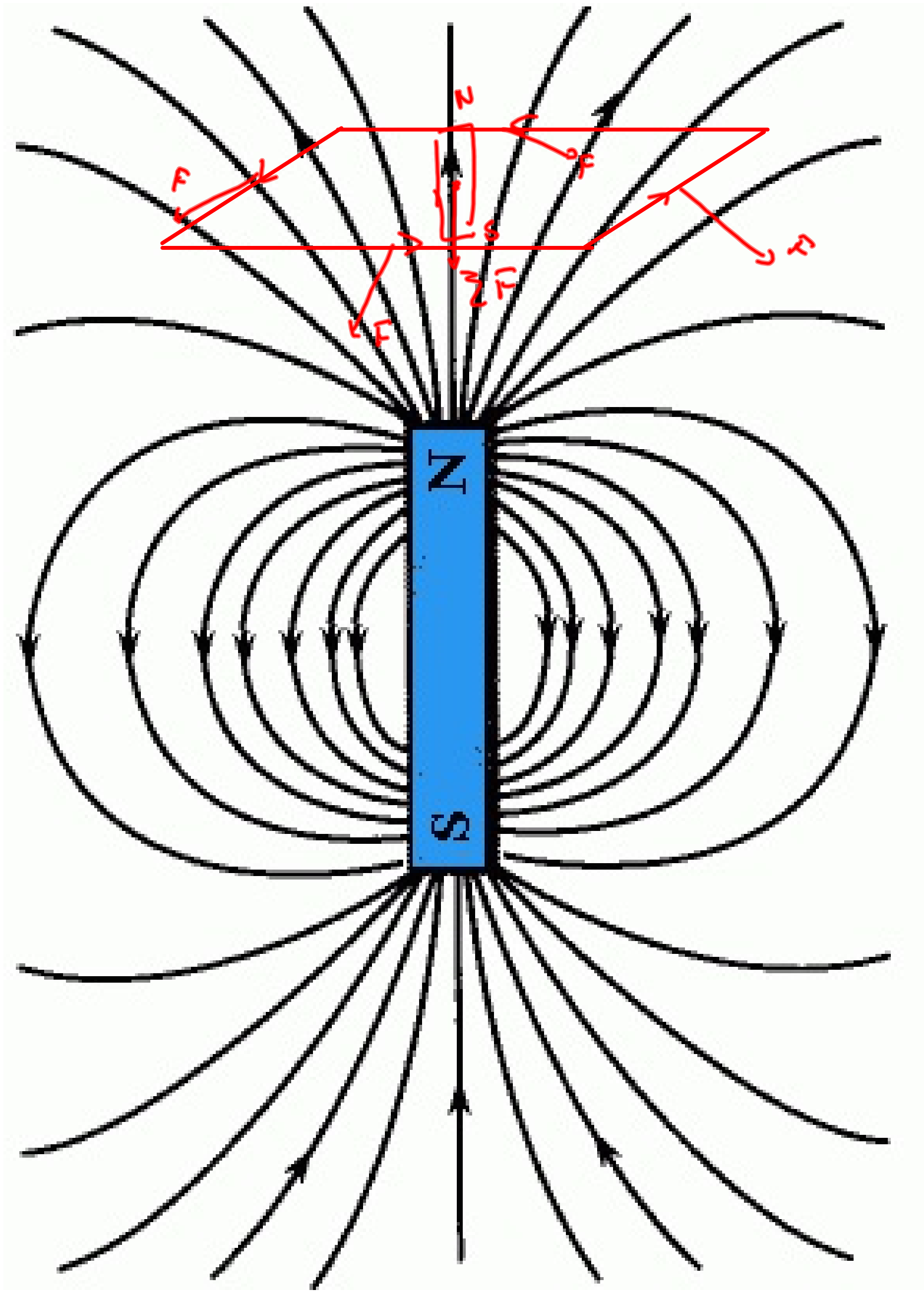
Samsnakk

A rectangular loop is placed in a uniform magnetic field with the plane of the loop parallel to the direction of the field. If a current is made to flow through the loop in the sense shown by the arrows, the field exerts on the loop:

