Eksempel 24/10, løysingsforslag

Eksempel 1

Lys med bølgelengd $\lambda = 102.5\ nm$

a) Synleg?

λ mellom (omtrent) 400 nm og 800 nm.

- Ikkje synleg

b) For alle typar bølger: $v = f\lambda$

v: fart, f: frekvens

Lysfarten $c = 3.00 \cdot 10^8\ m/s$

- Fort, men endeleg

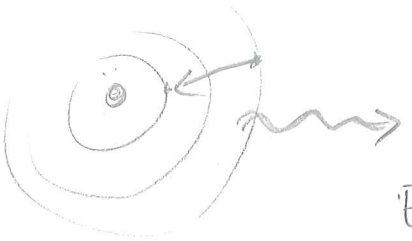
$$f = \frac{c}{\lambda} = \frac{3.00 \cdot 10^8\ m/s}{102.5 \cdot 10^{-9}\ m} = 2.9268 \cdot 10^{15}\ \frac{1}{s}$$

$$\approx 2.93 \cdot 10^{15}\ Hz$$

Energi:

$$E_f = hf = 6.62 \cdot 10^{-34}\ Js \cdot 2.9268 \cdot 10^{15}\ \frac{1}{s} =$$

$$1.9376 \cdot 10^{-18}\ J \approx 1.94 \cdot 10^{-18}\ J$$



$$E_n = -\frac{B}{n^2}$$

$$E_f = E_n - E_1$$

$$E_n = E_f + E_1$$

$$-\frac{B}{n^2} = E_f + \left(-\frac{B}{1^2}\right) = E_f - B =$$

$$1.9376 \cdot 10^{-18}\,J - 2.18 \cdot 10^{-18}\,J = -2.424 \cdot 10^{-19}\,J$$

$$n^2 = \frac{2.18 \cdot 10^{-18}\,J}{2.424 \cdot 10^{-19}\,J} = 9.0083$$

$$n = \sqrt{9.0083} = 3.0014 \approx \underline{3}$$

Before:

$$-\frac{B}{n^2} = E_f + E_1 = E_f - \frac{B}{1^2} = E_f - B$$

$$-\frac{1}{n^2} = \frac{E_f}{B} - 1$$

$$n^2 = \frac{1}{1 - \frac{E_f}{B}}$$

$$n = \frac{1}{\sqrt{1 - \frac{E_f}{B}}} = \frac{1}{\sqrt{1 - \frac{1.9376 \cdot 10^{-18}\,J}{2.16 \cdot 10^{-18}\,J}}} =$$

$$2.9989 \approx \underline{3}$$

Eksempel 2

Masseendring:

$$\Delta m = 2.01410\,u + 3.01605\,u - (1.00866\,u + 4.00151\,u) =$$
$$0.01998\,u$$

Energi:

$$\Delta E = \Delta m\, c^2 = 0.01998 \cdot 1.66005 \cdot 10^{-27}\,kg \cdot (3.00 \cdot 10^8\,m/s)^2 = 2.9859 \cdot 10^{-12}\,J \approx$$
$$2.99 \cdot 10^{-12}\,J$$