-Answer Key-
Inorganic Chemistry Cumulative Exam
Purdue University
October 12, 2019

Question 1:
A) 15.7
B) 1. Metal binding pulls electron density away from the oxygen, leaving less basicity with which to hold on to the proton. 2. Proton loss reduces the active site charge from 2+ to 1+. 3. There is a hydrogen bonding network stabilizing the Zn-OH.

Question 2:
Phytoplankton grow because they are starved for iron in the Southern Ocean. But there is no iron deficiency in other oceans, so there are no changes to phytoplankton growth.

Question 3:
Iron + porphyrin.
Electron transfer, substrate oxidation, and oxygen transport

Question 4:
Hemoglobin (Fe porphyrin), hemerythrin (Fe₂), and hemocyanin (Cu₂)

Question 5:
Zinc fingers are protein loop structures used to bind DNA. These groups are made from Zn²⁺ bound by two histidines and two cysteines. Zinc avoids problems with redox chemistry. Zinc fingers are inert structures, not meant to have any reactivity. If the metal center was, say iron, there might be oxidation or reduction reactions, leading to unwanted (and possibly toxic) chemistry. About 1% of all proteins have zinc fingers.