Fotoel. efekt

DIR 11/12

$\lambda = 400nm$
$\lambda_g = 600nm$
$E_{kmax} = ?$

$$E_{kinet} \leq h \cdot f - W_{iz}$$

$$E_{kmax} = h \cdot f - W_{iz}$$

$$= h \cdot \frac{c}{\lambda} - \underbrace{W_{iz}}$$

↳ izlezni rad pri granični λ
tj. pri min. en. potrebnoj
da bi došlo do fotoel. ef.

~~Ekin~~ → TADA $E_{kin} = 0 = h \cdot f_g - W_{iz}$

$$= h \cdot \frac{c}{\lambda_g} - W_{iz} \rightarrow \underline{W_{iz}}$$

$$E_{kmax} = \frac{h \cdot c}{\lambda} - \frac{h \cdot c}{\lambda_g} = 0.943\ eV$$

Compton ! ne formule n ve e^- n mirovanju !

LjiR 11/12

$E = h \cdot f = 4 \cdot 10^{-14}$) → $f = \frac{E}{h}$ → $\lambda = \frac{c}{f} = \frac{c \cdot h}{E}$

$$E_{kmax} = \frac{h\cdot c}{\lambda} - \frac{h\cdot c}{\lambda_g} = 0.943\ eV$$

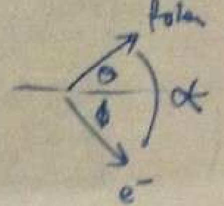
Compton ! sve formule su za e^- u mirovanju !

LjiR 11/12

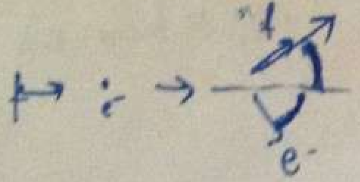
$E = h\cdot f = 4\cdot 10^{-14}\ J \rightarrow f = \frac{E}{h} \rightarrow \lambda = \frac{c}{f} = \frac{c\cdot h}{E}$

$\Delta\lambda = 1.5\cdot 10^{-12}\ m$

$\lambda' = \lambda + \Delta\lambda$



šalabahter : $\Delta\lambda = \frac{h}{m_e c}(1 - \cos\theta_f) \rightarrow \theta_f =$ ___



$$\boxed{\begin{aligned} \frac{h\cdot f}{c} &= \frac{h\cdot f'}{c}\cos\theta_f + \gamma_e' m_e v_e' \cos\theta_e \\ 0 &= \frac{h\cdot f'}{c}\sin\theta_f - \gamma_e' m_e v_e' \sin\theta_e \end{aligned}}$$

p_f $\quad$ p_f' $\quad$ p_e'

$$\frac{h}{\lambda} - \frac{h}{\lambda'}\cos\theta_f = p_e \cdot \cos\theta_e \quad /:$$

$$\frac{h}{\lambda'}\sin\theta_f = p_e \cdot \sin\theta_e$$

$$\tan\theta_e = \frac{\frac{\sin\theta_f}{\lambda'}}{\frac{1}{\lambda} - \frac{\cos\theta_f}{\lambda'}} = \frac{\lambda\sin\theta_f}{\lambda' - \lambda\cos\theta_f} \rightarrow \theta_e = \_\_\_$$

$$\alpha = \theta_e + \theta_f = 112.7^\circ$$

$\lambda = \lambda' - \Delta\lambda$

$\lambda = \frac{E_f'}{h \cdot c^2} - \frac{h}{m_e c}(1 - \cos\theta_f')$

$E_f = \frac{h \cdot c^2}{\lambda} = 3.54 \cdot 10^{-13} J = 2.21 MeV$

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$E_{kmax} = 0.19\ MeV$

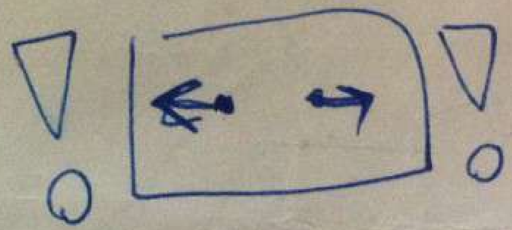
$\lambda = ?$

E_k

ĵalebalter

$\boxed{h \cdot f + m_e c^2 = h \cdot f' + \gamma_e' m_e c^2}$

$h \cdot f - h \cdot f' = \underbrace{\gamma_e' m_e c^2 - m_e c^2}_{\text{dobivena kin. en.}}$



$p_1 =$

$E_k = \frac{h \cdot c}{\lambda} - \frac{h \cdot c}{\lambda'} = \frac{h \cdot c}{\lambda} - \frac{h \cdot c}{\lambda + \Delta\lambda}$ $(\Delta\lambda = \lambda' - \lambda)$

$E_{kmax} = \max\left\{hc\left(\underbrace{\frac{1}{\lambda} - \frac{1}{\lambda + \Delta\lambda}}_{}\right)\right\}$

(ili f gubi En, gubi f, dobiva λ)

$\max \equiv \min \frac{1}{\lambda + \Delta\lambda} \equiv \max\ \lambda + \Delta\lambda \equiv \max\ \Delta\lambda$

