Alien Evolution Lab

Name: _____ **Period:** _____ **Date:** _____

> Open **peebedu.com** and navigate to **Alien Evolution Lab**. Read the introduction popup, which explains that NASA's Kepler-9 rover has landed on exoplanet Verdara and transmitted photographs of eight life forms back to Earth. Your mission: classify these organisms by building and validating a cladogram using three independent lines of evidence (morphological traits, DNA nucleotide sequences, and protein amino acid sequences), then apply your tree to interpret fossil evidence.

Free Response Questions

Question 1 — Conceptual Analysis

> **Simulation Task:** *In Phase 1 (First Contact), click each organism card to expand it and check off its traits in the trait matrix. Pay close attention to Trait 2 (antennae) and Trait 3 (wings). Identify which organisms share these traits, and which organisms share Trait 4 (mandibles) but not Trait 2.*

(A) (1 pt) **Describe** the type of trait that is used to group organisms into the same clade on a cladogram.

(B) (1 pt) **Explain** why organisms C, D, and E are placed in the same clade on the Verdara cladogram.

(C) (1 pt) **Predict** where a newly discovered Verdara organism that possesses Trait 1 (eye stalks) and Trait 4 (mandibles) but not Traits 2, 3, or 5 would be placed on the existing cladogram.

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

Question 2 — Analyze Model / Visual Representation

> **Simulation Task:** *Complete Phases 1, 2a, and 2b of the simulation. After each phase, use the Check Tree button to confirm your cladogram. Observe that the same groupings of organisms are supported independently by morphological traits, DNA nucleotide sequences, and amino acid sequences.*

(A) (1 pt) **Describe** the kinds of data that can be used to construct a cladogram.

(B) (1 pt) **Explain** how having morphological, DNA, and protein evidence affects confidence in a cladogram.

(C) (1 pt) **Represent** the evolutionary relationships among the five ingroup organisms (B, C, D, E, and F) by drawing a cladogram in which each internal node is labeled with the shared derived character that unites the clade above it.

Draw your diagram here.

(D) (1 pt) **Explain** how a change in an amino acid sequence can lead to a change in a morphological trait.

7.9.B.2, 7.6.B.2