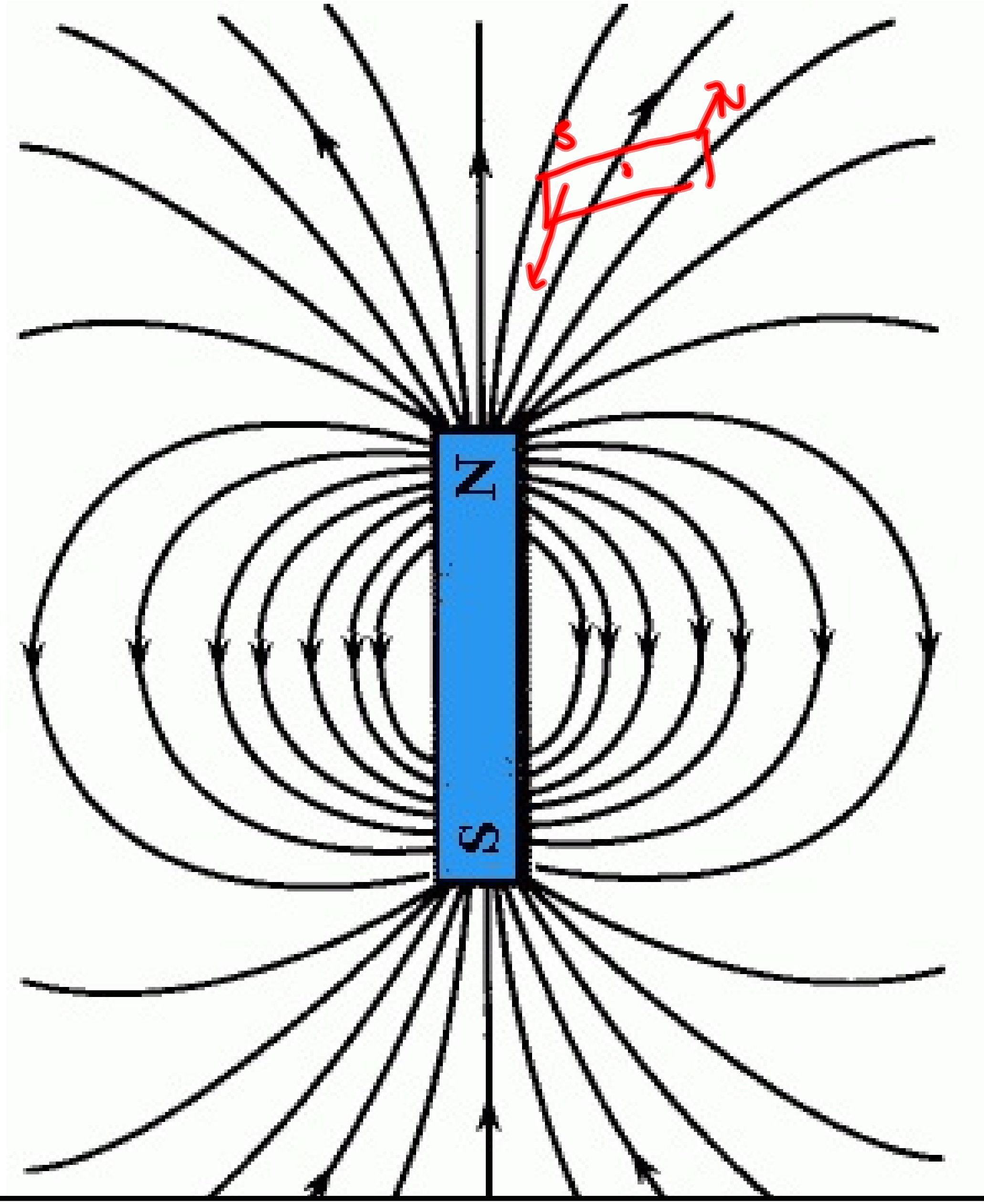


1. a net force.
2. a net torque.
3. a net force and a net torque.
4. neither a net force nor a net torque.

