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Statistical mechanics and thermodynamics in anisotropic Heisenberg-like nanoclusters ARMEN KOCHARIAN, Department of Physics and Astronomy, California State University, LEV ANANIKYAN, SERGEI POGHOSYAN, NERSES ANANIKYAN, Yerevan Physics Institute — The single site quantum and thermal entanglement, concurrences, quantum phase transitions and quantum critical points are studied in small spin s = 1/2 and 1 in ferromagnetic and antiferromagnetic Heisenberg clusters. The grand canonical ensemble of Heisenberg clusters is also used for exact calculations of thermal properties, quantum and thermal entanglements of the spin lattice models in the presence of magnetic field and anisotropic field. We study the magnetic phase transitions and crossovers in clusters of various topologies driven by exchange interaction, external field and temperature. The comparison with the exact solution for the Heisenberg model in thermodynamic limit for the limiting cases is also provided. The small Ising and Heisenberg clusters are also used for comparison with the exact Bethe-ansatz solutions. These exact results in clusters give a novel insight into the properties of single molecule magnets, the dynamics of magnetization and can be useful for interpretation of the phase diagram in molecular nanomagnets and nanometer-sized magnetic particles.

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