



The Birds and the Beaks

Lesson Overview

GRADE LEVEL: Grades 9-10

TIME ALLOTMENT: Two to three 45-minute class periods

OVERVIEW: The structure of an organism is related to its function and the role it plays in its environment. Many structural differences can be found within a species. These structural differences are often adaptations that allow organisms to better survive in their particular environment. These evolutionary adaptations develop through the process of natural selection.

This lesson explores different adaptations and variations in birds, using the NATURE episode “Extraordinary Birds.” It focuses on bird beaks, migratory patterns, and birds’ ability to co-exist with humans. Students will define key concepts from the lesson, discuss and explore different adaptations of birds, and analyze relationships between the concepts learned. This lesson can be taught independently, or it can be used as a precursor to the New York State Core Curriculum “Beaks of Finches” lab. Students must have a basic knowledge of evolution and natural selection in order to successfully complete this lesson.

SUBJECT MATTER: Biology/ Living Environment

LEARNING OBJECTIVES:

Students will be able to:

- Discuss and define key concepts from the lesson, including adaptation, migration, and interaction between humans and birds;
- Describe how particular characteristics of bird beaks reflect birds’ adaptations to their particular environments;
- Explain how different environmental factors can affect the migration cycle of the Rufous Hummingbird;
- Demonstrate understanding of how adaptations in different species of birds assist their interactions with humans;
- Create a concept map using different adaptive traits of birds.

STANDARDS AND CURRICULUM ALIGNMENT:

National Science Education Standards:

<http://www.nsta.org/publications/nses.aspx>

CONTENT STANDARD A: *Science Inquiry*

As a result of activities in grades 9-12 students should develop abilities necessary to do scientific inquiry and understand about scientific inquiry. To develop scientific inquiry



skills students must actively participate in scientific investigations and they must actually use the cognitive and manipulative skills associated with the formulation of scientific explanations.

CONTENT STANDARD C: *Life Science*

As a result of activities in grades 9-12 students should develop understandings of:

- Biological Evolution
- Interdependence of organisms
- Behavior of Organisms

Students' understanding of biology will expand by incorporating more abstract knowledge, such as the theories of evolution.

NEW YORK STATE CORE CURRICULUM ALIGNMENTS

Living Environment Core Curriculum:

<http://www.emsc.nysed.gov/ciai/mst/pub/livingen.pdf>

STANDARD 1: Students will use mathematical analysis, scientific inquiry, and engineering designs, as appropriate, to pose questions, seek answers, and develop solutions.

Key Idea 1: The central purpose of scientific inquiry is to develop explanations of natural phenomena in a continuing and creative process.

Performance Indicator 1.2: Hone ideas through reasoning, library research, and discussion with others, including experts.

1.2a. Inquiry involves asking questions and locating, interpreting, and processing information from a variety of sources.

Key Idea 3: The observations made while testing proposed explanations, when analyzed using conventional and invented methods, provide new insights into natural phenomena.

Performance Indicator 3.1: Use various methods of representing and organizing observations (e.g., diagrams, tables, charts, graphs, equations, matrices) and insightfully interpret the organized data.

3.1a Interpretation of data leads to development of additional hypotheses, the formulation of generalizations, or explanations of natural phenomena.

STANDARD 4: Students will understand and apply scientific principles and theories pertaining to the physical setting and living environment and recognize the historical development of ideas in science.



Key Idea 1: Living things are both similar to and different from each other and from nonliving things.

Key Idea 2: Organisms inherit genetic information in a variety of ways that result in continuity of structure and function between parents and offspring.

Key Idea 3: Individual organisms and species change over time.

Performance Indicator 3.1: Explain the mechanisms and patterns of evolution.

3.1g: Some characteristics give individuals an advantage over others in surviving and reproducing, and the advantaged offspring, in turn, are more likely than others to survive and reproduce. The proportion of individuals that have advantageous characteristics will increase.

3.1h: The variation of organisms within a species increases the likelihood that at least some members of the species will survive under changed environmental conditions.

3.1i: Behaviors have evolved through natural selection. The broad patterns of behavior exhibited by organisms are those that have resulted in greater reproductive success.

