PEPPERED MOTH GRAPHING ACTIVITY

Driving Question

How do genetic traits help or hurt organisms when environmental changes occur?

Background

A famous example of natural selection occurred in Manchester, England during the Industrial Revolution. The black-and-white-colored peppered moth, *Biston betularia* was a well-known moth species in Manchester. Its coloration helped it blend in with tree bark. In the mid-1800's, Manchester was an industrial city that experienced heavy air pollution from burning coal. Everything in the city including houses and trees became covered in a thin coat of black soot. As tree trunks turned black, the peppered moth stood out and was easily hunted by birds. The previously unknown black-colored variety of *B. betularia* suddenly appeared in large numbers in the population while the black-and-white peppered variety declined. In cleaner cities, the peppered variety continued to dominate and the black-colored variety was rarely seen.

Procedure

1. Open SPARKvue. Select Open PASCO Experiment > Quick Start Labs > Table & Graph (User Data).

2. Change the name of the first column to "Year" by clicking the pencil icon. The first column will end up on the x-axis of the graph, that's why it says "x". Leave the Units field blank.

3. Change the name of the second column to "Light". Leave the Units field blank.

4. Find and open the Table Tools menu below the last row of the table. Add a third column.

5. Click the Select Measurement box that appears. Select the gray "User-Entered" tab in the top-right. Choose "Create Data Set". Enter "Dark" for measurement name, and leave the unit name blank. Click OK.

6. Enter the data from Table A into SPARKvue's table. Hit Enter after each value.

7. You probably noticed one set of data is missing. To add the Dark data to the graph, go to the graph side of the display. Open the Graph Tools menu below the graph. Find and apply the "Add y-axis" feature.

8. Click the Select Measurement box that appears on the right side of the graph.

9. Select the gray "User-Entered" tab in the top-right. Choose "Dark."

10. Both data sets have a similar data range, so it will be appropriate for them to share the same origin. Find and apply the "Keep Origins Aligned" feature in the Graph Tools menu.

11. Scale the graph if necessary.

TABLE A

year	# of light moths captured	# of dark moths captured
1	556	64
2	537	112
3	484	198
4	392	210
5	246	281
6	225	367
7	193	412
8	147	503
9	84	594
10	58	638

This data was taken over a ten-year period to study the light and dark varieties of a moth population in Manchester during the Industrial Revolution. The moths were caught in traps located on the same trees every year.
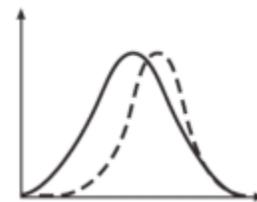
Graph

Roughly sketch the graph below. Include an appropriate title for you graph. Add numbers and labels to each axis.
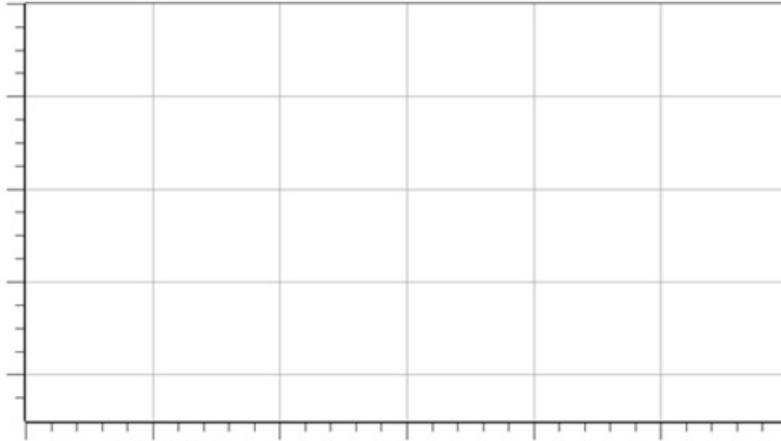
Questions

❷ 1. Which variety of moth increased over the ten-year period?

❷ 2. What could be done to return the frequencies or numbers of light and dark moths to their year 1 state?

❷ 3. Your data represents an example of directional selection where one trait is largely favored over the other. After a few generations, individuals in a population have a different appearance, or phenotype. Disruptive selection is usually represented in a graph that makes the shape shown in the diagram:

a. Which line in the diagram represents the light variety moth, and which line represents the dark variety? Explain your reasoning.

b. What variables, or measurements, would need to be on the x- and y-axis to achieve this graph display?

❷ 4. Discuss the results of either graph in terms of predator-prey interactions.