

科目：無機化學

1. For each of the following molecules or ions, predict (a) the Lewis structure, (b) the molecular geometry, (c) the point group, (d) the hybrid orbitals on central atom, (e) the oxidation number of central atom, and (f) the formal charge of central atom :
- (1) SF_4 , (12%)
(2) IF_5 , (12%)
(3) ClF_3 , (12%)
2. A mineral crystallized in a cubic close packed (ccp) array of O^{2-} ion with Al^{3+} ion in 1/2 octahedral holes and Mg^{2+} ion in 1/8 tetrahedral holes. What is formula of this mineral? (16%)
3. For each of $[\text{Cr}(\text{H}_2\text{O})_6]^{2+}$, $[\text{Ni}(\text{CN})_4]^{2-}$ (24%)
- (1) Calculate the ligand field stabilization energy (LFSE).
(2) Find the magnetic dipole moment.
(3) Draw the molecular orbital diagram (MO).
(4) Does it show Jahn-teller distortion?
4. Calculate the electron counting for the following transition metal complexes:
- (a) $\text{Cr}(\eta^6\text{-C}_6\text{H}_6)(\text{CO})_3$ (b) $(\eta^3\text{-C}_3\text{H}_5)(\eta^5\text{-C}_5\text{H}_5)\text{Fe}(\text{CO})$
(c) $\text{CpOs}(\text{CO})_2(\text{C}\equiv\text{NMe})$ (d) $\text{RhCl}(\text{PR}_3)_3$
- Which one obeys EAN rule? (18-electron rule for ML_6 and 16-electron rule for planar ML_4) (24%)