1. (12 pts) Guzder et al claim that the TFIIH complex is not physically associated with a number of other repair factors in yeast extracts.

(a) What’s the best evidence presented to support their conclusion?

(b) Suggest another experiment using their reagents to further test their conclusion.
2. (12 pts) (a) Describe an experiment to determine if a new sequence-specific DNA binding protein you’ve discovered binds to DNA cooperatively.

(b) Describe how you would analyze the data and what a plot of the binding data would look like.
3. (12 pts) (a) How is recognition of a specific DNA sequence by a protein fundamentally different than interactions of proteins with most other kinds of ligands?

(b) Why is there an optimal DNA sliding length for most efficient target site localization by a DNA binding protein? How can microarray-based gene expression profiling data be used to infer functional or physical interactions between proteins? What is a major pitfall with the use of microarray data in this way? Name one approach to make microarray data more useful for identification of biologically meaningful interactions between proteins.
4. (12 pts) A genetic screen that you’ve just performed uncovered a poorly characterized yeast gene apparently involved in the process you’re studying. Before doing any more experiments, you go immediately to your web browser. Describe how you might learn more about the function of the encoded protein by examining various datasets obtained by large-scale analysis of protein and gene function.
5. (12 pts) Portions of proteins that undergo allosteric transitions are frequently conformationally mobile.
(a) How does this observation alter standard models for how allosteric transitions occur?

(b) How can allosteric effects be mediated through proteins with multiple subunits?
6. (12 pts) Explain how fluorescence resonance energy transfer (FRET) can be used to monitor protein-protein interactions. What’s a potential problem with the use of this approach?
7. (10 pts) Describe the main forces responsible for holding a non-covalent protein polymer together. Discuss the role of entropy in this answer!
8. (10 pts) In the light microscope, the resolution is limited by the wavelength of light. What is this resolution limit for light, and what are the limitations on resolution in the electron microscope?
9. (5 pts) How many protein subunits are needed for assembling the simplest completely symmetrical icosahedron?