# Peppered Moth Graphing Activity Answer Key

NAME _____

**Peppered Moth Game**

**Objective:** Simulate changes in moth population due to pollution and predation, and observe how species can change over time.

Click on the link provided (on Moodle) and read each section BEFORE you play the game and answer the questions below as you read through each section.

**Peppered Moth**

1) Where do peppered moths live? _England, Europe, North America____

2) How do the moth larvae survive predators? __Live in trees that are covered in small lichens ____

3) What do the moths do during the winter? _change into cocoons_____

4) What color is the "typical" version of the moths? __light colored____

What color is the "carbonaria" version? _dark/almost black_____

5) How do adult moths survive predation? ___Fly at night and have good camouflage _____

**Natural Selection**

6) What was the industrial revolution? _Factories were being built that ran on coal and that caused dark smoke to cover the area _____

7) What was causing the change in the color of the moths? _The Color is genetic, and the color was passed on to each generation. It was caused by a mutation in the DNA. ___

8) What is natural selection? __species with characteristics will survive if they are better adapted to the environment _____

9) Why would dark moths have an advantage? __They had more time to breed because they lived longer than the white moths in the dark forest____

**Dr. Kettlewell**

10) What is an entomologist? _someone who studies insects___

11) How do scientists test theories? _They make predictions based on the theory and then they test the prediction and observe the findings ___

12) Dr. Kettlewell predicted that clean forests would have ____lighter___ colored moths and polluted forests would have ____darker_____ colored moths.

13) How did Kettlewell test his hypothesis? _He placed light and dark moths on tree trunks where he could observe them and then he recorded the times a bird found the moth ___

Peppered moth graphing activity answer key is a crucial tool for educators and students who are exploring the fascinating principles of evolution and natural selection through hands-on activities. The peppered moth, known scientifically as Biston betularia, serves as an excellent case study for demonstrating how environmental changes can influence species characteristics over time. In this article, we will delve into the background of the peppered moth, the significance of the graphing activity, and provide a detailed answer key to enhance understanding.

## Background of the Peppered Moth

The story of the peppered moth is a compelling example of natural selection. It primarily involves two color morphs: the light-colored (typical) and the dark-colored (melanic) forms. Historically, the light-colored moth was more prevalent due to its ability to blend in with the lichen-covered trees in industrial England. However, during the Industrial Revolution, soot and pollution darkened the trees, leading to a dramatic shift in the moth population.

## The Mechanism of Natural Selection

1. Variation: Within any given population, individuals exhibit variations in traits, such as coloration in the case of the peppered moth.
2. Competition: Limited resources lead to competition among individuals for survival, including avoiding predators.
3. Survival of the Fittest: Individuals with traits that better suit the environment are more likely to survive and reproduce.
4. Heritability: Traits that confer advantages are passed on to future generations, leading to evolutionary changes over time.

This cycle of variation, competition, and survival is at the heart of the graphing activity, as students visualize the population changes over time.

# Overview of the Graphing Activity

The peppered moth graphing activity typically involves students creating graphs to represent the changes in the population of the two color morphs over time. This exercise helps to solidify concepts related to evolution and provides a visual representation of how environmental factors can influence genetic traits.

## Objectives of the Activity

- Understand the concept of natural selection.
- Analyze how environmental changes affect species characteristics.
- Create and interpret graphs based on historical data.
- Develop skills in scientific reasoning and data analysis.

## Materials Needed

- Graph paper or digital graphing tools
- Data sets representing the population of light and dark moths over time
- Markers or colored pencils (if using paper)
- Access to research materials (books, articles, online resources)

# Steps of the Graphing Activity

1. Introduction to the Moth: Begin with a brief lecture on the peppered moth and the concept of natural selection.
2. Presentation of Data: Provide students with historical data showing the population percentages of light and dark moths over various decades.
3. Graph Creation:
- Instruct students to create a line graph with years on the x-axis and population percentage on the y-axis.
- Plot the data points for both light and dark moths.
4. Analysis: Ask students to analyze their graphs and discuss what the data indicates about the impact of industrialization on the moth population.
5. Discussion: Facilitate a class discussion on the implications of the findings and relate them back to the principles of natural selection.

