

Name: _____ Period: _____ Date: _____

Open **peebedu.com** and navigate to the **Reproductive Isolation Simulator**. Click the **Introduction** button and read through the popup, which describes how populations evolve different traits through natural selection, how predation and mating preferences drive adaptation, and how splitting populations into separate environments models geographic isolation and speciation.

Free Response Questions

Question 1 — Conceptual Analysis

Simulation Task: Set the Initial Population to 100, Initial Mean Trait (Color) to 128, and Initial Trait Variation (SD) to 20. Set Mating Preference to "None (Random mating)" and Max Color Diff for Mating to 30. Click "Run 10 Generations" to establish your baseline population. Then click "Split Population" to separate the organisms into two environments. Enable the predator in Population 1 with Predator Target Trait set to 200 and Predator Accuracy set to 60. Enable the predator in Population 2 with Predator Target Trait set to 50 and Predator Accuracy set to 60. Click "Run 100 Generations" and observe how the two populations diverge.

(A) (1 pt) **Describe** how the color trait distributions shown in the two histograms differ after the split populations have run for 100 generations under opposite predation pressures.

(B) (1 pt) **Explain** why the two populations diverged in their colour trait distributions after being split into separate environments with different predation pressures.

(C) (1 pt) **Predict** whether organisms from the two populations would still be able to interbreed if the geographic barrier were removed after 100 generations of divergent selection.

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

Question 2 — Analyze Model / Visual Representation

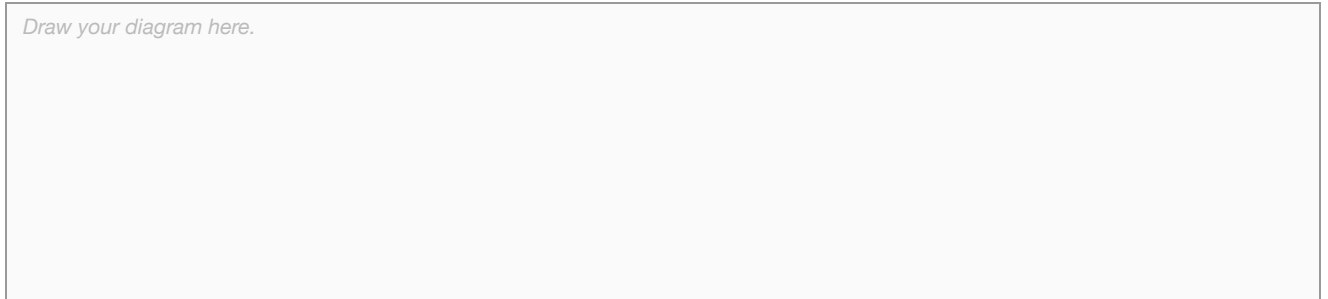
Simulation Task: Click "Reset Simulation." Set the Initial Population to 150, Initial Shape (% Circle) to 50%, and Max Color Diff for Mating to 50. Change Mating Preference to "Like Shapes Prefer." Do NOT split the population. Click "Run 100 Generations" and observe the shape frequency graphs and population counts. Note whether circles and squares maintain distinct groups or merge over time.

(A) (1 pt) **Describe** the criterion the biological species concept uses to define a species among sexually reproducing organisms.

(B) (1 pt) **Explain** how the "Like Shapes Prefer" mating preference models a prezygotic barrier to reproduction between the circle and square organisms.

(C) (1 pt) **Represent** the splitting of a single ancestral population into two reproductively isolated species over time by drawing a labeled diagram in the box below that identifies the reproductive barrier between them.

Draw your diagram here.



(D) (1 pt) **Explain** how gene flow between the circle and square groups would prevent them from diverging into two separate species.

7.10.A.2, 7.10.C.2