**Pepper Moth Evo Dots Lab**



**Background:**

During the early 1800’s, factories began to be widely used in England to produce goods and products; this time period is known as the industrial revolution. The pepper moth species, *Biston betularia,* lived in England during this time and was initially found as a light colored moth with small dark markings. As the number of factories increased so did the amount of soot (burning coal) found on trees making the tree bark almost black in color. The light colored moths easily stood out on the dark bark. By 1895 the frequency of dark moths in Manchester was found at 98% of the moths, nearly all of the moths. What could cause this change to occur?

**Assessment:**

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Not Proficient** | **Proficient** | **Exceeds Proficiency** |
| **Data Collection & Analysis:** | Missing some elements of proficient - please correct and turn back in within one class period. | Includes most of the following  *Data Analysis and Conclusion:*   * Type of graph and/or table is appropriate for data * Labeling of graph or table is correct (axis, units, and title) * Conclusion addresses original question or hypothesis using data | Includes most of the following  *Data Analysis and Conclusion:*   * Calculations are used when appropriate (mode, average, error) * Conclusion discusses limitations and errors (individual and procedural) and suggestions are made to improve and correct lab * Applies data and conclusions to other class content or real life examples by using additional research |
| **Teamwork:** | Missing elements listed in proficient. | Includes most of the following:   * Works with group members by remaining positive * Does not distract others * Positively contributes to the group’s lab completion | Includes most of the following:   * Student assists other group members as necessary |
| **Communication**: | Missing elements listed in proficient. | Includes most of the following:   * Answers fully address question * Limited grammatical errors and conventions * Uses scientific language (avoid the use of pronouns like I, you, me, we, our, etc.) and is concise but detailed | Includes most of the following:   * Discussion fully connects findings or implications to class concepts or real world events. * Appropriate scientific vocabulary used extensively and accurately |

**Directions:**

1. Partner with one other student.

*To simulate natural selection, we will use a computer program called EvoDots. In this program, a population of “Dots,” all the same species has variation by color and movement speeds. We will measure the effect of natural selection on this population.*

1. Click on the magnify glass in the top right hand corner of the Mac and search for “Evodots.” Click on the icon. If it doesn’t open automatically, check the menu bar for a blue, yellow, and red icon that says “EA.”
2. Click the button that says “new population.” Click the small “down arrow” on the right side of the program. This will expand the window to show a chart. G is the generation; 1=black, 2=purple, 3=blue, 4=green, 5=yellow, 6=orange, 7=red.
3. Record how many of each type of the dot species are present in Table 1.
4. Click “run” and, using your mouse, eat as many organism (dots) as you can in **15 seconds** by clicking on them with the mouse. **Have your partner time you. Click stop after 15 seconds.**
5. Record the number of remaining organisms after the first generation from the program in Table 1 on your edublogs post.
6. Have the surviving organisms **reproduce by clicking “reproduce**.”
7. **Record the number of each color organisms in Table 1 for Generation 1.** This is the **starting number of individuals** for each color for Generation 1. **The program will have two 0’s, two 1’s, etc. You want to use the second row as this represent after you have “eaten” or preyed on the organisms.**
8. Repeat steps 5-9 for a total of 3 generations and record your information in Data Table 1.
9. Trade with your partner and time for them.
10. Answer analysis questions and create graphs
11. ***TURN-IN:***
12. *Rename your personal assignment in the following way: Class\_Last Name\_First Name\_Assignment Name*
13. *Example: 3B\_Rott\_Dan\_Assignment Name*
14. *Move or put your personal copy of the Lab into your “Biology Turn in Folder” Google Doc Collection/Folder.*
15. *Turn in your assignment to Mr. Rott by using the following turn in* [*link*](https://docs.google.com/spreadsheet/viewform?formkey=dElxQXE4WXREcHExVVVRbXMwb1VJNEE6MA)
16. *Turn in your assignment to Ms. Brill/Childers by using the following turn in link*

**Data Table 1:**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Generation** | **Number of Black (1)** | **Number of Purple (2)** | **Number of Blue (3)** | **Number of Green (4)** | **Number of Yellow (5)** | **Number of Orange (6)** | **Number of Red (7)** |
| 0 (starting) |  |  |  |  |  |  |  |
| 1 |  |  |  |  |  |  |  |
| 2 |  |  |  |  |  |  |  |
| 3 |  |  |  |  |  |  |  |

**Analysis Questions:**

1. What did the experiment show about how prey are selected by predators?

2. What organism coloration is the best adaptation for the environment (background)? How do you know (use data to prove it)?

3. What would you expect the populations of the organisms to look like in each environment after 25 generations?

4. How does the simulation model natural selection?

5. Create a graph of your data from Table 1. **Be sure to title and label the axes of your graph.** Upload the graph below.

6. Examine Data Table 2; this is actual data for the number of dark and light moths during the industrial revolution in a single specific location. Construct a graph to visualize the data and upload to your edublogs post. *(Plot the years of the study on the X-axis, and the number of moths captured on the Y-axis. You should have 2 lines on your graph - one for light moths, and one for dark moths. Be sure to label your axes and give the graph a title)*.

**Data Table 2.**

|  |  |  |
| --- | --- | --- |
| **year** | **#of light**  **moths**  **captured** | **# of Dark**  **Moths**  **Captured** |
| 2 | 537 | 112 |
| 3 | 484 | 198 |
| 4 | 392 | 210 |
| 5 | 246 | 281 |
| 6 | 225 | 337 |
| 7 | 193 | 412 |
| 8 | 147 | 503 |
| 9 | 84 | 550 |
| 10 | 56 | 599 |

7. Explain in your own words what the graph for Data Table 2 shows. Include the following vocabulary in your explanation: survivors, offspring, environment,