Key Idea 6: Plants and animals depend on each other and their physical environment

Performance Indicator 6.1: Explain factors that limit the growth of individual populations

6.1g: Relationships between organisms may be negative, neutral, or positive. Some organisms may interact with one another in several ways. They may be in a producer/consumer, predator/prey, or parasite/host relationship or one organism may cause disease in, scavenge, or decompose another.

MEDIA COMPONENTS

Video

NATURE, *Extraordinary Birds*, selected segments:

Clip 1, "A Variety of Hummingbirds."

Describes different traits and adaptations in various species of hummingbirds.

Clip 2, "Little Brain, Big Journey."

Shows the migratory patterns and habits of the Rufous hummingbird.



Clip 3, "The Pigeon Express."

Profiles a small business in which homing pigeons play a central role.

Clip 4, "Birds of Kundha Kulam."

Demonstrates birds' extraordinary impact on the agriculture of a small Indian community.

Access the streaming and downloadable video segments for this lesson at the Video Segments Page (<http://www.pbs.org/wnet/nature/lessons/the-birds-and-the-beaks/video-segments/1481/>).

WEB SITES

Bird Adaptations - Beaks

<http://www.vtaide.com/png/bird-adaptations3.htm>

An interactive Web site featuring the beaks of nine different species of birds, with descriptions of their characteristics and what they are best adapted for. It also includes a similar page for adaptations of birds' feet, and worksheets to assess student comprehension.

MATERIALS

For each student:

- Rufous Hummingbird Student Organizer
- Beak Characteristics Student Organizer
- Vocabulary Student Organizer
- Practice Regents Questions

For each pair or group of students:

- For the Gallery Walk Activity: one pen or marker (a different color for each group)
- For the Concept Map Activity: two flip chart pages or large sheets of paper, one pad of sticky notes, one pen or marker
- Computer with internet access

For the class:

- Computer with internet access, projector and screen



- For the Gallery Walk Activity: flip chart pages with the following vocabulary terms written at the top of the page (one word per page): variation, natural selection, adaptation, competition, environment
- Teacher Answer Key
- Sample Concept Map (<http://www-tc.pbs.org/wnet/wp-content/blogs.dir/3/files/2008/08/sample-concept-map.pdf>)
- Scenarios for Vocabulary Terms - 2 copies
- Hat or bag (to hold Vocabulary Term scenarios)
- Regents Questions Answer Key

PREP FOR TEACHERS

Prior to teaching this lesson, you will need to:

Preview all of the video clips and Web sites used in the lesson.

Download the video clips used in the lesson to your classroom computer, or prepare to watch them using your classroom's Internet connection.

Bookmark the Web sites used in the lesson on each computer in your classroom. Using a social bookmarking tool such as del.icio.us or diigo.com (or an online bookmarking utility such as portaportal.com) will allow you to organize all the links in a central location.

Prepare all classroom materials. Print out and make copies of the student organizers and answer keys. Prepare for the Gallery Walk activity by writing the following vocabulary terms at the top of flip chart pages or large pieces of paper (one term per page): Variation, Natural Selection, Adaptation, Competition, and Environment. Post the flip chart pages around the room. If you are not familiar with conducting a "Gallery Walk" in your classroom, review the procedure at the "How to Use Gallery Walk?" Web page (<http://serc.carleton.edu/introgeo/gallerywalk/how.html>).

For the Culminating Activity: Print two copies of the Scenarios for Vocabulary Terms sheet. Keep one sheet for teacher reference, and cut up the other sheet so that each scenario is on a separate slip of paper. Do not include the right-hand column (Vocab Key Code) on the cut-up slips. Put all the slips of paper into a hat or bag and mix well.

INTRODUCTORY ACTIVITY: SETTING THE STAGE

1. Ask your students to look around the room at the posted vocabulary terms. They should already be familiar with most or all of the terms. Ask students for brief working definitions of each term. As they develop the definitions, write them on the flip chart pages. (*Approximate definitions: Variation - differences between individuals; Natural Selection - differential survival and reproduction of organisms; Adaptation - a structure or behavior that helps an organism survive and reproduce in its environment; Competition -*



process by which organisms contend for limited resources; Environment -external conditions affecting the life and survival of an organism).

