

Solution key - 7.012 Recitation 13 - 2010

Questions:

1. Why do some people think that viruses are alive and some people don't?

They need the host cells to replicate otherwise they remain dormant. Therefore they are regarded as being at the borderline of living and non-living.

2. The following sequence is a short viral gene from a double-stranded DNA virus that actually encodes three different proteins. The sequence shown is from the transcription start site to the transcriptional end site. The upper strand of this gene is used as a template in transcription.

5' -TACTCTATCGCTTTAGCGGTATGCTATCAGAGCCATGCATGCATC-3'

3' -ATGAGATAGCGAAATCGCCATACGATAGTCTCGGTACGTACGTAG-5'

- i. How do you know that it is true that these three short proteins are not produced from alternative splicing of a single transcript?

Alternative splicing does not occur in viruses.

- ii. How many amino acids long would each of the three proteins be that are produced from this gene?

The peptides produced will be 5, 11 and 7 amino acids long using the 1st, 2nd and 3rd open reading frames from the 5' end of the transcript.

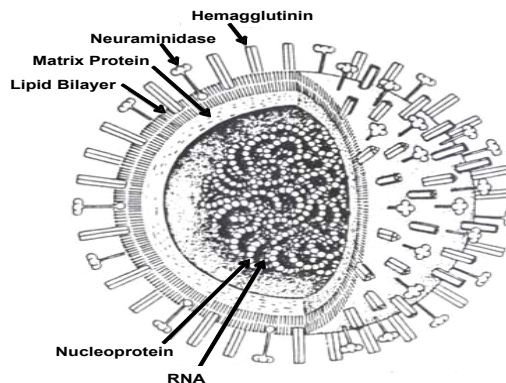
- iii. What is a major advantage for the virus to using this strategy?

It can use the same transcript to produce different proteins and allowing it to use limited space more efficiently.

- iv. What is a major disadvantage for the virus to using this strategy?

A single mutation in one transcript influences not just one viral protein but may have an effect on all the viral proteins that are being made from the single transcript.

3. Influenza virus is an RNA virus that does not replicate via a DNA intermediate. The virus typically infects vertebrate epithelial cells. The following is a schematic of the influenza virus.



Influenza virus is unable to make more viral RNA within the host cells using exclusively the host cell proteins.

- i. Explain why this is so.

This being a negative(-) stranded RNA virus can not be converted by the host cell machinery to a positive (+) RNA that has the same polarity as mRNA and is needed for translation.

- i. Explain how the virus overcomes this issue and replicates its genome in the host.

It solves this problem by bringing along its own RNA dependant RNA polymerase enzyme at the time of infection. Also RNA is less stable than DNA due to the presence of extra –OH group at 2'C position of ribose sugar.

4. Based on your answer to question 3 above, would you classify Influenza virus as a plus stranded / minus stranded RNA virus?

This is a negative(-) stranded RNA virus.