

1. Classify the following as closo, nido, arachno, or hypho: 20%
 - a. $\text{SiC}_2\text{B}_4\text{H}_{10}$
 - b. $\text{C}_2\text{B}_7\text{H}_{11}\text{CoCp}$
 - c. Ge_9^{4-}
 - d. B_6H_{12}

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

3. Predict the number of infrared-active C-O stretching vibrations for 10%
 $\text{W}(\text{CO})_3(\eta^6\text{-C}_6\text{H}_6)$, assuming C_{3v} geometry.

4. For $\text{W}(\text{CO})_6$ (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