2. Give a "Vocabulary Student Organizer" to each student. Tell students they will now be watching a video clip about hummingbirds, which contains examples of these terms. Provide students with a FOCUS FOR MEDIA INTERACTION by asking them to write down any examples they see of the concepts presented in the vocabulary terms on the Vocabulary organizer. PLAY Clip 1, "A Variety of Hummingbirds." (Access the video segments for this lesson at the [Video Segments Page](http://www.pbs.org/wnet/nature/lessons/the-birds-and-the-beaks/video-segments/1481/), <http://www.pbs.org/wnet/nature/lessons/the-birds-and-the-beaks/video-segments/1481/>.) When the clip is finished, give students a few minutes to finish writing their responses on the organizer. If students are having a difficult time finding the examples, play the clip again.

3. Divide the class into groups for the Gallery Walk activity (about 4 students to a group, more if the class is larger). Assign one group to each of the five vocabulary words. Give the class 3-4 minutes to work in their groups, and discuss the examples they have found for their word. One member of each group should write one or two of the examples on their flip chart page. When the time is up, rotate the groups so that each group is now standing in front of a different word, and repeat the process. Rotate groups every 3-4 minutes until each group has had a chance to discuss and write examples for each vocabulary word. The activity should take approximately 20-25 minutes.

4. When the class has completed the activity, review the definitions and examples for each term with the whole class. Post all of the flip chart pages in one area of the classroom for students to reference throughout the lesson.

LEARNING ACTIVITY 1

1. Add a flip chart page with the word "migration" to the collection of vocabulary terms. Ask students for a brief working definition of "migration," and write it on the flip chart page (*migration is the periodic movement of organisms from one region to another*). If desired, take five minutes to review all of the terms before moving on.

2. Explain that migration is another survival technique used by birds and other organisms. Ask students for some reasons why birds might migrate. (*Possible responses: they are looking for warmer weather; searching for mates or resources; their environment has been altered or destroyed.*)

3. Tell your students that they are going to see a video clip about the migration habits of one specific bird, the Rufous Hummingbird. Give each student the "Rufous Hummingbird Student Organizer" and briefly review the questions it asks. Provide students with a FOCUS FOR MEDIA INTERACTION by asking them to find the information on the organizer as they watch the video clip. PLAY Clip 2, "Little Brains, Big Journey." (Access the video segments for this lesson at the Video Segments Page, <http://www.pbs.org/wnet/nature/lessons/the-birds-and-the-beaks/video-segments/1481/>.) Give the students a few minutes to record their findings on the student organizers, and REPLAY clip if needed to help students determine information they may have missed.



4. Ask students to share their answers with the class. Revisit the original question “Why do birds usually migrate?” and see if students have any additional or different answers. (*Answers may include: To find new or different food sources; unknown genetic reasons. Answers can also be found on the Teacher Answer Key.*)

LEARNING ACTIVITY 2

1. Tell students that they will now be exploring birds' adaptations in greater detail. Review the concept of adaptation with students. Ask the class why adaptation might be necessary and to name some factors to which organisms might need to adapt. (*Answers may include a change in weather or seasons, a change in the environment, the introduction of new species, a need for food or new food sources*)

2. Show the Bird Adaptations - Beaks interactive (<http://www.vtaide.com/png/bird-adaptations3.htm>) on a projection screen for the whole class to view. Distribute the “Beak Characteristics Student Organizer” to each student. Provide a FOCUS FOR MEDIA INTERACTION by asking students to look at the pictures on the Web site, and to write in the first column of the organizer their first thoughts or guesses as to what each kind of beak is used for. If they have any questions about the beaks, they should write them in the second column.

3. Take a few minutes to review what the students wrote in Column 1. If there were any questions in Column 2, have students read them aloud as you write the questions on the board or a piece of flip chart paper. Encourage students to consider these questions as the class moves on to the next part of the activity.

4. Use the mouse to roll over each individual picture pictures on the page. As you review the details of each bird's beak, ask students to compare the birds' adaptive traits and uses for their beaks to the guesses that they wrote on their organizers, and to try to find the answers to any questions they might have asked. Students should write their revised answers or any new information learned in the third column of the organizer. Review the revised answers as a class and address any remaining questions.

