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Multiple Excitations in an Impure Infinite-Chain Heisenberg Ferromagnet

by EDGAR A. RHODES

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(20. X. 1975)

Abstract. The exact single spin deviation eigenstates (measured from full alignment along an applied field) of the infinite chain Heisenberg ferromagnet containing a substituted magnetically coupled impurity are found and studied in detail, allowing arbitrary host and impurity spins, Landé factors, exchange constants and uniaxial anistropy constants. Depending on the sign and magnitude of impurity–host exchange and the impurity parameters, a number of localized spin deviations are found above and below the spin wave band, and resonant states are found within the band. Using an expansion in terms of these eigenstates, an approximation scheme is formulated for localized double spin deviations. For certain ranges of parameter values, the ground state is found to contain one spin deviation. For antiferromagnetic impurity–host exchange, the ground state can contain two spin deviations, and the conditions for a metamagnetic transition to the two spin deviation ground state are found.

On the Derivation of Bounds for the Ladder Graphs of a Scattering Amplitude

by G. WANDERS

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(25. X. 1975)

Abstract. The derivation of exact upper and lower bounds for the sum of scalar ladder graphs is described in detail. The bounds are consistent with Regge behaviour. The sum of ladder graphs diverges if the coupling constant is large. This divergence occurs as well in the $g\phi^3$ theory in four space-time dimensions as in the $g\phi^4$ theory in two dimensions.

On the Thermodynamics of Fog

by H. R. TSCHUDI

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(28. X. 1975)

Abstract. Fog is considered as a thermodynamic system composed of an atmosphere (vapour and air) and droplets of water which move through the atmosphere. Expressions for the Helmholtz and Gibbs free energy of fog are derived which contain only the thermodynamic potentials of the atmosphere and of a droplet in contact with the atmosphere. It is shown that fog and not the pure phase represents the thermodynamic equilibrium, although the concentration of droplets may often be very small.

We discuss fog without condensation nuclei and fog around soluble nuclei. In the first case practically no droplets occur which contain more than a few dozen molecules. For the second case we show that fog exists only very close to the saturation point. At saturation every soluble nucleus of s molecules (or ions) forms a droplet containing $c \cdot s^{3/2}$ water molecules. Using the calculated value $c = \frac{1}{12}$ for water at 300°K, we obtain good agreement with experiment.