

## **BMB170c Problem Set 4: Viruses**

**Please turn into Peera Tuesday, May 19, 2009**

### **1.) Viruses and evolution (Holmes; Moreira & Lopez-Garcia).**

- a.) Argue why or why not viruses, plasmids, transposons, retrotransposons, RNA satellites, and spores ought to be considered "living."
- b.) Why can't scientists establish the common ancestor of human RNA viruses farther than a few hundred years ago when there are cases/evidence that they exist (accounts of diseases that are dated past hundred years ago)?
- c.) Between RNA and DNA viruses, which poses a greater pandemic threat? Why?

### **2.) Packaging of viral DNA (Petrov & Harvey)**

- a.) Summarize the main arguments that Petrov & Harvey made regarding different approaches in modeling how DNA gets packaged into the viral capsid.
- b.) What are the components that contribute significantly to the free energy in packaging DNA into the capsid? Where does the virus get the energy to overcome these energetic requirements?
- c.) Describe at least two experimental approaches that could be used to validate the modeling results. Briefly outline the experiments and discuss the information you expect to get from each experiment and how it would help validate the modeling studies.

### **3.) AIDS vaccine (Walker & Burton)**

- a.) What are unique characteristics of HIV-1 that make developing efficient vaccine against HIV extremely difficult?
- b.) Suppose you are now a new investigator in the HIV vaccine development field. What would be your first two projects? Frame the questions, outline experiments and goals and describe techniques/approaches you plan to employ. Argue why NIH should fund your first grant (these two projects). In other words, convince them why you think these two experiments are the most important steps toward an AIDS vaccine. You may consult the real experienced investigators in the field for some initial ideas, but cite them if you decide to do so.

### **4.) HIV assembly (Ganser-Pornillos et al.)**

- a.) Describe in detail, using figures, the structure of the mature HIV virus. Explain what each biophysical technique we studied during the winter term has contributed to that understanding. You may also find the lecture note helpful.