LEARNING ACTIVITY 3

1. Explain to students that as humans and birds have grown to co-exist in the same environments, they have adapted to each other. Ask students to think of ways that humans “use” birds, and how the natural adaptations of birds may assist people. Call on students to share answers with the class. (*Possible responses: food, using feathers for different purposes, as pets, catching pests and insects.*)

2. Tell students they will be watching two video clips of different types of bird/human interactions. Provide them with a FOCUS FOR MEDIA INTERACTION by asking the following questions (these can be written on the board or a flip chart page at the front of the class):

1. Have the humans had any effect on the birds' behavior?



2. Have the birds had any effect on the humans' behavior?

2. PLAY Clip 3, "The Pigeon Express". (Access the video segments for this lesson at the Video Segments Page, <http://www.pbs.org/wnet/nature/lessons/the-birds-and-the-beaks/video-segments/1481/>.) Give students a few minutes to finish writing their answers, and ask a few students to share their answers with the class. (1. *Humans have trained pigeons to learn specific routes, and have bred pigeons especially for homing.* 2. *Some humans have become specialists in breeding, keeping, and training homing pigeons. Scientists believe that homing pigeons possess a "solar compass" as well as geomagnetic sensors. They also rely heavily on scent. This enables them to deliver packages quickly and effectively.*)

3. PLAY Clip 4, "Birds of Kundha Kulam". (Access the video segments for this lesson at the Video Segments Page, <http://www.pbs.org/wnet/nature/lessons/the-birds-and-the-beaks/video-segments/1481/>.) Give students a few minutes to finish writing their answers, and ask a few students to share their answers with the class. (1. *None noted.* 2. *The birds' migratory patterns have adjusted to correspond to the seasonal rainfall patterns. People in the community perceive that the birds are responsible for bringing the rain, and they schedule their farming and harvesting around the birds' arrival.*)

3. Engage class in a compare/contrast discussion of the interactions in the two clips. Ask students if they can think of any natural adaptations or human interferences that might help or hinder these interactions in the future. (Possible answers: *change in climate may affect birds' migration in Kundha Kulam; pigeons could be selectively bred to be better at homing.*)

LEARNING ACTIVITY 4

1. Tell students that they will now be creating a Concept Map to represent what they have observed and to draw connections between birds' beaks and other adaptive qualities. If your students have not created concept maps before, review the process with them prior to starting the activity. Instructions for creating a Concept Map can be found here: <http://www.flcc.edu/biochem/toolbox/06ConceptMapping.doc>. Divide the class into pairs or groups of 3-4. Distribute a pad of sticky notes and a marker to each group.

2. Ask the pairs or groups to brainstorm all of the different concepts and terms introduced in the lesson: beak adaptations, beak types, vocabulary terms, adaptive traits, environmental factors, etc. Each one of these words, phrases, or concepts will go on a sticky note. Students may also draw pictures to represent concepts.

3. Students should begin organizing their concepts on a flip chart page or other large sheet of paper. The sticky notes will allow them to move and rearrange as desired. Students should use a pencil to draw connecting lines between each sticky note. Encourage students to discuss their answers and decisions, and to make as many connections as they can.



4. When students have arranged all of their sticky notes and connecting lines to their satisfaction, they should take a marker and permanently write down the terms and their linear connections on the flip chart page.

5. Each group should share their map with the class. Point out some of the differences and similarities between the maps (see Sample Concept Map as an example).

CULMINATING ACTIVITY

1. Make sure the six flip chart pages with the vocabulary terms and definitions are still posted in the room. If necessary, spread them out so that each page is posted in a different area of the room. Students should be comfortable with the concepts represented by the vocabulary terms by this point. Tell the students that just as the characteristics of birds are affected by these factors, so are the characteristics of most, if not all, living things.

2. Group the students into pairs or small groups. Take out the bag or hat containing all of the “Scenarios for Vocab Terms” - 2 copies of each. Have each student group draw one scenario. Tell the students to look at the scenarios they drew, and to decide to which vocabulary term it best applies.

3. Once the students have decided to which vocabulary terms their scenarios best apply, they should arrange themselves near the appropriate flip chart page. Give students two or three minutes to arrange themselves by a vocabulary term that applies to their scenario. Some of the scenarios are intentionally ambiguous, with more than one possible answer.