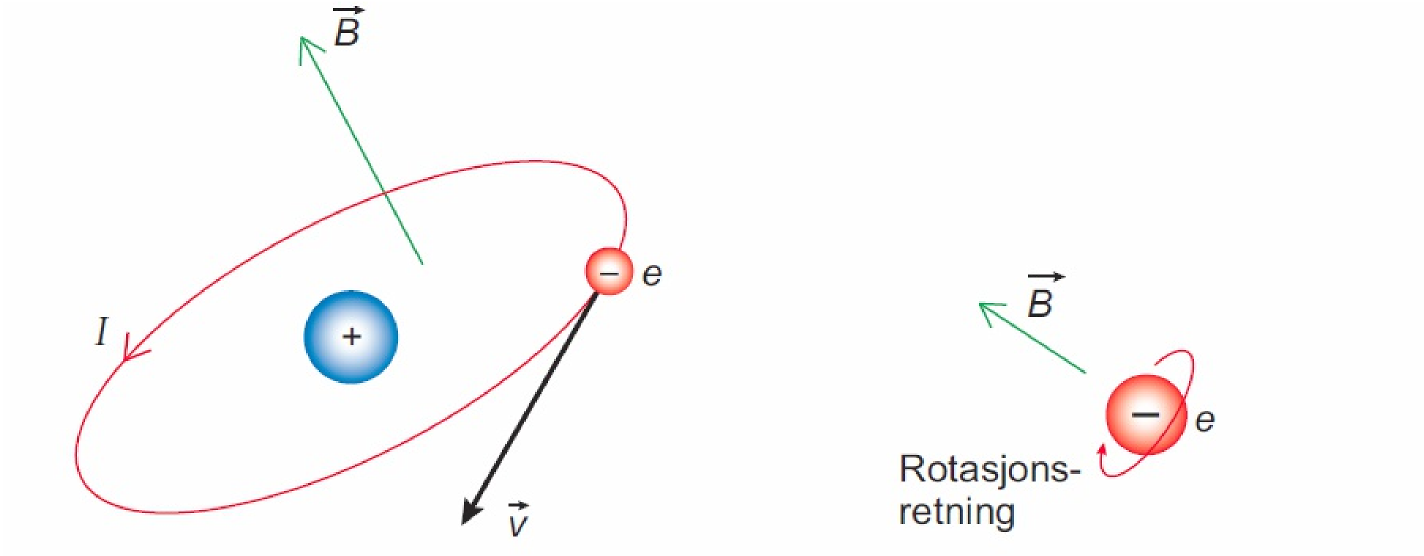
Kraft på strømsløyfe i inhomogent magnetfelt



