

Name: _____ Period: _____ Date: _____

Open **peebedu.com** and navigate to **Variant Ventures**. Click the **Introduction** button in the header and read through all steps before beginning. The introduction explains how each virus carries three RNA codons that determine its spread radius, antigen shape, and infection duration, and how the simulation models mutation, receptor-antigen matching, and zoonotic transfer.

Free Response Questions

Question 1 — Conceptual Analysis

Simulation Task: Start a new simulation in the Free Range environment with 30 pigs and 10 humans. Click Start Outbreak and let the simulation run until at least three variants have appeared in the Variants counter. Click on an infected pig to open the Viral Sequence Analysis panel and record the RNA sequence of the original virus and at least two variants, noting which codon changed in each.

(A) (1 pt) **Describe** the difference between a silent mutation and a nonsense mutation.

(B) (1 pt) **Explain** why a silent mutation leaves the protein a virus produces unchanged.

(C) (1 pt) **Predict** how the number of distinct viral variants in the population will change if the mutation rate is raised.

(D) (1 pt) **Justify** your prediction.

Question 2 — Analyze Model / Visual Representation

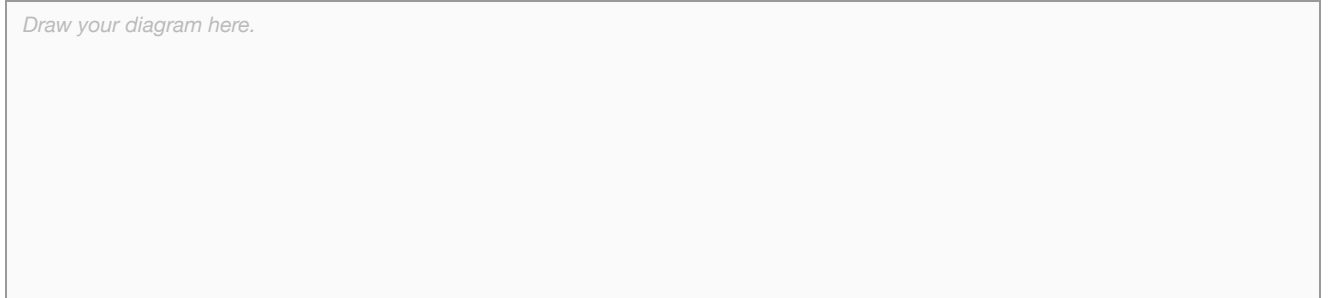
Simulation Task: Open *Viral Sequence Analysis* and read the codons of the original strain alongside the amino acids they specify. Start the outbreak, then open *View Variants* and compare the sequence of a descendant variant with the original, noting any codon that differs.

(A) (1 pt) **Describe** the relationship the Viral Sequence Analysis panel shows between a codon and an amino acid.

(B) (1 pt) **Explain** how a change to a single base within a codon can leave the amino acid it specifies unchanged.

(C) (1 pt) **Represent** the effect of a point mutation by drawing the original codon, the mutated codon, and the amino acid each one specifies.

Draw your diagram here.



(D) (1 pt) **Explain** why a change to a single amino acid can alter how a viral protein is recognised by an antibody.

6.4.A.3