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Heisenberg antiferromagnetic chain with multiple spin 1/2 particles of different flavors per site[1] SOLOMON F. DUKI, YI-KUO YU, NCBI/NLM/NIH — Motivated by the discoveries of quasi-1D magnetic systems, we studied a quantum mechanical spin lattice system consisting of a one-dimensional antiferromagnetic Heisenberg chain. In this system we considered M spin 1/2 particles of different flavors per site, and the low-lying states, ground state included, of the Hamiltonian was solved numerically using the exact diagonalization method for finite cluster sizes. We have also obtained the corresponding solutions for systems of the same chain length but with one spin M/2 particle per site. The low energy spectra of both systems are then compared. For M= 2 and M=3, our result shows that the two spin chain systems (one spin M/2 per site vs. M spin 1/2 of different flavors per site) have the same excitation spectra at low energy and the number of overlapped states increases as the size of the cluster increases. The observed overlap also indicates that low energy excitations of the M flavored spin 1/2 chain system selects the high spin states, effectively satisfying the Hund's Rule even though the system does not possess the orbital angular momentum.

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