

1. Prepare a molecular orbital energy level diagram for NO, predict the bond order and the number of unpaired electrons. (15%)
2. Predict the order of the following bases when they react with BMe_3 .
2,6-dimethylpyridine, 2-methylpyridine, 2-*t*-butylpyridine, pyridine. (15%)
3. Explain the crystal structure for CsCl, NaCl, CaF_2 , and ZnS. (15%)
4. Write chemical formula for diamminesilver(I) chloride and dichlorobis(ethylenediamine)cobalt(III) ion. (20%)
5. Predict the magnetic moments (spin-only) of the following species:
 $[\text{Fe}(\text{CN})_6]^{3-}$, $[\text{Ni}(\text{H}_2\text{O})_6]^{2+}$, $\text{Ni}(\text{CO})_4$. (15%)
6. Explain the following terms:
water gas, water gas shift reaction, borane, leveling effect. (20%)