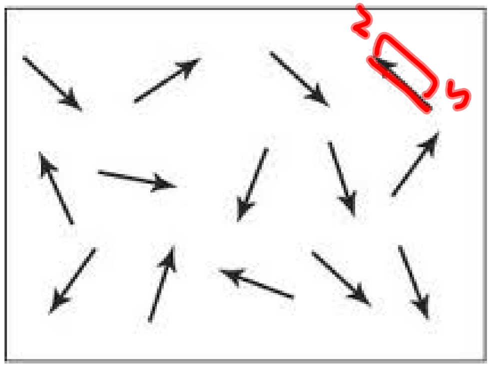
Kraft på magnet i inhomogent magnetfelt

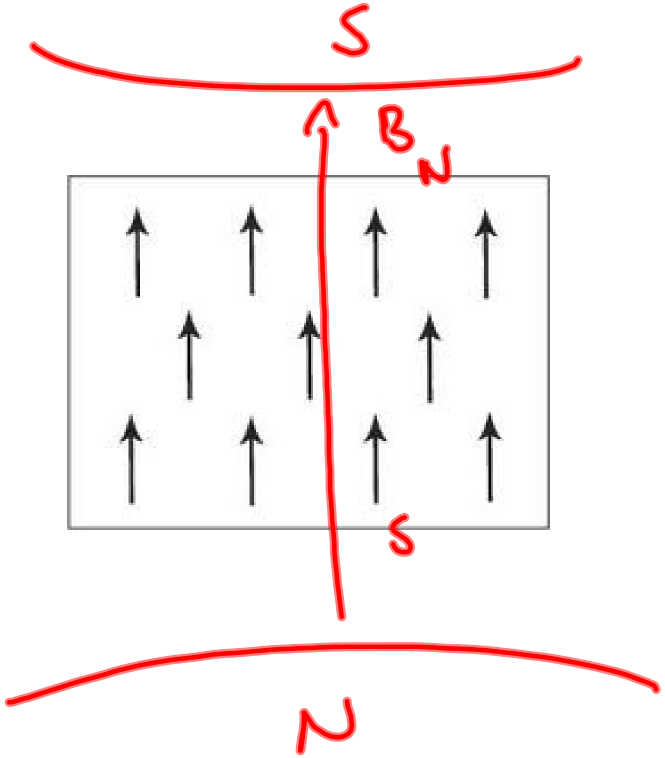


Atomer som magneter

