CH # 40 , H.W. solution

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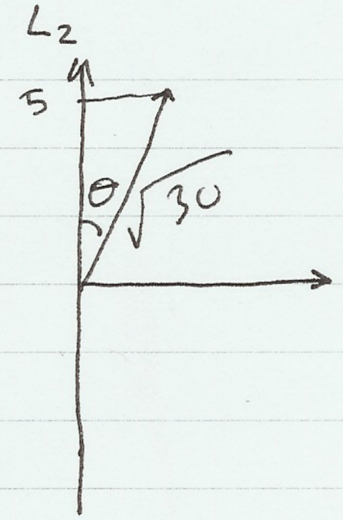


$l = 5$

$m_l = -5, -4, -3, -2, -1, 0, \cdots 5$

$$|\vec{L}| = \sqrt{l(l+1)} = \sqrt{5(6)}$$
$$= \sqrt{30}$$

$$\cos(\theta_{min}) = \frac{5}{\sqrt{30}} = 0.912$$

$$\theta_{min} = 0.42 \text{ rad}$$
$$= 24.1^\circ.$$

8# For $n=5$

$l = 0, 1, 2, 3, 4$

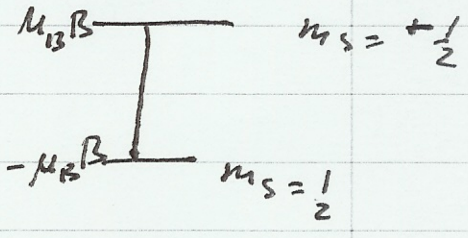
for a given l there are $2(2l+1)$ - states.

l	0	1			
number of states	2	6	10	14	18

Total $= 2+6+10+14+18$

#12 $\Delta E = 2\mu_{sz} B$

$= 2\mu_B B$



a $\Delta E = 2 \times 9.274 \times 10^{-24} \times 0.5$

$= 9.27 \times 10^{-24}\,J$

b. $hf = \Delta E$, $f = \frac{\Delta E}{h} = 1.48 \times 10^{10}\,Hz$.

c - $\lambda = \frac{c}{f}$

#19

$$E = \frac{h^2}{8mL^2} n^2$$

n	m_s	E
1	$+\frac{1}{2}$	1
1	$-\frac{1}{2}$	1
2	$\frac{1}{2}$	4
2	$-\frac{1}{2}$	4
3	$\frac{1}{2}$	9
3	$-\frac{1}{2}$	9
4	$\frac{1}{2}$	16
		44

#25 Take Selenium as an example

$Z = 34$

$1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 3d^{10}, 4s^2, 4p^4$

So the highst occupied subshell is 4p

the number of electrons in it is 4

#31

a. KE_0 Energy of the electron when accelerated through a potential difference V

is $KE_0 = eV$

$=$

$\Delta KE = KE_0 - KE_1$

$= 0.5 KE_0$

$= 0.5 \times 50 \times 10^3$ eV

$= 25 \times 10^3$ eV

$= 4 \times 10^{-15}$ J

$h\frac{c}{\lambda} = 4 \times 10^{-15}$

$\lambda = \frac{hc}{4 \times 10^{-15}} = \frac{6.626 \times 10^{-34} \times 3 \times 10^8}{4 \times 10^{-15}}$

$= 4.969 \times 10^{-11}$ m

$= 49.69 \times 10^{-12}$ m

$= 49.69$ pm.

b. Same as a.

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a. $L = c \times \Delta t$

$= 3\times10^{8} \times 12\times10^{-12}$

$= 3.6 \times 10^{-3}$ m

$= 3.6$ mm

b. Energy per 1 photon

$= hf = h\frac{c}{\lambda} = \frac{6.626\times10^{-34}\times3\times10^{8}}{694.4\times10^{-9}}$

$\epsilon = 2.86 \times 10^{-19}$ J

E = Energy in the puls $= 0.15$ J

$E = N\epsilon$, N = number of photons

$\therefore N = \frac{E}{\epsilon} = \frac{0.15}{2.86\times10^{-19}} = 5.24\times10^{17}$ photons