4. Ask the students to read their scenarios and to discuss their reasoning for choosing the vocabulary term they did. Ask students who were undecided why they were having difficulty with their scenario, and how it could apply to more than one of the vocabulary terms. Encourage students to debate and discuss how different concepts could apply to different scenarios. Repeat steps 2-4 until all the scenario slips have been chosen and discussed.

5. For a homework assignment, ask students to research the phenomenon represented in one of the scenarios, and to write a one-page paper explaining how or why it occurs.

6. Distribute the Living Environment Regents Questions to students to assess learning related to this topic. Discuss the students’ answers, referring to the Regents Questions Answer Key for suggested responses.

CROSS-CURRICULAR EXTENSIONS

Language Arts: Ask students to write a short story or a poem in the voice of a resident of Kundha Kulam. They should express their views or feelings about the yearly appearance of the birds. Why does it happen? How can the birds “bring rain”?

Social Studies: Ask students to research the history of homing pigeons in the military.



Art: Ask students to create drawings of different bird beaks that might suit particular environments around the world.

COMMUNITY CONNECTIONS

Ask an avian specialist to come in and speak to the class about bird adaptations and bird/human interactions.

Students can research local organizations committed to the protection and preservation of birds, and volunteer in their initiatives.

Visit a local park or zoo and observe birds. Note features that are particularly helpful to the birds in their particular environments.



NAME: _____

DATE: _____

Rufous Hummingbird Organizer

As you watch the video clip, answer the following questions.

1. Describe the migration route of the Rufous Hummingbird: _____

1a. How far do the birds travel?

2. Why is the Rufous like a GPS system?

3. What information is used to track the Rufous Hummingbirds? _____

4. How do young birds know the migration route? _____

4a. What adaptations to the trip do they make?

5. How does Dr. Calder plan to gather more information about the Rufous Hummingbirds?



NAME: _____

DATE: _____



NAME: _____

DATE: _____

Beak Characteristics Student Organizer

	First Thoughts	Questions	Revised Answers
1. Brown Creeper			
2. Eagle			
3. Curlew			
4. Spoonbill			
5. Flamingo			
6. Skimmer			
7. Hummingbird			
8. Heron			
9. Woodpecker			
10. Cardinal			
11. Duck			
12. Pelican			



NAME: _____

DATE: _____

Vocabulary Organizer

As you watch the video, write down examples of the following concepts:

Adaptation:

Competition:

Environment:

Natural Selection:

Variation:



