Ch 13 #2, Ch14 # 2, 4, 7, 8 Hin Ching Lee

13/#2 $E = 2000V / 4\times10^{-1} cm = 5\times10^{4} V cm^{-1}$

From figure 11.2 (b) $\rightarrow V_d = 6.5\times10^{6} cm/s$ (At 300k)

$\Rightarrow$ Max. Collection Time : $4\times10^{-1} / 6.5\times10^{6} = 0.062 \mu sec$ #

14/#2 $V = \frac{Q}{C} = \frac{M n_0 e}{C}$ $(n + {}^3He \rightarrow p + {}^3H)$

$= 10^3 \left(\frac{0.764\times10^{6} eV}{42.7 eV}\right) \frac{1.602\times10^{-19} Col}{10^2 \times 10^{-12} Farad}$

$= 0.029$ Volt #

#4 $\varepsilon(E_n) = 1 - e^{-\Sigma(E)x}$

According to the text in P.515 :

For BF_3 tube (96% enriched in ^{10}B)

$\varepsilon(E) = 91.5\%$ if length is 30 cm

$\Rightarrow \Sigma(E) = 0.0822 cm^{-1}$

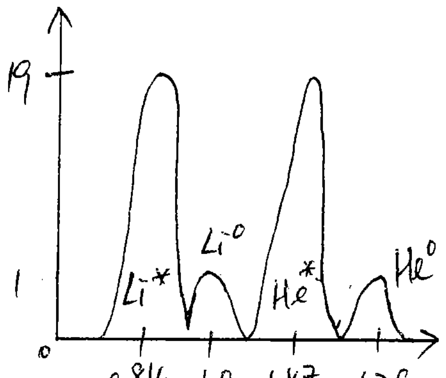
When length is 10 cm

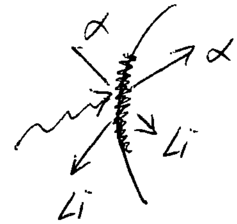
$\varepsilon(E) = 1 - e^{-0.822}$

$= 0.56$ (or use σ from P.507 in text)

$\Rightarrow \varepsilon(E) = 56\%$ #

#7/





* from excited state

° from ground state

#8 $n + {}^6Li \rightarrow {}^4He + {}^3H$ $\quad Q = 4.97$ MeV

For Li(En) : Wavelength of max. emission = 470nm

Scintillation efficiency : 2.8%

→ Energy needed to generate a scintillation photon $= \dfrac{(6.626 \times 10^{-34} \cdot 3 \times 10^{8})}{(470 \times 10^{-9} \times 0.028)}$

$= 94.288$ eV

⇒ No of photons produced $= 4.97 \times 10^{6} / 94.288 = 52$ k photons *

For Li : Wavelength of max. emission = 395 nm

Scintillation efficiency = 0.45 %

Energy need to generate a photon $= \left(\dfrac{6.626 \times 10^{-34} \times 3 \times 10^{8}}{395 \times 10^{-9} \times 0.0045}\right)$

$= 698.07$ eV

⇒ No of photons produced $= 4.97 \times 10^{6} / 698.07 = 7$ K photons *