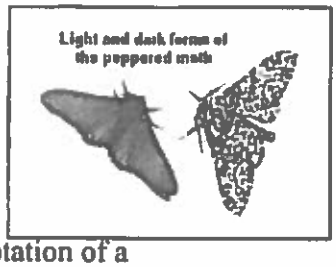
Name:_____ Per:_____ Score:_____Date:____
Lab: Darwin's Theory of Natural Selection In Action: Peppered Moth Simulation

Lab Objectives:



Describe the importance of coloration in avoiding predation
Relate environmental change to changes in organisms
Explain how natural selection causes populations to change

Background: Industrial Melanism is a term used to describe the adaptation of a population in response to pollution. One example of rapid industrial melanism occurred in populations of peppered moths in the area of Manchester, England from 1845 to 1890. Before the industrial revolution, the trunks of the trees in the forest around Manchester were light grayish-green due to the presence of lichens. Most of the peppered moths in the area were light colored with dark spots. As the industrial revolution progressed, the treee trunks became covered with soot (chimney smoke) and turned dark. Over a period of 45 years, the dark variety of the peppered moth became more common.

Materials

Sheet of white paper
Newspaper
Forceps
Colored Pencils
Clock with Second Hand
30 newspaper cutouts
30 white paper cutouts

Purpose: Write the purpose of this experiment here:

Hypothsesis: If the color of the prey matches the background color then **(complete the statement)** _____.

Procedure

1. You will work in a team of two. One person will be the 'predator' and the other person will arrange the 'prey' (the cutouts).
2. Place a sheet of white paper on the table and have one person spread 30 white cutouts and 30 newspaper cutouts over the surface while the 'predator' isn't looking.
3. The "predator" will then use forceps to pick up as many of the cutouts as he can in 15 seconds. Imagine yourself as a 'predator' in the wild.
3. This trial will be repeated. Next use newspaper and white cutouts on a newspaper background. Record the data on the next page.

Data Table:

Trial #	Background	Starting population of white cutouts	Starting population of newspaper cutouts	Number remaining of white cutouts	Number remaining of newspaper cutouts
1	White	30	30		
2	White	30	30		
3	Newspaper	30	30		
4	Newspaper	30	30		

Analysis:

1. What did the experiment show about how prey are selected by predators? Did your experiment support your hypothesis?

2. If the cutouts represented moths, what moth coloration is best adapted for a dark (newspaper) background? How do you know?

3. What would you expect the next generation of moths to look like after trial 1? What about the next generation after trial 3?

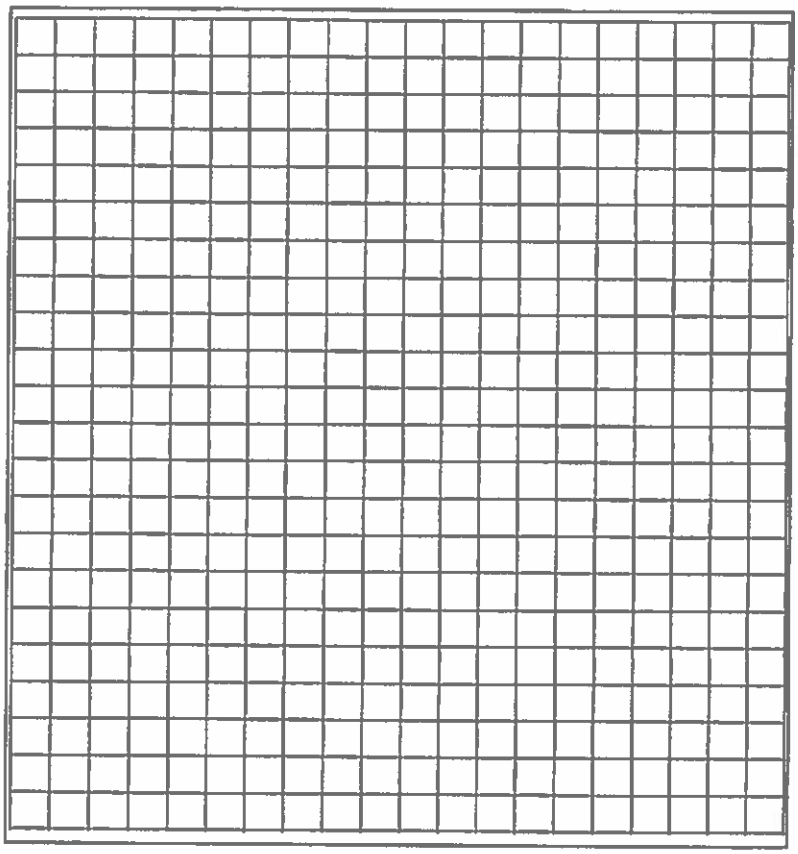
4. Did the experiment work in the way it was supposed to? Why/why not?