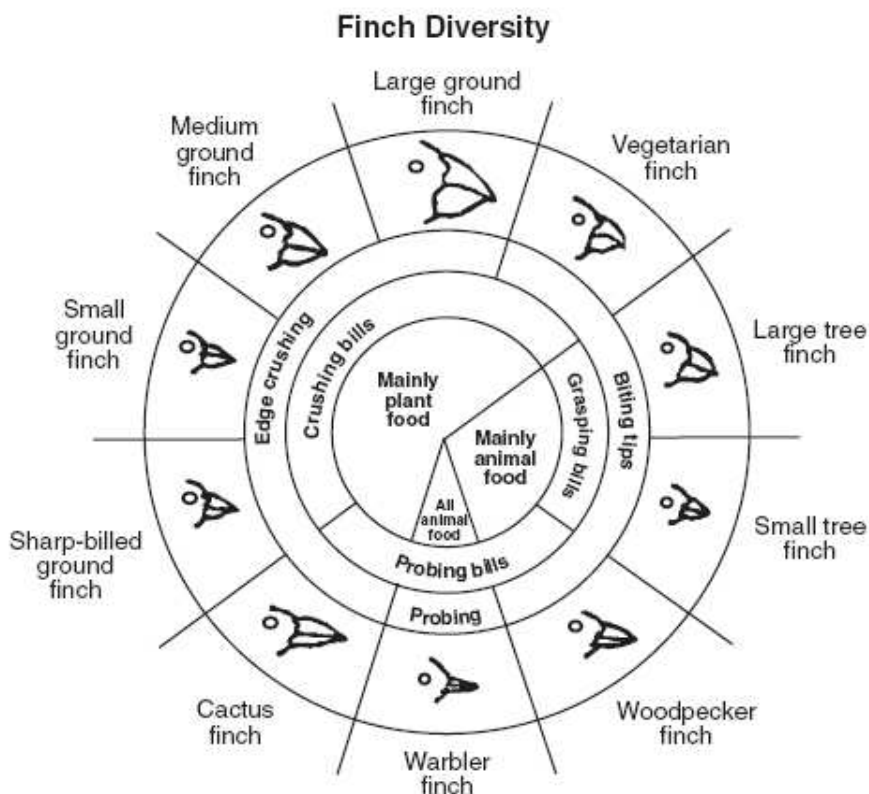
NAME: _____

DATE: _____

Living Environment Regents Exam Questions

Base your answers to questions 68 and 69 on the finch diversity chart below, which contains information concerning the finches found on the Galapagos Islands.

For Teacher Use Only



- 68 Identify *one* bird that would most likely compete for food with the large tree finch. Support your answer. [1]

68

☐

- 69 Identify *one* trait, other than beak characteristics, that would contribute to the survival of a finch species and state *one* way this trait contributes to the success of this species. [2]

69

☐



NAME: _____

DATE: _____

Base your answers to questions 72 and 73 on the information below and on your knowledge of biology.

In birds, the ability to crush and eat seeds is related to the size, shape, and thickness of the beak. Birds with larger, thicker beaks are better adapted to crush and open seeds that are larger.

One species of bird found in the Galapagos Islands is the medium ground finch. It is easier for most of the medium ground finches to pick up and crack open smaller seeds rather than larger seeds. When food is scarce, some of the birds have been observed eating larger seeds.

- 72 Describe *one* change in beak characteristics that would most likely occur in the medium ground finch population after many generations when an environmental change results in a permanent shortage of small seeds. [1]

72

☐

- 73 Explain this long-term change in beak characteristics using the concepts of:

- competition [1]
- survival of the fittest [1]
- inheritance [1]

73

☐

**For Teacher
Use Only**



NAME: _____

DATE: _____

Teacher Answer Key

Vocabulary Organizer Answer Key

Adaptation: *Hummingbirds developed wings and an ability to hover in order to eat nectar from flowers*

Competition: *Birds with differently colored feathers compete to protect their territory*

Environment: *The only food source for the birds was the nectar in flowers, causing them to evolve to suit that food source.*

Natural Selection: *Hummingbirds became smaller and smaller so they could move faster*

Variation: *In the same species, different bills developed for different types of flowers*

Rufous Hummingbird Organizer Answer Key

1. Describe the migration route of the Rufous Hummingbird:

Begins in coastal Alaska, south to the Rockies and to the mountains of Mexico for the winter. In the spring they go back through Western California and to Southwest Canada for the summer.

1a. How far do the birds travel?

Over 5,000 miles round trip.

2. Why is the Rufous like a GPS system?

Accurate navigation abilities, storing lots of information about the route, always come back to the same place.

3. What information is used to track the Rufous Hummingbirds?

Gender, size/weight, and feather color.

4. How do young birds know the migration route?

It is genetically programmed.

4a. What adaptations to the trip do they make?

They will adjust their trip for late blooming flowers or for yearly variations in their food supply.

5. How does Dr. Calder plan to gather more information about the Rufous Hummingbirds?

Using new technology, he plans to gather more genetic information from feather and tissue samples.



NAME: _____

DATE: _____

Beak Characteristics Organizer *Answer Key*

	First Thoughts	Questions	Revised Answers
1. Brown Creeper	<i>(Answers will vary)</i>	<i>(Answers will vary)</i>	<i>To probe under bark for insects</i>
2. Eagle			<i>Tearing flesh</i>
3. Curlew			<i>Probing shoreline for food trapped in sediments</i>
4. Spoonbill			<i>Shoveling through shallow waters for food</i>
5. Flamingo			<i>Separating mud and silt to find food</i>
6. Skimmer			<i>Lower jaw scoops fish from water</i>
7. Hummingbird			<i>Beak is used like a straw in flowers</i>
8. Heron			<i>Spearing fish in the water</i>
9. Woodpecker			<i>Drill into tree bark for insects</i>
10. Cardinal			<i>Nut cracker</i>
11. Duck			<i>Used as a sieve to catch fish and drain water</i>
12. Pelican			<i>Pouch for holding fish caught underwater</i>



NAME: _____

DATE: _____

Living Environment Regents Exam Questions - Answer Key

From August 2006 Living Environment Regents exam:

- 68 Allow 1 credit for identifying *one* bird that would most likely compete for food with the large tree finch and supporting the answer. Acceptable responses include, but are not limited to:
- Woodpecker finch: they use the same food resources
 - Small tree finch: both eat mainly animal food
- 69 Allow a maximum of 2 credits, 1 credit for identifying *one* trait, other than beak characteristics, that would contribute to the survival of a finch species and 1 credit for stating *one* way this trait contributes to the success of this species.

