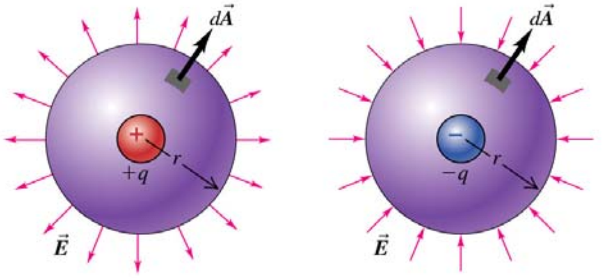
rep

Fluksen går <u>ut fra</u> positiv ladning
Fluksen går <u>inn mot</u> negativ ladning

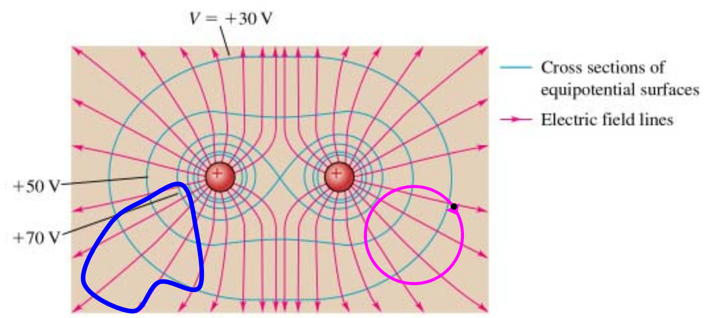


(a) Gaussian surface around positive charge: positive (outward) flux

(b) Gaussian surface around negative charge: negative (inward) flux

(Y&F Fig 22.15)

To positive ladninger
Feltlinjer og potensial (volt):

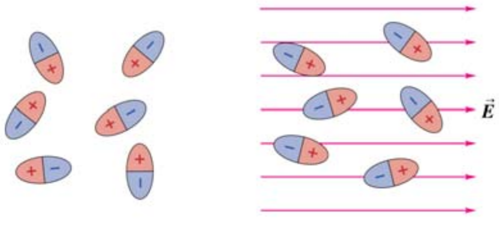


(c) Two equal positive charges

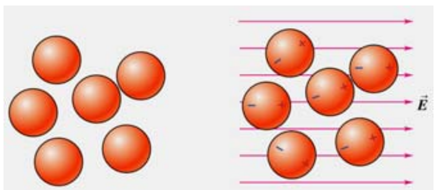
Gaussflate (arealint.) $\oint \vec{E}\cdot \mathrm{d}\vec{A} = \frac{Q}{\epsilon_0}$

Integrasjonsveg (linjeint.) $\oint \vec{E}\cdot \mathrm{d}\vec{l} = 0$

Dipoler innrettes i elektrisk felt:



