$$[1^3] = \begin{array}{|c|}\hline \phantom{x} \\ \hline \phantom{x} \\ \hline \phantom{x} \\ \hline \end{array}$$

This does not exist for spin-1/2 particles because there are only two spin states, up or down. Thus at least two of the three particles must have the same spin and hence it is impossible to make a completely antisymmetric spin function.

## Combine Spin and Isospin: *

$$\chi_{\rm S}\left(\frac{3}{2};\frac{3}{2}\right) = \left|s=\frac{3}{2},{\rm S}\right\rangle\left|I=\frac{3}{2},{\rm S}\right\rangle$$

$$\chi_{\rm MS}\left(\frac{3}{2};\frac{1}{2}\right) = \left|s=\frac{3}{2},{\rm S}\right\rangle\left|I=\frac{1}{2},{\rm MS}\right\rangle$$

$$\chi_{\rm MA}\left(\frac{3}{2};\frac{1}{2}\right) = \left|s=\frac{3}{2},{\rm S}\right\rangle\left|I=\frac{1}{2},{\rm MA}\right\rangle$$

$$\chi_{\rm MS}\left(\frac{1}{2};\frac{3}{2}\right) = \left|s=\frac{1}{2},{\rm MS}\right\rangle\left|I=\frac{3}{2},{\rm S}\right\rangle$$

$$\chi_{\rm MA}\left(\underset{S}{\frac{1}{2}};\underset{T}{\frac{3}{2}}\right) = \left|s=\frac{1}{2},{\rm MA}\right\rangle\left|I=\frac{3}{2},{\rm S}\right\rangle\ ;$$

$$\chi_{\rm S}\left(\frac{1}{2};\frac{1}{2}\right) = \frac{1}{\sqrt{2}}\left[\left|s=\frac{1}{2},{\rm MS}\right\rangle\left|I=\frac{1}{2},{\rm MS}\right\rangle + \left|s=\frac{1}{2},{\rm MA}\right\rangle\left|I=\frac{1}{2},{\rm MA}\right\rangle\right]$$

$$\chi_{\rm MS}\left(\frac{1}{2};\frac{1}{2}\right) = \frac{1}{\sqrt{2}}\left[\left|s=\frac{1}{2},{\rm MA}\right\rangle\left|I=\frac{1}{2},{\rm MA}\right\rangle - \left|s=\frac{1}{2},{\rm MS}\right\rangle\left|I=\frac{1}{2},{\rm MS}\right\rangle\right]$$

$$\chi_{\rm MA}\left(\frac{1}{2};\frac{1}{2}\right) = \frac{1}{\sqrt{2}}\left[\left|s=\frac{1}{2},{\rm MS}\right\rangle\left|I=\frac{1}{2},{\rm MA}\right\rangle + \left|s=\frac{1}{2},{\rm MA}\right\rangle\left|I=\frac{1}{2},{\rm MS}\right\rangle\right]$$