**Structure matching : the $64,000 question**

In-class exercise based on:

“A Proton-Switchable Bifunctional Ruthenium Complex That Catalyzes Nitrile Hydroboration” by Jacob B. Geri and Nathaniel K. Szymczak, *Journal of the American Chemical Society*, **2015**, *137*, 12808-12814.



|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **1H NMR** | **31P NMR** | **Reduction Potentials** | **Comments** |
| 1 | C2 symmetric set of resonances | singlet at  33.6 | -460 mV |  |
| 2 | single acidic proton at  13.84 | singlet at  32.0 | 195 mV | One equivalent of acid results in a neutral compound with no Ru-O bond |
| 3 |  | singlet at  30.69 |  |  |
| 4 |  |  | -660 mV | One equivalent of base to compound 1 results in disappearance of the 1H NMR OH resonance resulting in complex 4. |

1. Given the structures represented above how are they different from each other? Draw in the appropriate chemical reaction that generates each compound starting with compound A.
2. Using the four compounds above and data presented in the table assign the given structures with their appropriate observations systematically. Each row is one compound.
3. Using the 1HNMR data represented above, assign the structure.
4. Using the reduction potential, reconcile the assigned structure.
5. Comment on the 31P data. Are there any structural inconsistencies?
6. Annotate the above structures with the experimental data from the table.
7. Write a paragraph explaining each experimental and structural data set and comment on the chemical nature of each complex.