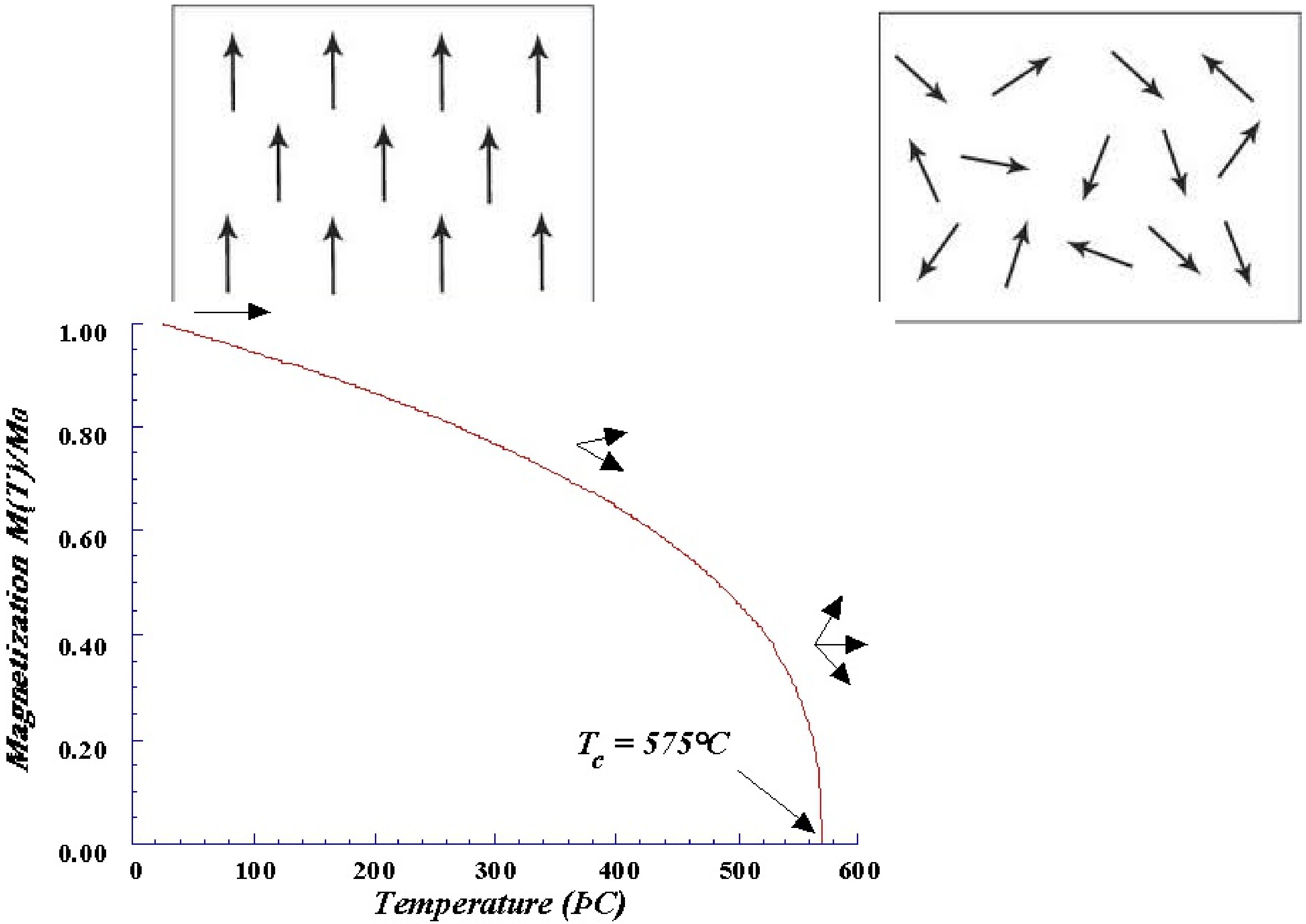


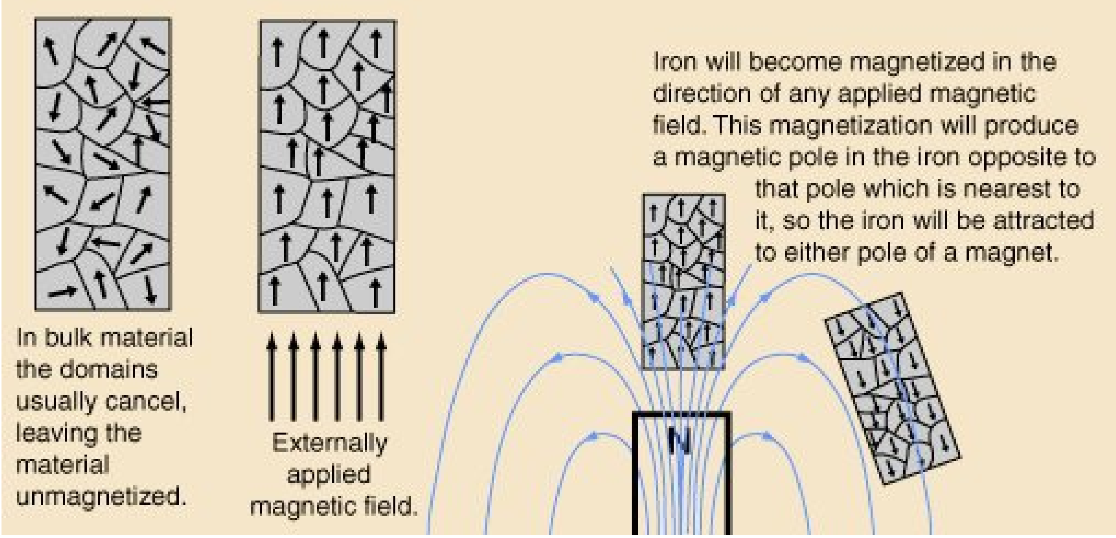
Paramagnetisme: Atomære magneter kan ordnes av et ytre felt

