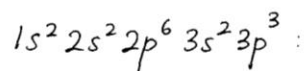


Q7 (a) $n=4$ $l=0, 1, 2, 3$ (s, p, d, f)

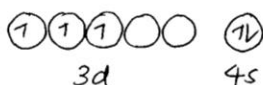
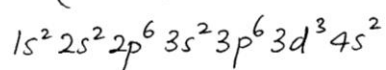
	n	l	m_l	m_s	
$4s^2$	4	0	0	$+\frac{1}{2}$	1e ⁻ with $m_s = -\frac{1}{2}$
	4	0	0	$-\frac{1}{2}$	
$4p^6$	4	1	+1	$+\frac{1}{2}$	3e ⁻ with $m_s = -\frac{1}{2}$
	4	1	+1	$-\frac{1}{2}$	
	4	1	0	$+\frac{1}{2}$	
	4	1	0	$-\frac{1}{2}$	
	4	1	-1	$+\frac{1}{2}$	
	4	1	-1	$-\frac{1}{2}$	
$4d^{10}$	4	2	+2	$+\frac{1}{2}$	5e ⁻ with $m_s = -\frac{1}{2}$
	4	2	+2	$-\frac{1}{2}$	
	4	2	+1	$+\frac{1}{2}$	
	4	2	+1	$-\frac{1}{2}$	
	4	2	0	$+\frac{1}{2}$	
	4	2	0	$-\frac{1}{2}$	
	4	2	-1	$+\frac{1}{2}$	
	4	2	-1	$-\frac{1}{2}$	
	4	2	-2	$+\frac{1}{2}$	
	4	2	-2	$-\frac{1}{2}$	
$4f^{14}$	4	3	+3	$+\frac{1}{2}$	7e ⁻ with $m_s = -\frac{1}{2}$
	4	3	+3	$-\frac{1}{2}$	
	4	3	+2	$+\frac{1}{2}$	
	4	3	+2	$-\frac{1}{2}$	
	4	3	+1	$+\frac{1}{2}$	
	4	3	+1	$-\frac{1}{2}$	
	4	3	0	$+\frac{1}{2}$	
	4	3	0	$-\frac{1}{2}$	
	4	3	-1	$+\frac{1}{2}$	
	4	3	-1	$-\frac{1}{2}$	
	4	3	-2	$+\frac{1}{2}$	
	4	3	-2	$-\frac{1}{2}$	
	4	3	-3	$+\frac{1}{2}$	
	4	3	-3	$-\frac{1}{2}$	

There are 16 electrons with $m_s = -\frac{1}{2}$

Q7(b) P (Z = 15)



V (Z = 23)



} 3 unpaired electrons in 3d orbital

Ans

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