Ab initio spin-orbit configuration interaction calculations are performed on the $UO_2$ molecule, which has been observed in matrix isolation and laser ablation vacuum ultraviolet spectroscopic studies. We found the ground state to be $5f^17s^1\Sigma_u^+$. There are four excited states below 32,000 cm$^{-1}$ that have large transition moments with the ground state. The highest of these excited states is $5f^1\sigma_u^+ \Sigma_g^+$. It has two minima in its potential curve. The $\sigma_u$ orbital at the minimum with shorter bond distance has mostly $7p$ character, while it has mostly $5f$ character at the longer bond distance minimum. There are only a few dipole-allowed emission lines from this state to lower-energy states. Most electronic states in this region of the spectrum have $g$ symmetry because most of the orbitals involved ($5f, 7s, 7p$) have the same inversion symmetry.