INTRODUCTION TO NATURAL SCIENCE

CHEMISTRY HOMEWORK - WINT. 2007 - WEEK 3

Chapter 7

(23) $\lambda = \frac{h}{mv} = \frac{6.626 \times 10^{-34}\ J\,s}{(9.1094 \times 10^{-31}\ kg)(2.5 \times 10^{8}\ cm\ s^{-1})}$

$= 2.9095 \times 10^{-12}\ \frac{J\,s}{kg\ cm\ s^{-1}}$

$\frac{kg\,m^2\,s^{-2} \cdot s \times 100\,cm}{kg\ cm\ s^{-1} \quad m}$

$= 2.9095 \times 10^{-12}\ \frac{kg\,m^2\,s^{-2} \cdot s}{kg\ cm\ s^{-1}} \cdot \frac{100\ cm}{m}$

$= 2.9095 \times 10^{-10}\ m \times \frac{10^{9}\ nm}{m} = 0.29095\ nm$

$= \underline{0.29\ nm}$

(26) $\lambda = \frac{h}{mv} = \frac{6.626 \times 10^{-34}\ J\,s}{(1.50\ g)(7.00 \times 10^{2}\ miles\ h^{-1})}$

$= 6.31048 \times 10^{-37}\ \frac{J\,s\ h}{g\ miles} \times \frac{3600\ s}{h} \times \frac{kg\,m^2\,s^{-2}}{J} \times \frac{10^{3}\ g}{kg}$

$= 2.2718 \times 10^{-30}\ \frac{m^2}{miles} \times \frac{mile}{1.609\ km} \times \frac{km}{10^{3}\ m}$

$= 1.41192 \times 10^{-33}\ m \times \frac{10^{9}\ nm}{m} = \underline{1.41 \times 10^{-24}\ nm}$

(27) (a) $\ell = 0, 1, 2, 3$

(b) $-2, -1, 0, +1, +2$

(c) $n=4 \quad \ell=0 \quad m_\ell = 0$

(d) $n=4 \quad \ell=3 \quad m_\ell = -3, -2, -1, 0, +1, 2, 3$

(29) $n=4 \quad \ell=1 \quad m_\ell = -1, 0, +1$

(31) $n=4 \quad \ell = \underbrace{0, 1, 2, 3}_{\text{orbitals}}$

(45) $\ell=0 \quad m_\ell = 0$

(4p) $\ell=1 \quad m_\ell = -1, 0, +1$

(4d) $\ell=2 \quad m_\ell = -2, -1, 0, 1, 2$

(4f) $\ell=3 \quad m_\ell = -3, -2, -1, 0, 1, 2, 3$

} 16 orbitals total

(33) (a) $\ell < n \quad \therefore \ell \neq 2$

(b) $m_\ell = -\ell, -\ell+1, \cdots +\ell \quad \therefore m_\ell \neq -2$ when $\ell=0$

(c) $m_\ell \neq 1$ when $\ell=0$

(35) (a) $n=3, \ell=0, m_\ell = +1$ (none). $m_\ell \neq 1$ when $\ell=0$

(b) $n=5 \quad \ell=1$ this is the 5p set of 3 orbitals

(c) $n=7, \ell=5$ 7h ~~orbital~~ set of 11 orbitals

(d) $n=4 \quad \ell=2, m_\ell = -2$ one of the 4d orbitals

3p exists

3f no. $n = 3$, $l = 0, 1, 2$ only 3s, 3p & 3d are possible

4f exists

5s exists.

(41) $n = 4$ $l = 2$ must be 4d

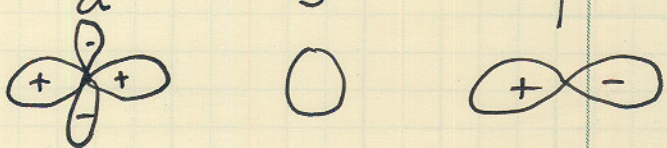
(47) s = no nodes
p = one node
d = 2 nodes
f = 3 nodes

(49)

l	orbital type
3	f
0	s
1	p
2	d

(a) (b) (c)

(d) 7 (e) one (f) d s p



(g) 0, 1, 2, 3, 4 (h) 4