## CHEM 322: Coordination Chemistry

## Topic: Spectrochemical Series & Techniques for Studying Complexes

**Name:** _____ **Roll No.** _____ **Submission date:** _____

### Relating Electronic Spectra and Ligand Field Strength of $NiX_4^{2-}$ Anions

Insert Figure 3 from the following reference: Zheng, B.; Miranda, M. O.; DiPasquale, A. G.; Golen, J. A.; Rheingold, A. L.; Doerrer, L. H. Synthesis and Electronic Spectra of Fluorinated Aryloxide and Alkoxide $[NiX_4]^{2-}$ Anions. *Inorganic Chemistry* **48** (2009) 4274 - 4276. DOI: 10.1021/ic9003593

It may be advisable to zoom in on the range indicated in Question 4 (12,000 - 6100 $cm^{-1}$), while still including the Figure legend.

Questions:

1. What are the units on the x and y-axes?

2. Convert 10,400 $cm^{-1}$ to wavelength in units of nm. Convert 7840 $cm^{-1}$ to wavelength in units of nm. Which wavelength corresponds to higher energy?

3. In which direction on the x-axis does energy increase?

4. If a d-d transition at 9,000 $cm^{-1}$ is blueshifted, would it be found at a higher or lower wavenumber? Would this be a higher or lower energy transition?

5. Consider the d-d transition peaks in the range ~12,000 – 6,100 $cm^{-1}$. The energy of the d-d transitions in this range correlate to the ligand field splitting energy. Based on these data, arrange the compounds in order of increasing ligand field strength in a partial spectrochemical series.

6. All of these compounds have the same geometries. What are the two possible geometries for this class of compounds?