ĵalabalter $\Delta\lambda = \frac{h}{m_e \cdot c}(1 - \cos\theta) \underset{max}{=} 2 \cdot \frac{h}{m_e c}$

$E_{kmax} = hc\left(\frac{1}{\lambda} - \frac{1}{\lambda + 2\frac{h}{m_e c}}\right) = \ldots \Rightarrow \lambda = 3.704 \cdot 10^{-12} m$

Z1 07/08

$f = 10^{19}\ Hz$

ĵalebalter

$h f + m_e c^2 = h f' + \gamma_e' m_e c^2$ $\left(c\left(\frac{1}{f'} - \frac{1}{f}\right) = \frac{h}{m_e c}(1 - \cos\theta)\right.$

$E_2 = 3.40$
$E_3 = 1.51$] → 4, 2
$E_4 = 0.85$
$E_5 = 0.54$

$^{9}_{4}Be^{3+}$ $n = ?$ $f = ?$

8 12/13

$$r_n = \frac{\varepsilon_0 h^2}{\pi m_e Z e^2} n^2 = r_0 = \frac{\varepsilon_0 h^2}{\pi m_e e^2} \to \frac{n^2}{Z} = 1 \to n^2 = 4 \to n = 2$$

$$E_{fot} = h \cdot f = |E_{n_2} - E_{n \to \infty}| \overset{E_n = -\frac{E_1}{n^2}}{=} |E_2| \to$$

$$f = \frac{1}{h} \cdot \frac{E_1}{n^2} = \frac{m_e Z^2 e^4}{8 \varepsilon_0^2 h^2} \frac{1}{h n^2} = \dots = 1.314 \cdot 10^{6} \text{ Hz}$$

H $Z = 1$

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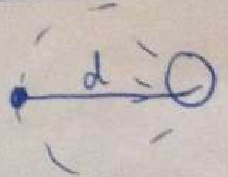
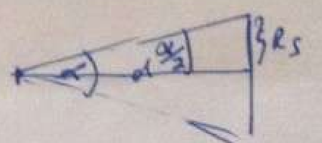
$E_1 = -0.85$ eV $\to n = 4$
$E_2 = -3.4$ eV $\to m = 2$

$$E_n = -\frac{13.6 \text{ eV}}{n^2} Z^2$$

$$\lambda = \frac{|E_n - E_m|}{hc} = \dots = 487.2 \text{ nm}$$

Crno tijelo
$T_S = 5700$K





$\frac{R_S}{d} = tg\frac{\alpha}{2}$

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$$P_Z = S \cdot I_d = r_Z^2 \pi \cdot \frac{P_S}{4\pi d^2} = \frac{r_Z^2}{4d^2} \sigma T_S^4 \cdot 4\pi R_S^2 = \frac{r_Z^2 R_S^2}{d^2} T_S^4 \pi \sigma$$ | Zemlja apsorbira

$$P_E = \sigma T^4 4\pi r_Z^2$$

$P_E = P_Z$ jer je sustav u ravnoteži

$$\sigma\pi 4 r_Z^2 T^4 = \sigma\pi r_Z^2 \frac{R_S^2}{d^2} T_S^4$$

$$T = T_S \cdot \sqrt[4]{\frac{R_S}{2d}} = T_S \sqrt{\frac{1}{2} tg\frac{\alpha}{2}} = \dots = 266K$$

$\Delta E_{k\,max} = ?$

$= \ldots = 574.9\,eV$

ZIR 11/12

$\lambda'_{90} = 2\lambda'_{30}$

$\lambda = ?$

$\lambda' = \lambda + \Delta\lambda = \lambda + \frac{h}{m_e c}(1-\cos\theta)$

$\lambda'_{90} = \underbrace{\lambda + \frac{h}{m_e c}(1-\cos 90)} = 2\lambda'_{30} = \underbrace{2\lambda + 2\cdot\frac{h}{m_e c}(1-\cos 30)}$

$\lambda = \frac{h}{m_e c}(1-2+2\cos 30) = (2\cos 30 - 1)\frac{h}{m_e c}$

$\lambda = 1.779\,pm$

ZIR 12/13

$T = 0.2\,MeV$

$\lambda' = 1.25\lambda \rightarrow \Delta\lambda = 0.25\lambda$

$\theta = ?$

Rał.

$\Delta\lambda = 0.25\lambda = \frac{h}{m_e c}(1-\cos\theta)$

$h\cdot\frac{c}{\lambda} = h\cdot\frac{c}{\lambda'} + T$

$h\cdot c\left(\frac{1}{\lambda} - \frac{1}{\frac{5}{4}\lambda}\right) = T$

$\frac{hc}{\lambda}\cdot\frac{1}{5} = T$

$\lambda = \frac{hc}{5T}$

$\frac{1}{4}\cdot\frac{hc}{5T} = \frac{h}{m_e c}(1-\cos\theta)$

$\frac{m_e c^2}{20T} = 1-\cos\theta$

$\cos\theta = 1 - \frac{m_e c^2}{20T}$

$\theta = \ldots = 29.3°$