5. Are the light and dark colored moths different species? How can you tell?

Conclusion: Write a 5 sentence summary of a) what the experiment tested and showed b) how the experiment relates to natural selection c) how the experiment is an example of evolution (gradual change). Use the space below:

6. Examine the table and construct a graph. 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.

Year	# of dark colored moths	# of light colored moths
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
11	?	?



7. Explain in your own words what the graph shows.

8. Describe how the change in moth population from dark to light could occur – what in the environment might have changed and why?

Names _____
Date _____
Period _____

SAFETY ALERT
Wear Safety Goggles!
Use caution with scissors to avoid injury.
Follow all safety procedures for handling glassware and chemicals
Do not ingest raw liver. Wash your hands if your hands after handling the liver.

Mystery Meat

Purpose: Differentiate between physical and chemical changes by observing the signs of changes to a piece of liver

Materials:

Safety Goggles
Raw Liver
Beaker
Graduated Cylinder
Stopwatch
Thermometer
50mL of hydrogen peroxide (H_2O_2)

Procedure:

1. Put on your safety goggles.
2. Obtain a piece of liver from your teacher.
3. Place the thermometer into your piece of liver and record the starting temperature. **Write the starting temperature in the data at 0 sec. Observe the piece of liver at and record your observations at 0 sec.**
3. Leave the thermometer in the piece of liver and pour 50 mL of hydrogen peroxide (H_2O_2) into the beaker.
4. Observe the reaction for 3 minutes. **Measure** the temperature in 30 sec intervals. **Record the temperature in the data table every 30 sec.** While recording the temperature every 30 sec. all lab group members should observe the reaction for signs of physical or chemical changes. **Record your observations every 30 sec.**

Time (sec)	Temperature (°C)	Observations (signs of physical or chemical change)
0		
30		
60		
90		

Names _____
Date _____
Period _____

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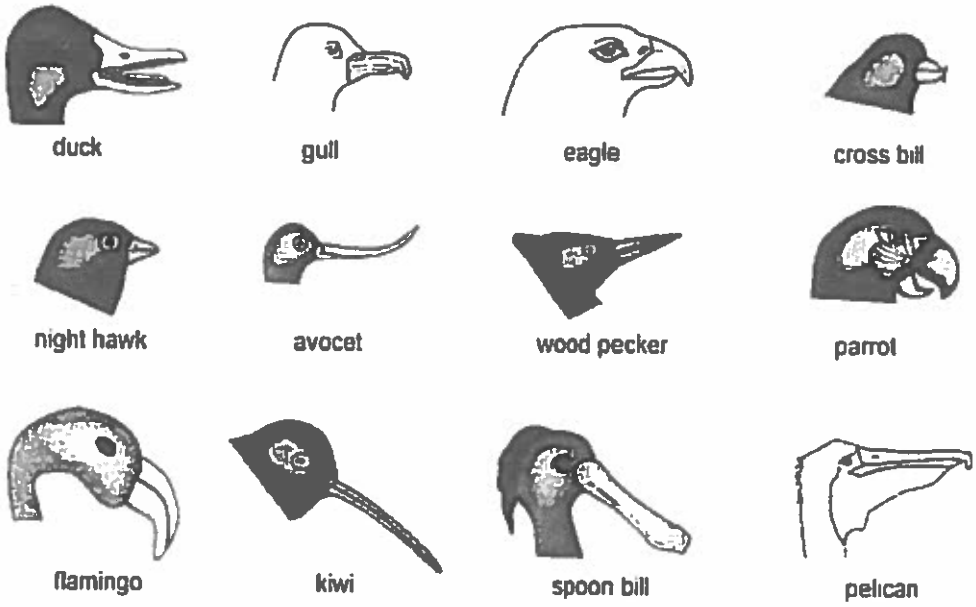
30		
60		
90		