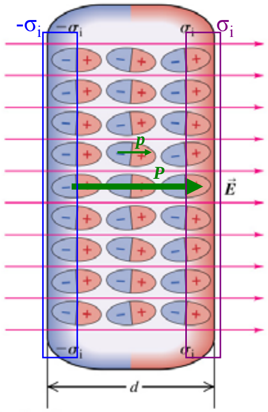
Polare molekyl, for eksempel Vann, H_2O

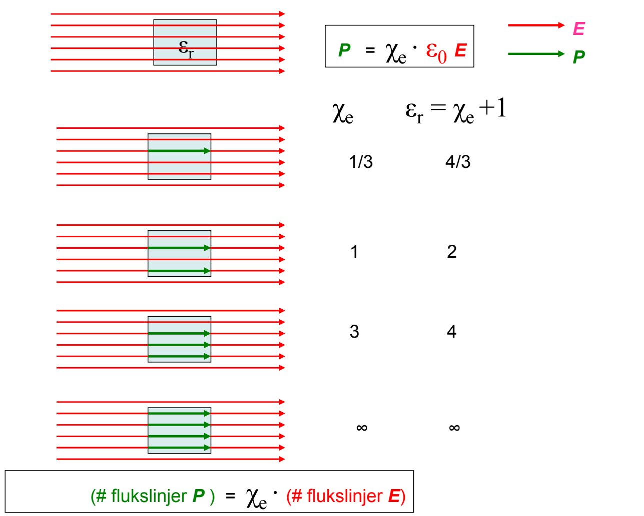


Apolare molekyl

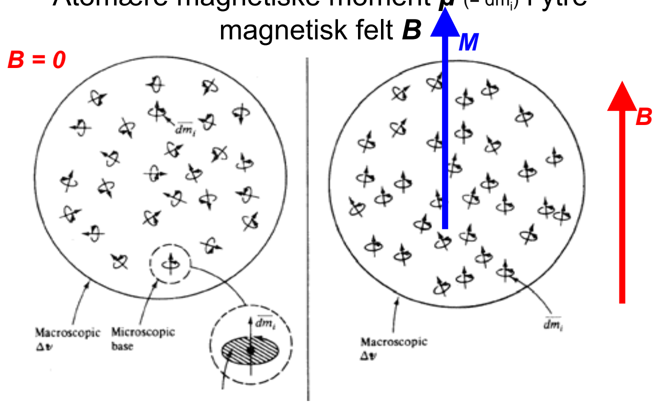
- Dipoler *induseres* og deretter *innrettes*

Innretting (polarisering) gir flateladning
σ_i (i = indusert ladning)





Atomære magnetiske moment $\boldsymbol{\mu}$ (= $\overline{dm_i}$) i ytre magnetisk felt $\boldsymbol{B}$



Paramagnetiske og ferromagnetiske:
Innretting av magn.moment $\boldsymbol{\mu}$

Tre typer magnetisk materiale:

Type	Effekt	Årsak: Ytre $\boldsymbol{H}_0$ .....
Dia-magnetisk	***B***-felt ↓	induserer magn.mom. $\boldsymbol{\mu}$ med $\boldsymbol{\mu} \parallel (-\boldsymbol{H})$
Para-magnetisk	***B***-felt ↑	innretter permanente $\boldsymbol{\mu}$ med $\boldsymbol{\mu} \parallel \boldsymbol{H}$
Ferro-magnetisk	***B***-felt ↑↑↑↑↑↑↑↑↑	innretter permanente $\boldsymbol{\mu}$ med $\boldsymbol{\mu} \parallel \boldsymbol{H}$ **Mange**

Integral-form:

$$\oint \vec{E}\cdot d\vec{A} = \frac{Q}{\epsilon_0} \qquad \text{(Gauss' lov for } \vec{E}\text{)}$$

$$\oint \vec{B}\cdot d\vec{A} = 0 \qquad \text{(Gauss' lov for } \vec{B}\text{)}$$

$$\oint \vec{B}\cdot d\vec{\ell} = \mu_0 I + \boxed{\mu_0\epsilon_0 \frac{\partial \Phi_E}{\partial t}} \qquad \text{(Amperes lov)}$$

$$\oint \vec{E}\cdot d\vec{\ell} = \boxed{-\frac{\partial \Phi_B}{\partial t}} \qquad \text{(Faradays lov).}$$

Differen-sial-form:

$$\vec{\nabla}\cdot\vec{E} = \frac{\rho}{\epsilon_0}$$

$$\vec{\nabla}\cdot\vec{B} = 0$$

$$\vec{\nabla}\times\vec{B} = \mu_0\vec{J} + \boxed{\mu_0\epsilon_0\frac{\partial \vec{E}}{\partial t}}$$

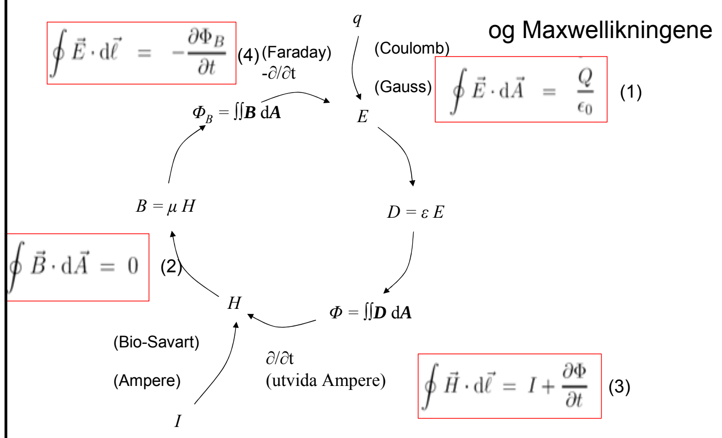
$$\vec{\nabla}\times\vec{E} = \boxed{-\frac{\partial \vec{B}}{\partial t}}\,.$$

