

Singles , doubles and triplets :

also remember the singlets , doublets and triplets in the atom of hydrogen .

When we have an atom with configuration $1s^1$, we have 1 possible ψ :

$$\psi_{singulet} = 1s(1)$$

When we have 1 electron unpaired , $m_s = \frac{1}{2}$ or $m_s = -\frac{1}{2}$; therefore we have a double with configuration $1s^1 2s^1 m_s = -1/2, 1/2$

$$\psi_1 = \frac{1s(1)1s(2)+2s(2)2s(1)}{\sqrt{2}}$$

$$\psi_2 = \frac{1s(1)2s(2)+1s(2)2s(1)}{\sqrt{2}}$$

However , if the configuration is $1s^2 2s^1$, we we find with a triplet

$$\psi_1 = \frac{1s(1)1s(2)2s(3)+1s(2)1s(1)2s(3)+1s(3)2s(1)2s(2)}{\sqrt{3}}$$

$$\psi_2 = \frac{1s(2)1s(3)2s(1)+1s(3)1s(2)2s(1)+1s(1)2s(2)2s(3)}{\sqrt{3}}$$

$$\psi_3 = \frac{1s(3)1s(1)2s(2)+1s(1)1s(3)2s(2)+1s(2)2s(3)2s(1)}{\sqrt{3}}$$

1, 2, 3 are the electrons

which is understandable , since $2s(1)2s(2) \equiv 2s(2)2s(1)$

$2s(2)2s(3) \equiv 2s(3)2s(2)$, $2s(3)2s(1) \equiv 2s(1)2s(3)$,

$1s(1)1s(2) \equiv 1s(2)1s(1)$, $1s(3)1s(2) \equiv 1s(2)1s(3)$,

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Knowing that:

1s	2s	2s
1	2	3
2	3	1
3	1	2