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Exercises for EFT 1, Sheet 3 Solutions

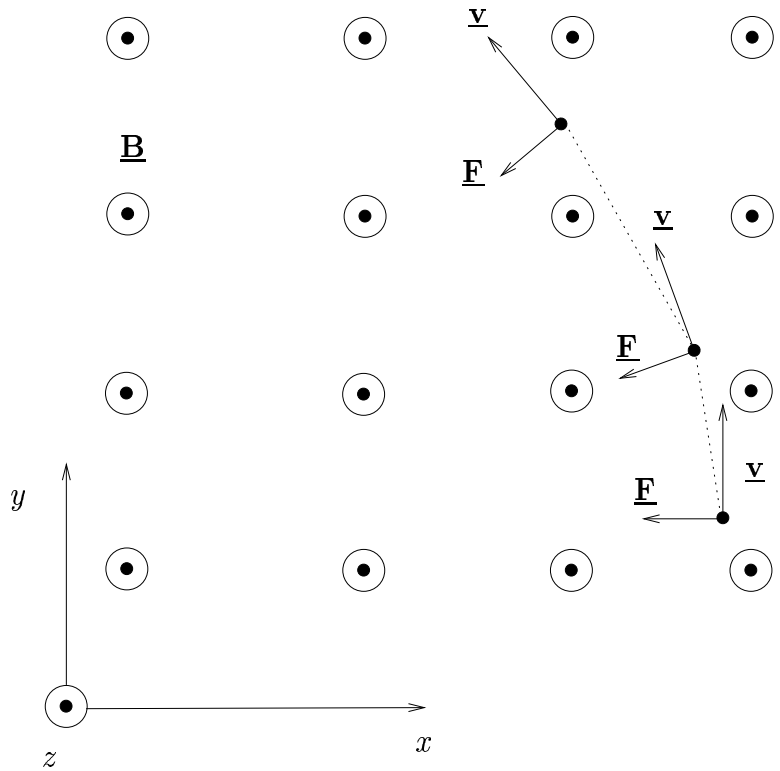
Exercise 1.
$V = \frac{4}{3}\pi R_0^3$

Exercise 2.

(a) $F = 0\text{N}$

No change of direction.

(b) $F = -4.806^{-18}\text{N}\underline{\mathbf{e}}_x$



Electron moves on spherical path. (Kreisbahn)

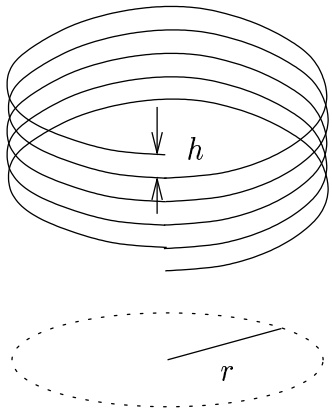
Equality of centripetal and centrifugal force leads to radius

$$r = 1,706 \cdot 10^{-7}\text{m}$$

(c) $F = (4.806^{-18}\underline{\mathbf{e}}_y - 3.204^{-18}\underline{\mathbf{e}}_x)\mathrm{N}$

Electron is moving on a helical path. (Spiralbahn) Radius as in b).

$$r = \frac{mv_s}{Q_e B} = 2,128 \cdot 10^{-7}\mathrm{m}$$



Determine helical pitch h:
Bestimme Gangöhe h:

$$h = v_z T = 3,57 \cdot 10^{-7}\mathrm{m}$$

Exercise 3.
$U_i = 25\mathrm{V}$

Exercise 4.

(a) $\underline{\mathbf{H}}(r, \varphi, z, t) = H_0 r_0 (-\frac{1}{r}\underline{\mathbf{e}}_\varphi + \frac{a}{r^2 - az}\underline{\mathbf{e}}_z)\cos(\omega t + \varphi_0)$

(b) $\Phi = a\pi \ln(\frac{az - r_0^2}{az})\cos(\omega t + \varphi_0)$

(c) $U_i = a\pi \ln(\frac{a^2 - r_0^2}{a^2})\omega \sin(\omega t + \varphi_0)$