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|  | Biology Student ***EQ:*** *Why do horses have hooves?* | |  | ***Enduring Understanding***  Variations within species provide a means for adaptation and survival in a changing environment. |  |
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|  | BD08053_ | Peppered Moth Graphing Activity |  | ***Broad Brush Knowledge***  evidence of evolution, natural selection, animal adaptations to diverse environments, comparative anatomy, structure & function |  |
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|  |  | ***Concepts Important to Know and Understand***  Evolution, Constancy & Change, Natural Selection |  |
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|  | ***Targeted Skills***  comparing, sequencing, patterns, graphing | |  | ***Core Objectives***  11. Evaluate the role of natural selection on survival of the species. |  |
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**PURPOSE:**

To observe the effect of environmental changes on the color variation of the peppered moth.

To use research data to graph the results of an environmental adaptation in the peppered moth.

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| Industrial melanism is the term used to describe the adaptation of an organism in response to industrial pollution. One example of rapid industrial melanism occurred in the peppered moth, *Biston betularia*, in the area of Manchester, England from 1845 to 1890. H.D.B. Kettlewell studied and described industrial melanism in the peppered moth as an example of observable natural selection.  Before the Industrial Revolution, the trees in the forest around Manchester were light grayish-green due to the presence of lichens on their trunks. Most peppered moths that lived in the area were light with dark spots. Their coloring served as camouflage against predators such as birds. As the Industrial Revolution progressed, the trees became covered with sulfur dioxide that turned the trunks dark. Over a period of 45 years, the peppered moth population changed to a mostly dark species, with only a few light-colored individuals remaining.  In this investigation, you will observe the effects of industrial melanism in the peppered moth over the course of several years. |

**Background Questions:**

1) What is variation in a species?

2) Define mutation.

3) What preys on the peppered moth?

4) If the bark of trees is dark and the moths that rest on the trees are light, what will happen to the moths?

**PROCEDURE**

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| 1) Table A represents data from a ten-year study of two varieties of the same species of peppered moth. The numbers show moths captured in traps for ten consecutive years. The traps were located in the same area each year. |  |  | **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 |

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| 2) Using the data provided, make a graph comparing the numbers of each variety of peppered moth. *Be sure that everything is labeled appropriately*. (Use different colored pencils for light and dark moths.) (See the “Making a Graph” skill sheet for details on making and labeling graphs.) |  | 700  650  600  550  500  450  400  350  300  250  200  150  100  50  0  0 1 2 3 4 5 6 7 8 9 10 |

**DATA: QUESTIONS** (Use your textbook and your graph to answer the following questions.)

3) Assume that, in the beginning, the peppered moths were all light colored. How did the dark coloring first occur in the moth population?

4) What event caused the tree trunks of many trees in England to turn from light to dark?

5) Which variety of moth increased over the ten-year period?

6) What is the name of this type of evolutionary change?

**ANALYSIS AND CONCLUSIONS**

1. Explain the reason for the increase in the number of dark colored moths.

2. Using the data on the graph, draw a conclusion about the population of peppered moths in the sampled area of England.

3. What could be done to return the environment of the peppered moth to its original state?

4. What effect would cleaning up the environment have on the moths?

5. Explain the peppered moth events in terms of natural selection.