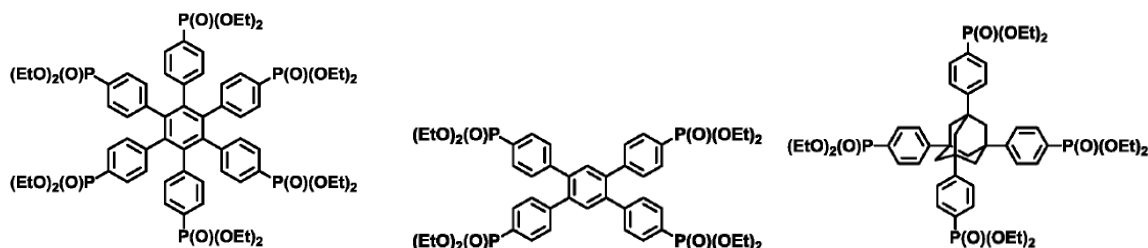
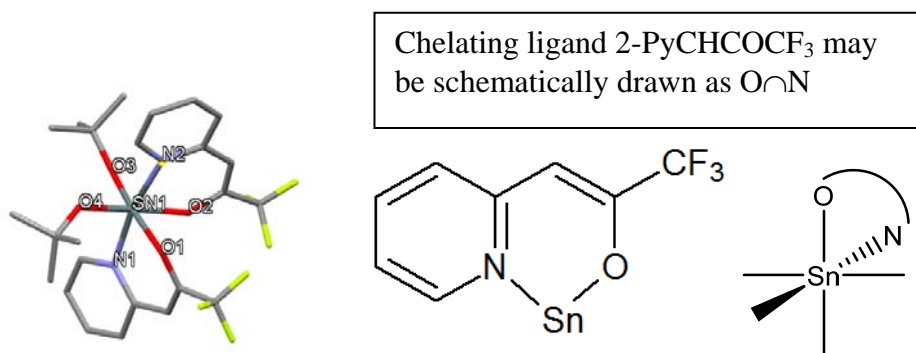


<b>HW 1</b>	<b>Multinuclear NMR</b>	<b>Name:</b>	
<b>Points:</b>	<b>C6800</b>	<b>Date:</b>	
Max. 100 points	<b>Spring 2018</b>	<b>Version A</b>	

- (10 points) Show that  $E_{\text{mag}} = -\boldsymbol{\mu} \cdot \mathbf{B}_0 = -\mu_z |B|$
- (15 points) Consider symmetry properties of following molecules. Find symmetry elements and give their point group labels. How many signals would you expect in the  $^{31}\text{P}$  NMR spectra.



- (10 points) Calculate the energy difference between the spin levels inside a 950 MHz magnet for a  $^3\text{H}$  nucleus.
- (10 points) Calculate the excess of nuclei on the lowest energy level of  $^3\text{H}$  at 300 K and 173 K.
- (25 points) Octahedral complexes  $\text{Sn}(\text{2-PyCHCOCF}_3)_2(\text{O}^t\text{Bu})_2$  may form several geometrical isomers. Find all of them, draw their geometrical formulas (ligand 2-PyCHCOCF<sub>3</sub> schematically), and give their symmetry point group labels.



- (10 points) How many signals would you expect in the  $^{19}\text{F}$  NMR spectra for each isomer?
- (10 points) How many signals of  $^t\text{BuO}$  groups would you expect in  $^{13}\text{C}$  NMR spectra for each isomer?
- (10 points) How many signals would you expect in the  $^{19}\text{F}$  and  $^{31}\text{P}$  NMR spectra and why?

