

PEEBEDU Bed Bug Treatment Lab

Unit 7: Natural Selection and Evolution

Name: _____ Period: _____ Date: _____

Open peebedu.com and navigate to **Bed Bug Treatment Lab**. Click the **How to Play** button to read the introduction. This simulation models a bed bug population in a home where you can apply different pest control treatments and observe how the population changes over time. Pay attention to the population stats panel (Total, Normal, Resistant, Eggs, q Freq), the two graphs (Population Over Time and Allele Frequency), and the five treatment options (DDT Spray, Steam, Vacuum, Wash Sheets, Call Professionals).

Free Response Questions

Question 1 — Conceptual Analysis

Simulation Task: *In the Bed Bug Treatment Lab, reset the simulation so you begin on Day 1 with 100 total bugs (99 Normal, 1 Resistant) and a q frequency of 0.010. Use only DDT Spray to treat the infestation. Press Play and apply DDT every time the population begins to recover. Continue until you have applied DDT at least five times and observe what happens to the population stats and both graphs.*

(A) (1 pt) **Describe** how the Normal and Resistant bug counts shown in the population stats panel change after each application of DDT.

(B) (1 pt) **Explain** why the frequency of the resistance allele (q) increases in the bed bug population after repeated applications of DDT.

(C) (1 pt) **Predict** what would happen to the resistance allele frequency (q) over time if you stopped using DDT entirely and instead used only steam treatment and vacuuming.

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

Question 2 — Analyze Model / Visual Representation

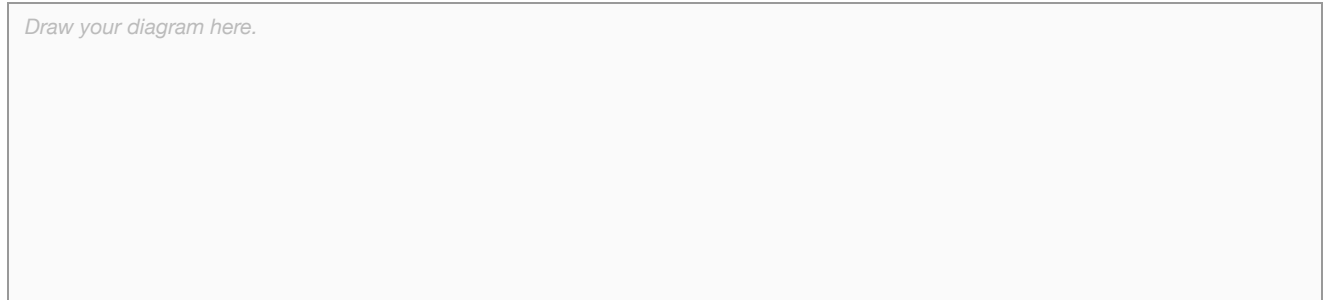
Simulation Task: Reset the simulation. This time, run two separate trials. In Trial 1, treat the bugs using only DDT Spray for 30 days. Record the final q frequency. In Trial 2, reset and treat using a combination of DDT Spray, Steam, and Vacuum over 30 days. Record the final q frequency. Compare the two outcomes.

(A) (1 pt) **Describe** the difference between a selective treatment (such as DDT) and a non-selective treatment (such as steam or vacuuming) in terms of their effect on allele frequencies in a population.

(B) (1 pt) **Explain** why an integrated pest management approach that combines chemical and physical treatments is less likely to drive the evolution of resistance than relying on a single pesticide.

(C) (1 pt) **Represent** the predicted change in resistance allele frequency (q) over 30 days for your two trials by drawing a labeled graph in the box below with one curve for each trial.

Draw your diagram here.



(D) (1 pt) **Explain** why the bed bug population you treated with DDT does not meet the conditions required for Hardy-Weinberg equilibrium.

7.2.A.1, 7.2.A.3