# Answer Key for the Graphing Activity

The following answer key provides a detailed guide for educators to assess students' graphs and analyses effectively.

## Sample Data Set

| Year | Light Moths (%) | Dark Moths (%) |
|---|---|---|
| 1850 | 95 | 5 |
| 1900 | 90 | 10 |
| 1920 | 80 | 20 |
| 1940 | 30 | 70 |
| 1960 | 15 | 85 |
| 1980 | 30 | 70 |
| 2000 | 60 | 40 |

## Expected Graph Characteristics

- X-axis: Years (1850, 1900, 1920, 1940, 1960, 1980, 2000)
- Y-axis: Percentage of Moths (0% to 100%)
- Lines:
- A decreasing line for light moths from 1850 to 1960, followed by a slight increase in 2000.
- An increasing line for dark moths from 1850 to 1960, followed by a decrease in 2000.

## Analysis Questions and Sample Answers

1. What trend do you observe in the population of dark moths from 1850 to 1960?
- Sample Answer: The population of dark moths increased significantly from 5% in 1850 to 70% in 1960, indicating a strong advantage in survival due to environmental changes.

2. How did the population of light moths change during the same period?
- Sample Answer: The population of light moths decreased from 95% in 1850 to 30% in 1960, suggesting that they became more visible to predators as the environment darkened.

3. What factors contributed to the shift in moth populations?
- Sample Answer: The shift was primarily due to industrial pollution, which darkened tree trunks and reduced the camouflage effectiveness of light moths while benefiting dark moths.

4. Discuss the changes observed from 1960 to 2000. What might explain these differences?
- Sample Answer: The population of dark moths declined slightly, while light moths increased. This could be attributed to environmental regulations reducing pollution, allowing lichen to recover and providing better camouflage for light moths.

## Conclusion and Reflection

The peppered moth graphing activity provides students with a practical approach to understanding the concepts of evolution and natural selection. By analyzing real historical data, students can grasp how species adapt to their environments over time. The provided answer key serves as a resource for educators to effectively guide discussions and assessments based on student-created graphs.

In conclusion, the peppered moth graphing activity answer key not only reinforces theoretical knowledge but also cultivates critical thinking and data interpretation skills. By engaging with this material, students can appreciate the dynamic nature of evolution and the impact of environmental factors on species survival. As future scientists, these understanding and analytical skills will be invaluable in their academic and professional pursuits.

## Frequently Asked Questions

### What is the purpose of the peppered moth graphing activity?

The purpose of the peppered moth graphing activity is to illustrate natural selection and how environmental changes can affect species populations and traits over time.

### What data is typically graphed in the peppered moth activity?

Typically, data on the population of light-colored vs. dark-colored peppered moths is graphed over time, often correlating with changes in the environment such as industrial pollution.

### How does the graph demonstrate natural selection?

The graph demonstrates natural selection by showing shifts in the population ratios of light and dark moths in response to environmental changes, indicating which traits were more advantageous for survival.

### What key factors influence the color variation in peppered moths?

Key factors include predation by birds, camouflage effectiveness in different environments, and changes in environmental conditions such as pollution.

### What is the expected trend in the graph after industrialization?

After industrialization, the expected trend is an increase in the population of dark-colored moths due to their better camouflage against soot-darkened trees.

### What type of graph is commonly used in the peppered moth activity?

A line graph or bar graph is commonly used to show the population changes of the different color variations of peppered moths over time.

### How can students interpret the results of the graph?

Students can interpret the results of the graph by analyzing the changes in the population ratios and discussing the implications of these changes in terms of natural selection and environmental impact.

### What conclusions can be drawn from the peppered moth graphing activity?

Conclusions include the understanding that species can adapt to changes in their environment and that human activities can significantly impact natural selection processes.

### Why is the peppered moth a classic example in studies of evolution?

The peppered moth is a classic example in studies of evolution because it provides clear evidence of natural selection in action, illustrating how rapid environmental changes can influence species traits.

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