The eight molecular orbitals of the π-system of the cyclooctatetraene dianion (COT, C₈H₈²⁻), an aromatic ion, are shown below in two views, along the z (top) and x (bottom) axis.

1. What is the axial symmetry of the eight molecular orbitals of C₈H₈²⁻ along the principal rotation axis? (fill chart above)
2. Consider a metal ion interacting with these orbitals along the principal rotation axis. Which metal orbitals (s, p, d, f) have the correct axial symmetry to interact with each of the eight molecular orbitals of C₈H₈²⁻? (fill chart above)
3. What is the axial symmetry of the eight molecular orbitals of C₈H₈²⁻ along an axis defined by the pₓ orbital of the top carbon in the view along the z axis? (fill chart above) Consider electron density that is 2 C-C bonds away (or further) to be too far to interact.
4. Consider a metal atom interacting with these orbitals along the axis described in 3. Which metal orbitals (s, p, d, f) have the correct axial symmetry to interact with each of the eight molecular orbitals of C₈H₈²⁻? (fill chart above)