Statikk
Dynamikk

rep

Elmagsirkelen

og Maxwelllikningene



Maxwells likninger i Notat 4

$$\oint \vec{E}\cdot d\vec{A} = \frac{Q}{\epsilon} \qquad \vec{\nabla}\cdot\vec{E} = \frac{\rho}{\epsilon}$$

$$\oint \vec{B}\cdot d\vec{A} = 0 \qquad \vec{\nabla}\cdot\vec{B} = 0$$

$$\oint \vec{B}\cdot d\vec{\ell} = \mu I + \mu\epsilon\frac{\partial \Phi_E}{\partial t} \qquad \vec{\nabla}\times\vec{B} = \mu\vec{J} + \mu\epsilon\frac{\partial \vec{E}}{\partial t}$$

$$\oint \vec{E}\cdot d\vec{\ell} = -\frac{\partial \Phi_B}{\partial t} \qquad \vec{\nabla}\times\vec{E} = -\frac{\partial \vec{B}}{\partial t}.$$

Tilleggslikninger: $\boldsymbol{D} = \varepsilon\boldsymbol{E} \quad \boldsymbol{B} = \mu\boldsymbol{H}$

Flukser
$$\begin{cases} \Phi = \int \vec{D}\cdot d\vec{A}. \\ \Phi_E = \int \vec{E}\cdot d\vec{A} \\ \Phi_B = \int \vec{B}\cdot d\vec{A} \\ I = \int \vec{J}\cdot d\vec{A}. \end{cases}$$

$\vec{J} = \sigma\vec{E}$, Ohms lov

$\vec{F} = q(\vec{E} + \vec{v}\times\vec{B})$, Lorentzkrafta

Maxwells likninger
i ladningsfritt og strømfritt rom

$$\oint \vec{E}\cdot d\vec{A} = \cancel{\frac{Q}{\epsilon_0}}\ 0 \qquad \vec{\nabla}\cdot\vec{E} = \cancel{\frac{\rho}{\epsilon_0}}\ 0$$

$$\oint \vec{B}\cdot d\vec{A} = 0 \qquad \vec{\nabla}\cdot\vec{B} = 0$$

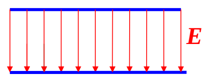
$$\oint \vec{B}\cdot d\vec{\ell} = \cancel{\mu_0 I} + \mu_0\epsilon_0\frac{\partial \Phi_E}{\partial t} \qquad \vec{\nabla}\times\vec{B} = \cancel{\mu_0\vec{J}} + \mu_0\epsilon_0\frac{\partial \vec{E}}{\partial t}$$

$$\oint \vec{E}\cdot d\vec{\ell} = -\frac{\partial \Phi_B}{\partial t} \qquad \vec{\nabla}\times\vec{E} = -\frac{\partial \vec{B}}{\partial t}.$$

E i parallellplatekondensator

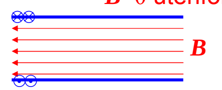
B i solenoide

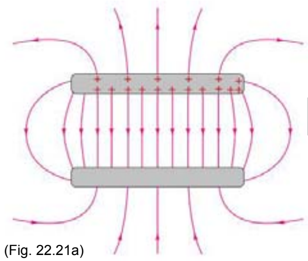
$\boldsymbol{E}$=0 utenfor



Idealisert

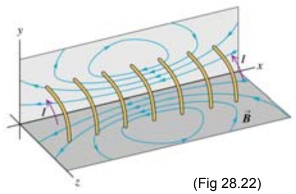
$\boldsymbol{B}$=0 utenfor





(Fig. 22.21a)

Reelt



(Fig 28.22)