QM S'04 #1

$S_1 = 3/2$; $S_2 = 1/2$; $S = S_1 + S_2 = 2$ (max. total S)

$S_1 - S_2 = 1$ (min. total S)

$$|2,2\rangle = |3/2, 3/2\rangle |1/2, 1/2\rangle$$

$$|2,1\rangle = \frac{1}{\sqrt{4}} |3/2, 3/2\rangle |1/2, -1/2\rangle + \sqrt{\frac{3}{4}} |3/2, 1/2\rangle |3/2, 1/2\rangle$$

$$|2,0\rangle = \frac{1}{\sqrt{2}} |3/2, 1/2\rangle |1/2, -1/2\rangle + \frac{1}{\sqrt{2}} |3/2, -1/2\rangle |1/2, 1/2\rangle$$

$$|2,-1\rangle = \sqrt{\frac{3}{4}} |3/2, -1/2\rangle |1/2, -1/2\rangle + \frac{1}{\sqrt{4}} |3/2, -3/2\rangle |1/2, 1/2\rangle$$

$$|2,-2\rangle = |3/2, -3/2\rangle |1/2, -1/2\rangle$$

$$|1,1\rangle = \sqrt{\frac{3}{4}} |3/2, 3/2\rangle |3/2, -1/2\rangle - \frac{1}{\sqrt{4}} |3/2, 1/2\rangle |3/2, 1/2\rangle$$

$$|1,0\rangle = \frac{1}{\sqrt{2}} |3/2, 1/2\rangle |1/2, -1/2\rangle - \frac{1}{\sqrt{2}} |3/2, -1/2\rangle |1/2, 1/2\rangle$$

$$|1,-1\rangle = \frac{1}{\sqrt{4}} |3/2, -1/2\rangle |1/2, -1/2\rangle - \sqrt{\frac{3}{4}} |3/2, -3/2\rangle |1/2, 1/2\rangle$$