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Thermal effects on weak-interaction nuclear reactions in stellar conditions

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By the example of selected iron group nuclei and neutron-rich nuclei with N≈50, the influence of temperature on the rates and cross sections for various weak-interaction reactions (electron capture, inelastic neutrino scattering, etc.), which play an important role in the late stages of massive star evolution, is studied. It is shown that thermodynamically consistent incorporation of thermal effects leads to a stronger temperature dependence of the rates and cross sections than predicted by the shell model calculations.

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