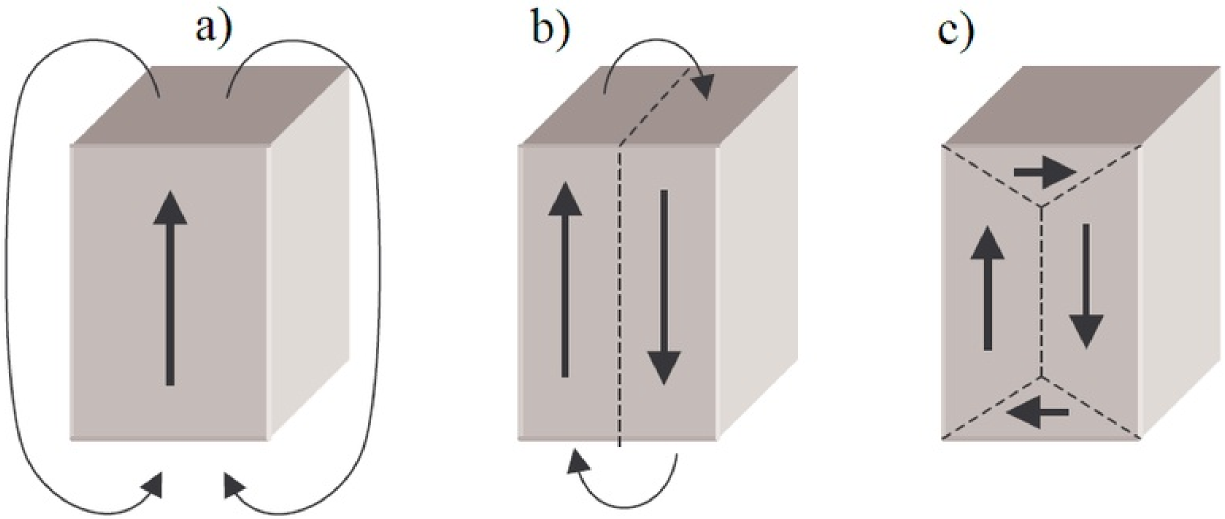




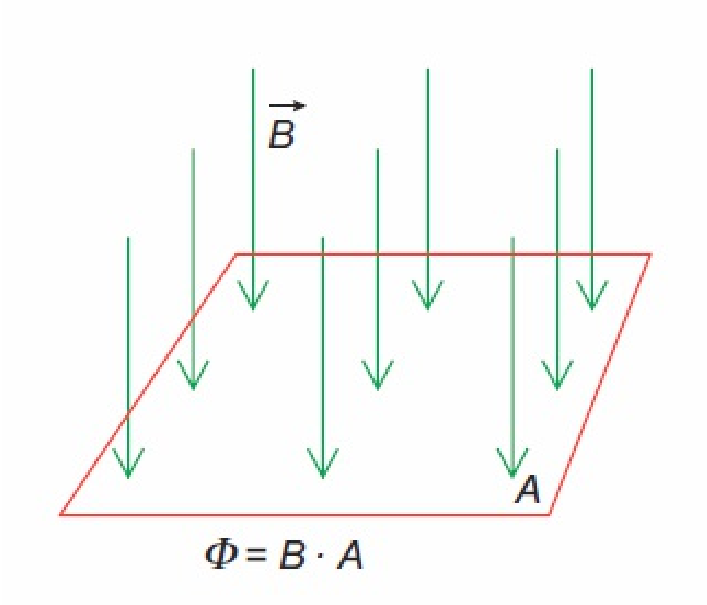
Ferromagnetisme: Atomære magneter kan ordnes av seg selv




In bulk material the domains usually cancel, leaving the material unmagnetized.
Externally applied magnetic field.
Iron will become magnetized in the direction of any applied magnetic field. This magnetization will produce a magnetic pole in the iron opposite to that pole which is nearest to it, so the iron will be attracted to either pole of a magnet.
N


a)
b)
c)

Magnetisk fluks

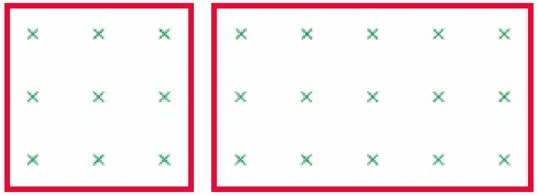


7-13 Fluksen er produktet av feltstyrken og arealet.

a Ulik fluks fordi feltstyrken er ulik.

b Ulik fluks fordi arealet er ulikt.