Name_____ Partner_____ Date_____

Bird Beaks – Science Investigation

Birds eat many different types of foods. It may depend upon their environment and what's available for them to eat. It could even depend upon their body and beak structure and how they are able to get the food. Bird beaks (or "bills" as scientists call them) have adapted over the years to help the bird survive in whatever environment they are in. Here are some examples of different bird beaks or bills.

BIRD BEAKS



Material - Type of Beak or Bill

1. Strong jaw with a curved beak (Clothespins)
2. Pointed long beak (Forceps, Tweezers, or clothespins with glued on popcycle sticks to form long beak)
3. Scooping beak (Rounded Spoon)

Directions:

1. Use each type of beak (clothespin, tweezers/long, spoon) to pick up as many of the food items as possible in **one try**.
2. Count the number of items the bird ate.
3. Record the data under the graph.
4. Graph the data. Remember to use the right "scale" if there are not enough lines on the graph.
5. Answer the question.
6. Compare your data with your teams.
7. Move to the next feeding station when directed.

Bird Beak Experiment with "Bugs"

Number of Bugs

0

Strong Jaw (Clothespin)	Long Pointed Beak (Forceps)	Scoop Beak (Spoon)
Number "caught"	Number "caught"	Number "caught"

Bugs
(Raisin)

After your investigation, which kind of bird beaks do you think would most likely be able to eat bugs?

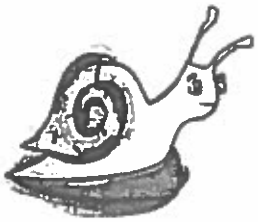
_____

Bird Beak Experiment with "Shellfish or Small Animals"

Number of Shellfish

0

Strong Jaw (Clothespin)	Long Pointed Beak (Forceps)	Scoop Beak (Spoon)
Number "caught"	Number "caught"	Number "caught"



Shellfish or
Small Animals
(Nuts)

After your investigation, which kind of bird beaks do you think would most likely be able to eat shellfish or small animals?

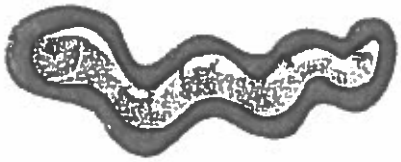
_____

Bird Beak Experiment with "Worms"

Number of Worms

0

Strong Jaw (Clothespin)	Long Pointed Beak (Forceps)	Scoop Beak (Spoon)
Number "caught"	Number "caught"	Number "caught"



Worms
(Gummy Worms)

After your investigation, which kind of bird beaks would most likely be able to eat caterpillars and/or worms?

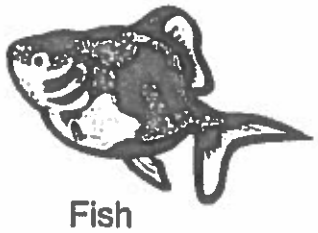
_____

Bird Beak Experiment with "Fish"

Number of Fish

0

Strong Jaw (Clothespin)	Long Pointed Beak (Forceps)	Scoop Beak (Spoon)
Number "caught"	Number "caught"	Number "caught"



Fish
(Swedish Fish)

After your investigation, which kind of bird beaks would most likely be able to eat fish?

_____