

**Problem-Solved Example 31**

Consider the  $n = 5$  principal quantum number.

- Predict the number of sublevels (subshells) in this level.
- Identify each of the sublevels (subshells) and their  $l$  values.
- Use the  $2l+1$  rule to calculate how many orbitals each subshell has and identify the  $m_l$  value for each orbital.
- What is the total number of electron in the  $n = 5$  level?
- What is the total number of orbitals in the  $n = 5$  level?

**Solution**



Problem-Solved Example 31 : Solution

(a), (b)  $n=5$  : total no. of subshells,  $l = 0, 1, 2, 3 \dots (n-1)$

$l=0$  (5s-subshell)

$l=1$  (5p-subshell)

$l=2$  (5d-subshell)

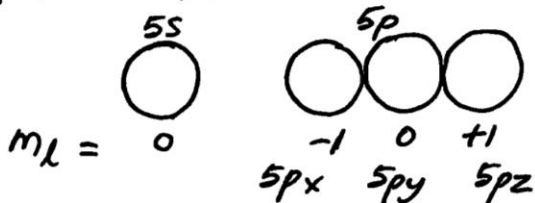
$l=3$  (5f-subshell)

$l=4$  (5g-subshell)

(c) Total no. of orbitals in each subshell is  $= 2l+1$

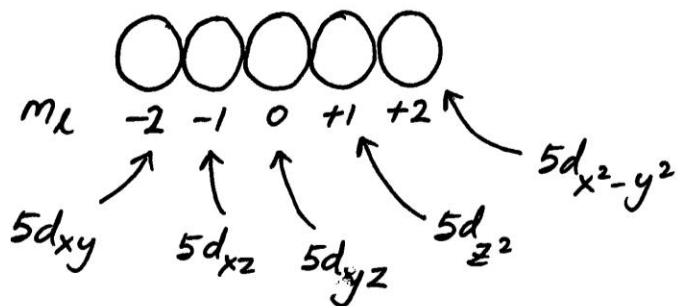
$n=5, l=0$  : No. of orbital  $= (2l+1) = 2(0)+1 = 1$  orbital : 5s

$n=5, l=1$  : No. of orbitals  $= 2(1)+1 = 3$  orbital :  $5p_x, 5p_y, 5p_z$



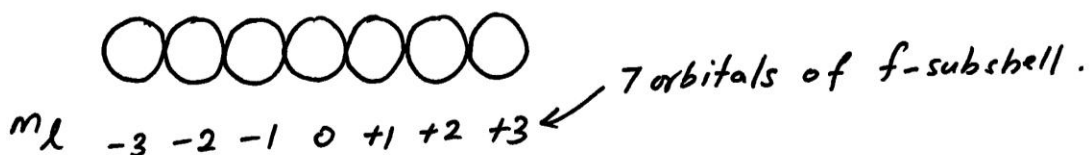
$n=5, l=2$  (5d subshell)

No. of orbitals  $= 2l+1 = 2(2)+1 = 5$  orbitals of d.



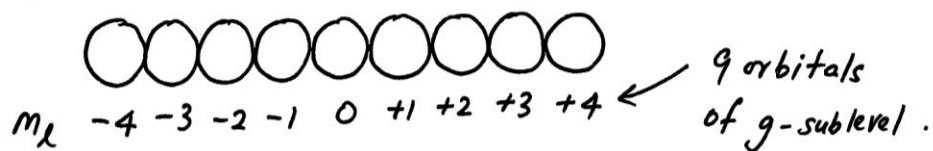
$n=5, l=3$  (5f subshell)

No. of orbitals  $= 2l+1 = 2(3)+1 = 7$  orbitals of f of 5f subshell



$n = 5, l = 4$  (5g subshell)

No. of orbital =  $2l + 1 = 2(4) + 1 = 9$  orbitals of g  
of 5g subshell



- Total no. of orbitals =  $n^2 = 5^2 = 25$  orbitals  
(5s - 1 orbital; 5p - 3 orbitals; 5d - 5 orbitals; 5f - 7 orbitals; 5g - 9 orbitals)
- Total no. of electrons in  $n = 5$  level =  $2n^2$  electrons =  $2(5)^2 = 50$  e's  
ie 25 orbital  $\times$  2 e's/orbital = 50 e's.

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