Solutions of practice sheet quantum number 01

126. The energy of different orbitals in an atom or ion having only one electron, depends on

(a) n only
(b) n and l only
(c) n, l and m only
(d) n, l, m and s

For unielectron species energy decided by principal quantum No (n), higher the value of n higher the energy.

127. The size of an orbital is given by

(a) principal quantum number
(b) azimuthal quantum number
(c) magnetic quantum number
(d) spin quantum number

Size of shell or orbital given principal Q.N.(n

128. The types and number of orbitals belonging from the fifth orbit are, respectively,

(a) 5, 25 (b) 25, 5

(c) 4, 16 (d) 5, 5

For $n = 5$

$l = 0, 1, 2, 3, 4$ → 5 types of orbitals.

s p d f g

No of orbitals $= n^2$

$= (5)^2 = 25$

129. The electron in the same orbital may be identified with the quantum number

(a) n (b) l

(c) m (d) s

For same orbital mean same value of (n, l, m) but electron will have different value of s (spin quantum No.)

130. The orbital angular momentum of an electron is 2s orbital is

(a) $+\frac{1}{2}\cdot\frac{h}{2\pi}$ (b) 0

(c) $\frac{h}{2\pi}$ (d) $\sqrt{2}\,\frac{h}{2\pi}$

orbital Angular momentum

$= \sqrt{l(l+1)}\,\frac{h}{2\pi}$

for 2s, ⇒ $l=0$

$= 0$

131. The orbital angular momentum of a 4p electron will be

(a) $4.\frac{h}{2\pi}$ (b) $\sqrt{2}.\frac{h}{2\pi}$

(c) $\sqrt{6}.\frac{h}{4\pi}$ (d) $\sqrt{2}.\frac{h}{4\pi}$

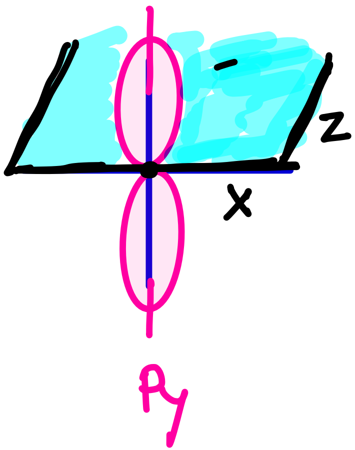
for 2p $l=1$

$= \sqrt{1(1+1)}\,\frac{h}{2\pi} = \sqrt{2}\,\frac{h}{2\pi}$

132. The probability of finding P_y electron is zero in

(a) *XY*-plane (b) *YZ*-plane

(c) *XZ*-plane (d) *Y*-axis



→ Nodal plane (xz)

133. The quantum number which determines the shape of the orbital is

(a) Magnetic quantum no.

(b) Azimuthal quantum no.

(c) Principal quantum no.

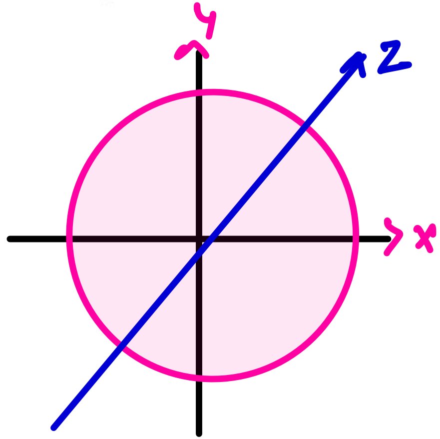
(d) Spin quantum no.

→ Shape of orbital determined by Azimuthal quantum number

134. Orbital with maximum symmetry is

(a) p-orbital (b) s-orbital

(c) d_{xy} -orbital (d) d_{z^2} -orbital



In each direction orbital has same electron charge density so symmetric

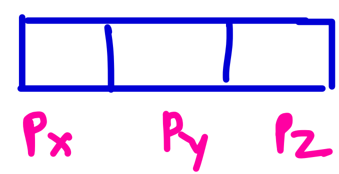
135. In presence of external magnetic field, p-orbital is

(a) 3-fold degenerate

(b) 5-fold degenerate

(c) 7-fold degenerate

(d) non-degenerate



$E_{p_x} = E_{p_y} = E_{p_z}$

136. The number of orbitals of g-type

(a) 5 (b) 7

(c) 9 (d) 11

→ for g type

s, p, d, f g

$l = 0 \quad 1 \quad 2 \quad 3 \quad 4$

No of orbitals $= 2l+1$

$= 2\times4+1 = 9$

137. Which of the following orbital does not exist according to quantum theory?

(a) 5g $\left<\begin{array}{l} n=5 \\ l=4 \end{array}\right.$ (b) 4f $\left<\begin{array}{l} n=4 \\ l=3 \end{array}\right.$

(c) 5h $\left<\begin{array}{l} n=5 \\ l=5 \end{array}\right.$ (d) 6h $\left<\begin{array}{l} n=6 \\ l=5 \end{array}\right.$

138. Which of the following set of quantum numbers is permissible?

(a) 4, 1, +2, +1/2 (b) 4, 2, –1, +1/2

(c) 4, 0, 0, 1 (d) $\boxed{4, 4}$, +2, –1/2

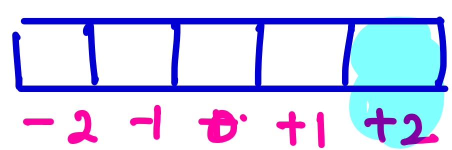
n = l which is not possible

139. Number of orbitals represented by $n = 3$, $l = 2$ and $m = +2$ is

(a) 1 (b) 2

(c) 3 (d) 4

$n = 3$, $l = 2$, 3d



140. The quantum numbers +1/2 and –1/2 for the electron spin represent

(a) rotation of the electron in clockwise and anticlockwise direction, respectively.

(b) rotation of the electron in anticlockwise and clockwise direction, respectively.

(c) magnetic moment of the electron pointing up and down, respectively.

(d) two quantum mechanical spin states which have no classical analogue.

→ theoratical