Examples of 2-credit responses:

- Faster *or* more aggressive birds get to seeds faster.
- Larger *or* stronger birds compete successfully.
- Coordination helps an individual avoid predators.

From January 2007 Living Environment Regents Exam:

- 72 Allow 1 credit for describing *one* change in beak characteristics that would most likely occur in the medium ground finch population after many generations when an environmental change results in a permanent shortage of small seeds. Acceptable responses include, but are not limited to:
- Beaks would be thicker.
 - Birds with larger, thicker beaks would become more common in the population than those with the original beak characteristics.
- 73 Allow a maximum of 3 credits for explaining the long-term change in beak characteristics, allocated as follows:
- Allow 1 credit for including the concept of competition.
 - Allow 1 credit for including the concept of survival of the fittest.
 - Allow 1 credit for including the concept of inheritance.

Example of a 3-credit response:

Competition for food would increase as small seeds became scarce. Birds with larger, thicker beaks would have a better chance of surviving when the seeds were larger and tougher to crack. Birds with normal thickness beaks would be less likely to survive. Reproduction of the surviving birds, many with the larger, thicker beaks, would produce more offspring inheriting the better adapted beak type. Over time, this would lead to a large proportion of the population having the thicker beaks.



NAME: _____

DATE: _____

SCENARIO CHART FOR VOCABULARY TERMS

Instructions: Print two copies of this chart. Keep one for teacher reference. Cut up the other copy so that each scenario is on a separate slip of paper (do NOT include the Vocab Key Code on these slips). Place all scenario slips into a hat or bag and mix well.

A=Adaptation NS=Natural Selection C=Competition
E=Environment

V=Variation

SCENARIO	Vocab Key Code
Sea otters use rocks to dislodge prey and open shells. In doing so the sea otter is one of the only mammals, besides humans, to use tools.	A
The arctic fox lives in the northernmost areas of the planet, and its thick fur and good supply of body fat protect it from the extreme cold temperatures.	A
A chameleon moves from a brown branch to a green leaf. Within a short period of time, the chameleon's skin color changes from brown to green.	A
A Bactrian camel is in the middle of a desert sandstorm. It closes off its eyes with its long eyelashes, covers its ears, and pinches its nostrils shut to prevent sand from getting inside.	A
A person with sickle-cell anemia appears to be at a survival disadvantage because of the consequences of the disease. However, in areas of the world highly affected by malaria epidemics, more people carry the gene associated with sickle-cell anemia. In these regions the sickle trait is advantageous, since it also provides resistance to malaria.	NS
There are two trees growing side by side in a forest. One tree grows very tall, and absorbs a great deal of sunlight. The other tree grows shorter, in the shadow of the taller tree, and does not get as much sunlight. The first tree continues to grow and reproduce, while the second atrophies and does not distribute seeds due to its lack of resources.	NS



