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Matrix isolation infrared spectra of three cyclic diketones, 1,2-, 1,3- and 1,4-cyclohexanediones, have been recorded in argon and nitrogen matrices at 10K. In the first two cases, the diketones exist in varying degrees of tautomeric forms, and the position of equilibria have been determined by noting the intensity ratio of bands which are weakly sensitive to a tautomeric form. In case of 1,4-cyclohexanedione, resolved band structures of matrix isolated spectrum enable us to suggest refined values of isomeric distribution of the molecule in the ground electronic state. The medium dependence of isomeric conversion has been determined by performing measurement in liquids of varying polarity. The experimental observations have been complemented by predictions of ab initio and density functional theory calculations.