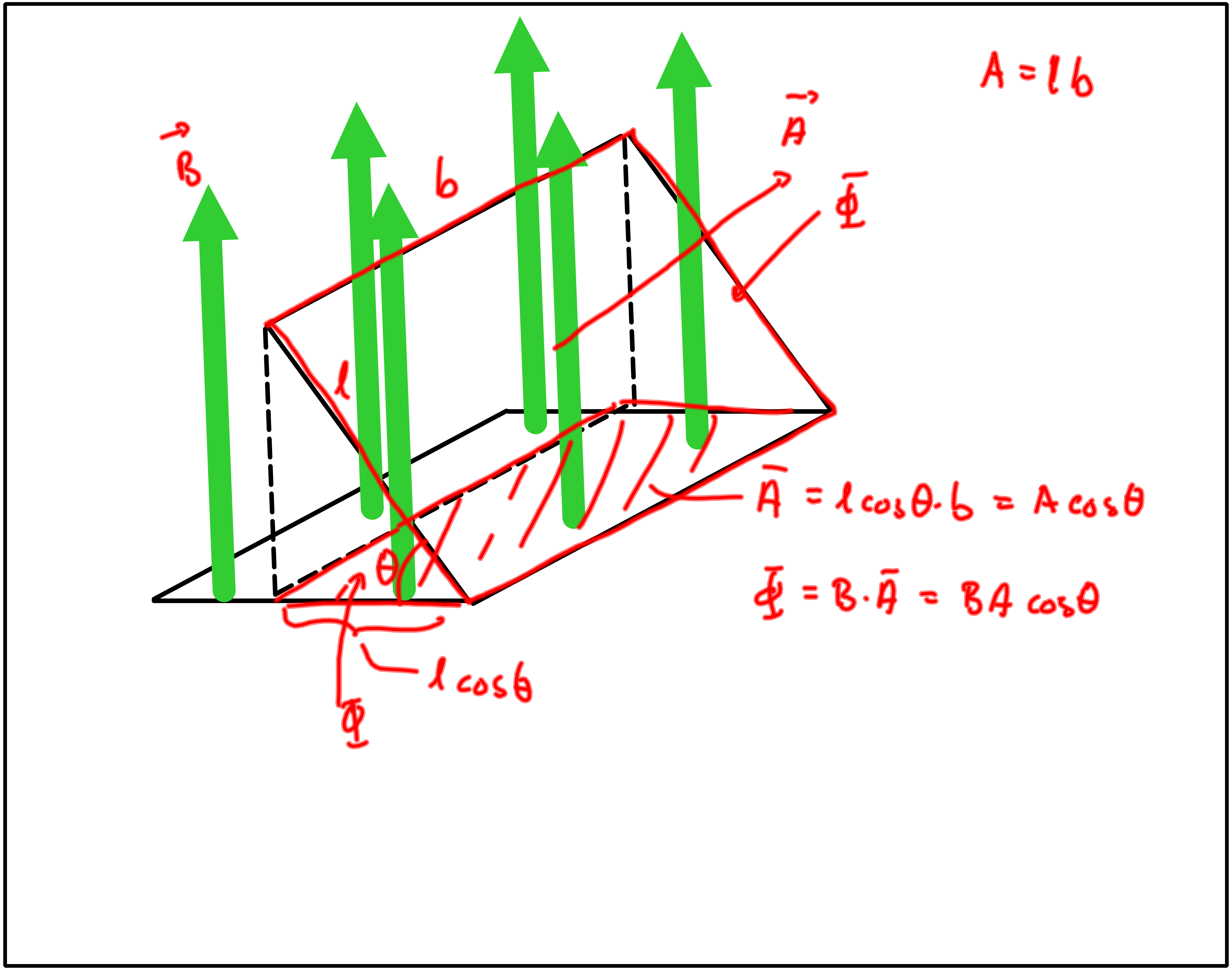
a

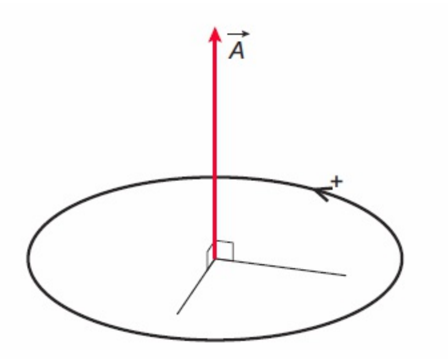


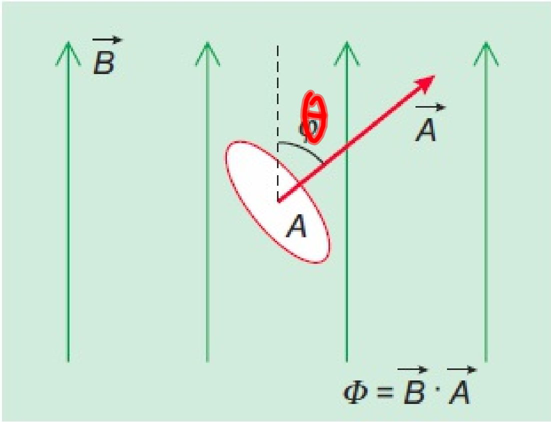
b

Enheten for magnetisk fluks er *weber* med symbolet Wb. Fra definisjonen av magnetisk fluks ser du at weber er lik tesla ganger kvadratmeter,

$$Wb = Tm^2$$


A = lb
$\vec{B}$
$\vec{A}$
b
l
θ
Φ
$\bar{A} = l\cos\theta \cdot b = A\cos\theta$
$\Phi = B \cdot \bar{A} = BA\cos\theta$
$l\cos\theta$





$$\Phi = B \cdot A \cos\theta$$
$$= \vec{B} \cdot \vec{A}$$