NAME: _____

DATE: _____

When Charles Darwin visited the Galapagos Islands, he found that each island was home to a different type of finch , each with a beak uniquely suited to eat the food on its particular island.	NS, A, V
Traditional “staph” infections are frequently cured with broad-spectrum antibiotics, including a drug called methicillin. In recent years, a strain of staph bacteria has emerged with a natural resistance to methicillin, and it can stand up to all but the most powerful antibiotics.	NS
Most mammals lose the ability to digest milk/lactose as they grow older. In human cultures where cows, sheep, and goats are milked for food, humans developed genes for lifelong lactose tolerance .	NS, A
The peppered moth comes in two varieties - a light-colored form and a dark-colored form. In England prior to the Industrial Revolution, there were many more light-colored moths than dark ones in the population. By the late 1800s, pollution from factories had deposited dark soot over England's trees and shrubs. It was found that the percentage of dark-colored moths in the Peppered Moth population had increased to 98%.	NS, E, V
A particular plant is growing in a dense swamp habitat . Over the course of many generations, a genetic mutation occurs which makes the roots of the plant less susceptible to rotting. As a result, the descendents of that plant flourish in the wet, swampy environment and breed more, while plants with the original genetic makeup are less successful in the environment.	NS, V
Cheetahs and lions feed on similar prey; sometimes lions will steal prey items killed by the cheetahs. A cheetah on the eastern plains of Africa kills a gazelle for food. Before the cheetah can feed on its prey, a pride of lions comes in and eats the gazelle.	C
One particular grasshopper in a field eats an unusually large amount of grass. As a result, all of the other grasshoppers in the field are deprived of food.	C



NAME: _____

DATE: _____

In the 17 th century, Dutch explorers landed on the island of Mauritius and encountered a new species – the Dodo bird . The colonists proceeded to damage the Dodo's habitat, introduce new species that ate the birds' eggs and young, and overhunted the Dodo population. Within less than a century, the Dodo was extinct.	C
17 th century sailors introduced goats to isolated islands. The goats thrived in the new locations and overgrazed many of the islands. As a result, many of the indigenous island species could not get access to the resources they were used to and became extinct.	C
At the end of the summer, the Monarch butterfly leaves its home in the Canadian Rockies and flies southward. About two months into the journey, the butterflies mate and a new generation is born. This generation of Monarchs continues south to Mexico. In the spring, yet another generation of Monarchs is born and makes the journey all the way back to Canada.	M
The Kung bushmen of the Kalahari Desert rely on hunting big game animals for food. When the animals travel to find new sources of food and water, so does the Kung population.	M
A swarm of locusts forms on the coast. They proceed to grow and multiply, and consume all of the available food in the area. The whole swarm leaves and flies to the Arabian Peninsula, in search of more food.	M
An Arctic Tern lives in a colony near the North Pole during the northern summer months. When winter comes, it flies all the way to Antarctica for the southern summer months, and returns to its colony once again for northern summer. This cycle continues for the bird's entire lifespan.	M
There is a set of identical twins that you know, Janie and Joanie. Janie exercises every day; Joanie does not. As a result, Janie is in much better physical shape than Joanie.	V
In one particular family, the mother's blood type is AB, the father's blood type is O, and the children's blood types are A and B.	V



NAME: _____

DATE: _____

There are many different breeds of pedigree dogs . Some examples are: Dachshund, Lhasa Apso, Rottweiler, Yorkshire Terrier, and Poodle.	V
A person is born with the genes that will allow him to be at least 6' when he grows up. However, due to food and water shortages in his area he is malnourished in his childhood, and as an adult only reaches a height of 5'4".	V, E
All bats fly, but do so in different ways to suit different purposes. Bats that feed on ground insects or vegetation fly more slowly and have short, small wings; bats that feed on flying insects fly faster, but still need a degree of maneuverability, and have medium wings; bats that need to fly primarily with speed and endurance have long, thin wings.	V, A
The North American newt is born in the water, but as it grows it begins to live on the land. Once the newt reaches full adulthood, it returns to the water to live out the rest of its life. Conversely, the European newt stays on land once it has gone through its metamorphosis, rarely returning to the water.	V
Bromeliads are plants composed of a spiral arrangement of leaves. There are several species of frog that make their homes in the water pools that collect between the leaves of the bromeliad. These frogs may spend their entire lives in the bromeliad pools.	E, A
The growing season in the Arctic is short, due to the extreme cold and weather conditions. Plants in the Arctic tend to have smaller leaves, and grow close to the ground, to conserve water and prevent wind damage.	E, A
Large areas of the rainforest are being destroyed for commercial purposes. When this happens, many of the species that live in the rainforest are displaced or driven to extinction.	E
Lichens are common organisms that are composed of both fungus and algae. Lichens can be indicators of air quality in a region, as they are very sensitive to sulfur dioxide and are rarely found in urban areas or near roads.	E



NAME: _____

DATE: _____

A human family has lived in Denver, CO all of their lives. When they move to New York City, they learn that the number of red blood cells in their body is much higher than their neighbors.

E