Name_____KEY_____ UT EID_____

BIO330
Quiz 1
January 23, 2014

1. What is the theoretical number of protein subunits in a T = 4 viral capsid? How many of the subunits will be in pentons? Give your rationale. (5 points)

A T=1 icosahedral capsid is composed of 60 subunits, which are arranged in groups of five (pentons) at each of the 12 vertices. If T > 1, then the number of subunits is T X 60 = 4 X 60 = 240 subunits. All icosahedral capsids will have 12 pentonic capsomers or 12 X 5 = 60 subunits, but those T > 1 capsids will have additional subunits in hexons (groups of 6 subunits).

2. Name three properties that suggest that viruses are living organisms. (4.5 points)

Viruses have: (1) nucleic acid genomes, either RNA or DNA, (2) proteins encoded by the genome, (3) the ability to replicate, (4) the ability to infect, (5) the capability to evolve and be selected, (6) the ability to mutate.

3. What can you learn about an unknown virus by examination using an electron microscope? Name two properties. (6 points)

Under the EM, you can see the shape of the virion, whether it has an envelope, and if you strip off the envelope (assuming it has one), you can determine the type of capsid (icosahedral, helical, or complex). With icosahedral capsids, you can determine the T number and potentially the family of viruses. With helical capsids, you can calculate the pitch (P). You also can observe virally infected cells and determine some aspects of the life cycle, such as whether the virus replicates in the nucleus.

4. Why are certain types of virus capsids found commonly in nature? (Why are the same types of structures observed in different virus families?) (4.5 points)

Certain structures, such as helical or icosahedral capsids, will be observed in viruses that are not genetically related to each other. These structures also are stable in the environment and provide protection for the viral genome. Helical and icosahedral capsids can be formed by self-assembly from repeating subunits with very little input of energy. The use of repeating subunits allows viruses to survive with small genomes (little coding capacity).