A. Answer the following short answer questions. (52 POINTS TOTAL)

1) List and describe two mechanisms by which influenza undergoes antigenic variation. (4 pts).

2) Why do retroviruses contain LTRs? (4 pts).

3) Predict the consequence of having a HIV genome that encodes a defective protease. Explain the primary defect (4 pts).

4) Briefly describe the purpose of the influenza virus M2 protein. Explain its role both in entry and assembly of the particle (8 pts).
5) In the blanks below, indicate the type and nature of the viral genome for each of the viruses indicated. Be precise in your answer (for example poliovirus: single strand linear, positive sense RNA) (12 pts).

Adenovirus _____________________________________________________

HIV _____________________________________________________

Influenza _____________________________________________________

Reovirus _____________________________________________________

SV40 _____________________________________________________

Rous Sarcoma _____________________________________________________

6) What is cap snatching and why is it necessary (8 pts)?

7) List two mechanisms by which retroviruses induce cellular transformation (4 pts).

8) Describe the role of SV40 Large T in the switch from the early phase of transcription to the late phase of transcription (4 pts).
9) Explain the role of CD4 in the entry step of HIV into host cells (4 pts)

B. Answer the following TRUE (T) OR FALSE (F). (3 points each, 30 POINTS TOTAL)

_____ 10. SV40 causes tumors in its natural host.
_____ 11. Influenza is a non-enveloped animal virus which displays spike proteins with enzymatic activity.
_____ 12. Large T-antigen is a true virus oncogene.
_____ 13. Adenovirus RNA splicing occurs in the cytoplasm.
_____ 14. Most retroviruses that carry oncogenes are defective for replication.
_____ 15. Transcription from the Major Late Promoter of adenovirus results in primary RNA transcripts of greater than 30kB lacking poly (A) tails.
_____ 16. Transcription of the retrovirus genome upon infection is a prerequisite for viral DNA replication and integration.
_____ 17. Retrovirus integration is site-specific within the cell's genome.
_____ 18. SV40 is a T=7 icosahedral virus composed exclusively of pentamer subunits.
_____ 19. Retrovirus gag proteins are initially synthesized in the form of a polyprotein.
C. **Answer the following problem solving question (18 points).**

20) After your graduation from Purdue, you land a high-paying job working for a major drug company. For your first project, you are asked to design a set of novel compounds that will have antiviral activity against HIV. The company has indicated that it would like you to concentrate on the following targets in the virus life cycle:

a. rev  
b. capsid (p24)  
c. TM (pg41)

i. For each target describe its function in the virus life cycle  
ii. Describe the mechanism of action for the compound that you will develop  
iii. Explain your assay for antiviral activity. It should be specific for the step in virus replication that is being inhibited (don’t just say virus infectivity assays).