PROBLEM 53

[SUPPL Problem 53 # 1]

Arabic compound numbers in TAPSOC,
Roman numerals in Supplementary material

In Perspective

Transition metal (TM) and noble metal (NM) catalysis has grown into a major tool for organic synthesis, so the more important it is to examine its mechanistic aspects. While the vast repertoire of such reactions deserves a discussion forum of epic proportions, examining a few reactions of current interest, like the one in TAPSOC Scheme 53.1 developed by Prof. Weiping Tang and his collaborators at the University of Wisconsin, gives us a taste of what you may lay ahead in future mechanistic challenges.

Generally, TM and NM catalysts impart increased reactivity by helping to organize transition states around a well structured manifold, enhance electron redeployment, and occasionally transmit chiral information from ligands around the metal atom to the organic substrate. Additionally, metal complexes are excellent HEDZ → LEDZ converters, very much as if they were a very big proton.

In view of this, your problem analysis should include some degree of detail of substrate-TM interaction, influence (if any) of other ligands of TM on complex construction, how this complex makes a difference relative to the uncatalyzed reaction, and resolution of the complex into product(s) and free catalyst to justify a new catalytic cycle. The example of Cu(II) enhanced Vitamin C electron transfer portrayed in Scheme S(II)9.6 of Suppl Material II Nº 9 (for Chapter II) illustrates this point in detail although your mechanistic wonderings may not go always that far, as the present problem shows. Its mechanism is not particularly difficult but will serve as training ground for more complex problems you may encounter in your life as professional organic chemist.