Practice Assessment 6

Hydrogen atom in excited state with $n=3$ and $l=2$

(a) $l=2$ $s=1/2$

From Clebsh-Gordan table $2 \times 1/2$

$j = 5/2$ and $m = 5/2$

$\rightarrow \sqrt{j(j+1)}\,\hbar = \sqrt{35}\,\hbar/6$ $\quad P=1$

(B) angular momentum of electron is $\sqrt{35}\hbar/2$, $j=5/2$
$m: [-2, 2]$

J_1	J_2	M_1	M_2	
5/2	+5/2	+2	+1/2	$P=1$
5/2	+3/2	+2	-1/2	$P=4/5$
5/2	+1/2	+1	-1/2	$P=3/5$
5/2	-1/2	0	-1/2	$P=2/5$
5/2	-3/2	-1	-1/2	$P=1/5$
5/2	-5/2	-2	-1/2	$P=1$

(C)

J_1	J_2	M_1	M_2		
5/2	5/2	2	1/2	$J=\sqrt{55}\hbar/6$	$P=1$
5/2	3/2	1	1/2	$J=\sqrt{55}\hbar/6$	$P=4/5$
3/2	3/2	1	1/2	$J=\sqrt{15}\hbar/2$	$P=4/5$
5/2	1/2	0	1/2	$J=\sqrt{55}\hbar/6$	$P=3/5$
3/2	1/2	0	1/2	$J=\sqrt{15}\hbar/2$	$P=4/5$
5/2	-1/2	-1	1/2	$J=\sqrt{55}\hbar/6$	$P=2/5$
3/2	-1/2	-1	1/2	$J=\sqrt{15}\hbar/2$	$P=4/5$
5/2	-3/2	-2	1/2	$J=\sqrt{55}\hbar/6$	$P=1/5$
3/2	-3/2	-2	1/2	$J=\sqrt{15}\hbar/2$	$P=4/5$