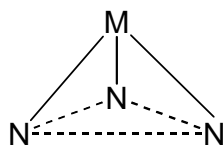


**Problem set 3**

1. Draw the 3 most common 7-coordinate geometries.

The bulky, rigid tridentate ligand **NNN** is a good ligand for  $\text{Ln}^{3+}$  ions. Its rigidity means that it always coordinates in such a way as to occupy a triangular face:



**NNN** is sufficiently bulky that only 4 other ligands can bind to the metal. How many possible geometric isomers for  $\text{Ln}(\text{NNN})\text{L}_4$  (L = monodentate ligand) are there for each coordination geometry?

[Q from 2004 midterm]

2.  $\text{Ln}(\text{NO}_3)_3(18\text{-crown-6})$  complexes have structures in which the 12 O atoms take up an icosahedral geometry around the lanthanide ion ("18-crown-6" is a crown ether,  $\text{cyclo}\{-\text{CH}_2\text{CH}_2\text{O}\}_6$ ). The 6 O atoms of the crown take up a boat rather than a chair conformation. By drawing the structure, explain why.

3. Explain why tungsten has the highest mp, bp and heat of atomization of any element.

[Q from 2004 midterm]