

1. What are the possible geometries for a 4 coordinate compound?

4 coordinate compounds  
Tetrahedral (Td)  
Square geometry (C4h)  
One lone pair (C2v)

- Pyramidal       D<sub>3h</sub>       D<sub>4h</sub>       C<sub>2v</sub>
- C<sub>4v</sub>       Tetrahedral       Square pyramid       T<sub>d</sub>

The other geometries relate to other coordination environments. See page 8 of the lecture.

2. Actinides are hard metal ions

2.1. What are properties of hard metal ions

- Low Positive Charge       Closed shells or half-filled electron configurations
- Large ionic radius       Small radii       High positive charges

Based on Lewis acid definitions, hard acid metal ions have the following properties

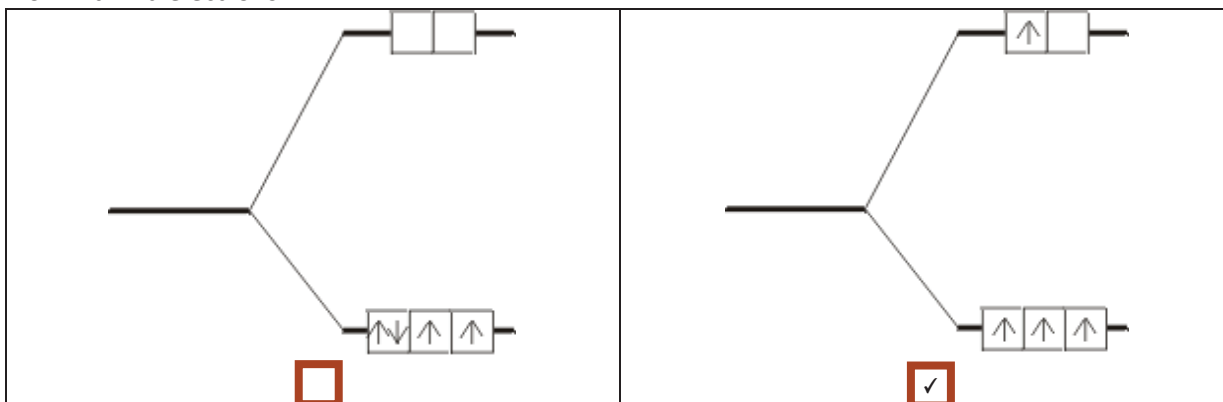
- \* High positive charges
- \* Small radii
- \* Closed shells or half filled configurations

2.2. Lanthanides and actinides can both be classified as hard metal ions. Which are considered to

be harder, lanthanides or actinides? Lanthanides

Lanthanides are harder. The 4f electrons are not involved in bonding. Actinides interact stronger with soft ligands (S,P, and Cl as examples).

3. Identify the d orbital splitting that is classified as high spin in crystal field theory. This is for a metal ion with 4 d electrons.



High spin is also weak field. The larger number of unpaired electrons drives the higher spin configuration. The high spin is facilitated by the weaker splitting field, permitting an electron to occupy the e<sub>g</sub> orbital.

Ken Czerwinski Digitally signed by Ken Czerwinski  
Date: 2018.10.07 19:48:15 -0700

Digital signature