系所(組)別：應用化學所 M-3-1	考試科目：無機化學

1. Classify the following as closo, nido, arachno, or hypho: 20%
   a. $SiC_2B_4H_{10}$
   b. $C_2B_7H_{11}CoCp$
   c. Ge_9^{4-}
   d. B_6H_{12}

2. Show how transition metal complex could be used to catalysis the following synthesis: 20%
   a. aldehyde from ethylene
   b. CH_3COOH from CH_3OH and CO

3. Predict the number of infrared-active C-O stretching vibrations for $W(CO)_3(\eta^6\text{-}C_6H_6)$, assuming C_{3v} geometry. 10%

4 For $W(CO)_6$ (octahedral), 20%
   a. predict the number of unpaired electron
   b. estimate its magnetic dipole moment
   c. find its ligand field stabilization energy (LFSE)
   d. is it labile or inert?

5. Give an example for each of the following chemical terms: 30%
   a. hard acid
   b. soft base
   c. Arrhenius acid
   d. Lewis base
   e. charge transfer
   f. semiconductor