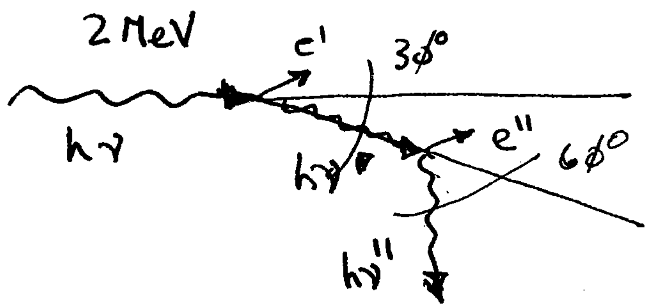
1ϕ.2



$$KE_{e'} = h\nu - h\nu' = h\nu\left(\frac{(h\nu/m_0c^2)(1-\cos\theta)}{1+\left(\frac{h\nu}{m_0c^2}\right)(1-\cos\theta)}\right)$$

$$KE_{e'} = h\nu\left(\frac{x}{1+x}\right) \quad \text{where } x = (h\nu/m_0c^2)(1-\cos\theta)$$

(a) $h\nu = 2.\phi\phi$ MeV, $\theta = 3\phi°$, $m_0c^2 = \phi.511$ MeV $\rightarrow x = \phi.5244$

$$KE_{e'} = 2.\phi\phi\left(\frac{0.5244}{1.5244}\right) = \phi.68798 \text{ MeV}$$

$$h\nu' = 2.\phi\phi - KE_{e'} = 1.312 \text{ MeV}$$

(b) $h\nu = 1.312$ MeV, $\theta = 6\phi°$, $x = 1.284$

$$KE_{e''} = 1.312\left(1.284/2.284\right) = \phi.7375 \text{ MeV}$$

$$h\nu'' = 1.312 - KE_{e''} = \phi.574 \text{ MeV}$$

Total KE in det is $KE_{e'} + KE_{e''} = 1.425$ MeV

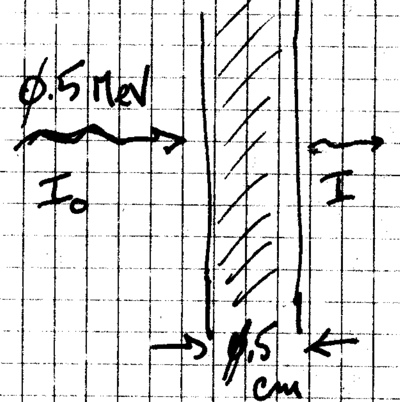
If reverse angles $(KE_{e'} = 1.32) + (KE_{e''} = \phi.091) = 1.41$ MeV

1ϕ.6 $R = k/\sqrt{E} \Rightarrow k = R\sqrt{E} = .06\sqrt{0.662}$

$$R(E_2) = k/\sqrt{E_2} = \frac{0.06\sqrt{0.662}}{\sqrt{1.28}}$$

$$R(E_2) = 0.043$$

10.7



$\mu/\rho = 0.955 \frac{cm^2}{g}$

$I/I_0 = e^{-\mu x \rho} = e^{-[\underbrace{0.955 * 0.5 * 3.67}_{1.752}]}$

$I/I_0 = 0.173$

that means $(1 - 0.173)$ of photons are attenuated or absorbed

$\epsilon_{PEAK} = f_{photo} * (1 - I/I_0) = 0.40 * (1 - 0.173) = 0.33$

10.8 (a) Compton Edge $\theta = 180°$ $KE_{e'}$ is max

$KE_{e'} = h\nu \left(\frac{x}{1+x}\right)$, $x = \left(\frac{h\nu}{m_0 c^2}\right)(1 - \cos\theta) = \frac{1.17}{0.511}(1 - \cos 180°)$

$x = 4.579$

$KE_{e'} = 1.17 \left(\frac{4.579}{5.579}\right)$

$= 0.960$ MeV

(b) Backscatter peak $E_\gamma = h\nu - KE_{e'} (\theta = 180)$

$E_\gamma^{Back} = h\nu \left(1 - \left(\frac{x}{1+x}\right)\right) = h\nu \left(1/(1+x)\right)$, $x = \frac{h\nu}{0.511} * Z$

$h\nu$	x	E_γ^{Back}
1	3.914	0.204 MeV
2	7.828	0.227 MeV
3	11.742	0.235 MeV

10.10 1 MeV e^- in NaI (Tl) $\epsilon_{coll} = 0.50$ QE = 20% $\epsilon_{Ano} = 0.80$

$$M = \delta^{10} = (2.5)^{10} = 9.54 \times 10^3$$

$$i \sim \frac{N e_{anode}}{\Delta t} = \left(1\ \text{MeV} \times 38000/\text{MeV}\right) 0.50\,(0.20)(0.80)\frac{M}{\Delta t}\left(1.602 \times 10^{-19}\ \text{coul}\right)$$

$$i = \frac{Q}{\Delta t} = 4.65 \times 10^{-12}\ \text{coul}/\Delta t$$

check $\tau_{electronics} = RC = (100\ k\Omega)(100\ pF) = 1 \times 10^{-5}\ \text{sec} \rightarrow 10\ \mu s$

$\tau_{NaI} \sim 0.23\ \mu s$ from Table in book

→ "slow" electronics $V_R = \frac{Q}{C} = \frac{4.65 \times 10^{-12}\ \text{coul}}{10^2 \times 10^{-12}\ F} = 46.5\ mV$