May 8, 2012
Biochemistry Cumulative Exam
Richard J. Kassner

Bioinorganic Chemistry
JBC Thematic Minireview Series: Metals in Biology 2012

*Answer any five of the following questions.*

1. It is well recognized that metal ions serve important functions in many proteins. Other than those proteins considered in the following questions, name one metalloprotein containing a transition metal ion, describe its function (if catalytic show the reaction involved), name the metal ion and describe its role in the protein.

2. Alkali and alkali earth metal ions exhibit distinct differences from transition metal ions in terms of their properties and their preference for ligand binding groups in proteins. Describe these differences in properties of both types of metal ions and their preference for particular binding groups. Be specific by showing the structures of the binding groups involved.

3. Briefly describe the differences in transmembrane transport rates of alkali/alkali earth versus transition metal ions. Also comment on the basis for the difference in rates.

4. Describe copper ion transmembrane transport by P₁B-ATPases. Include in your discussion the role of CopZ and TM-MBSs and how specificity for the metal ion is achieved.

5. Describe the function of metallochaperones in eukaryotic cells.

6. Bacteria excrete siderophores to acquire iron from their environment and host cells during infection while animals use endogenous siderophores that maintain a labile iron pool. a) Explain why siderophores are needed by bacteria when iron is so abundant in the biosphere. b) Indicate the oxidation state of bound iron and describe the differences between bacterial and mammalian siderophores. c) Describe the role(s) of siderocalins in mammalian systems.