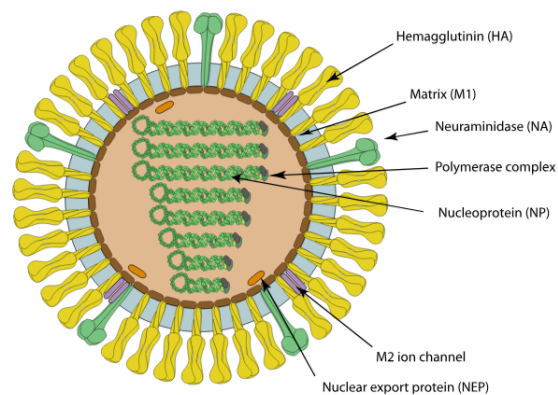


Student Pre-Activity Assessment of Flu Fighters Activity

I. For each of the following statements, indicate if the statement is correct or incorrect. If the statement is incorrect, explain why in 1-2 sentences.

- a. All viral genes/proteins (Figure below: H1N1 virion and proteins) may be used to design a vaccine against influenza infections. **False, only antigenic proteins or glycoproteins such as hemagglutinin and neuraminidase should be used to make a vaccine against influenza infections.**



Credit: ViralZone

- b. In humans, a vaccine cannot protect against an influenza infection. **False, In humans, a vaccine protects against an influenza infection and an annual vaccination is recommended.**

- c. Mutations may not impact the effectiveness of influenza vaccines. **False, Mutations especially non-synonymous ones may impact the effectiveness of influenza vaccines**

II. Multiple Choice

- i. Which of the following best describes the central dogma of molecular biology?
- a) **DNA -> RNA -> Protein**
 - b) Protein -> RNA -> DNA
 - c) RNA -> DNA -> Protein
 - d) DNA -> Protein -> RNA

ii. Which of the following is the correct description of a codon?

- a) A sequence of three nucleotides in tRNA that pairs with the mRNA codon
- b) A sequence of three nucleotides in mRNA that specifies a particular amino acid
- c) A sequence of amino acids in a protein that determines its function
- d) A sequence of nucleotides in DNA that codes for a tRNA molecule

iv. Which level of protein structure is defined by the sequence of amino acids in the polypeptide chain?

- a) Primary structure
- b) Secondary structure
- c) Tertiary structure
- d) Quaternary structure

iii. Which of the following is true about Influenza vaccines:

- a) Influenza is caused by bacteria
- b) Influenza viruses are never involved in epidemics
- c) Minor changes in the surface antigens of influenza viruses may occur every year
- d) The burden of influenza disease is mostly in children

iv. Which of the following is true about Influenza vaccines:

- a) Influenza vaccines must be given annually
- b) Influenza vaccines must be given once in a lifetime
- c) Most of the vaccines are prepared from bacteria grown in embryonated hens' eggs

iv. Which of the following is the most specific characteristic of the adaptive immune system?

- a) Antibodies
- b) Antigens
- c) A small a foreign substance
- d) A big carbohydrate molecule

v. Which of the following is true about the adaptive immune response?

- a) It is similar to the innate immune response
- b) It happens immediately after viral infections
- c) It is composed of humoral and cellular responses
- d) It is only present in insects

vi. What is herd immunity?

- a) The number of disease-fighting white blood cells in a person
- b) The protection the whole population has against a disease because a threshold number of individuals are immune to the disease
- c) Immunity in a herd of dogs
- d) The number of people that opt out of getting vaccinations

III. Short-Answers

Using your knowledge of the central dogma, convert the nucleotide sequence into an mRNA, and the mRNA into a protein, naming each step of the process. You can refer to the codon chart on this page to help.

5' A T G G C T G C T G T T G T C C A A C A G A A C G A C C T A 3'

1. Nucleotide to mRNA

Name of the process: **transcription**

5' AUGGCUGCUGUUGUCCAACAGAACGACCUA 3'

2. mRNA to protein

Name of the process: **translation**

MAAVVQQNDL

| | | Second mRNA base | | | | |
|-----------------------------------|---|---|--|--|---|------------------|
| | | U | C | A | G | |
| First mRNA base (5' end of codon) | U | UUU } Phe (F) UUC } UUA } Leu (L) UUG } | UCU } UCC } Ser (S) UCA } UCG } | UAU } Tyr (Y) UAC } UAA Stop UAG Stop | UGU } Cys (C) UGC } UGA Stop UGG Trp (W) | U C A G |
| | C | CUU } CUC } Leu (L) CUA } CUG } | CCU } CCC } Pro (P) CCA } CCG } | CAU } His (H) CAC } CAA } Gln (Q) CAG } | CGU } CGC } Arg (R) CGA } CGG } | U C A G |
| | A | AUU } Ile (I) AUC } AUA } AUG Met (M) or start | ACU } ACC } Thr (T) ACA } ACG } | AAU } Asn (N) AAC } AAA } Lys (K) AAG } | AGU } Ser (S) AGC } AGA } Arg (R) AGG } | U C A G |
| | G | GUU } GUC } Val (V) GUA } GUG } | GCU } GCC } Ala (A) GCA } GCG } | GAU } Asp (D) GAC } GAA } Glu (E) GAG } | GGU } GGC } Gly (G) GGA } GGG } | U C A G |
| | | Third mRNA base (3' end of codon) | | | | |