

# Sample Performance Assessment Tasks for the New Jersey Biology Competency Test

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## Sample Performance Assessment Tasks for the NJ Biology Competency Test

Starting in May 2011, New Jersey high school biology students will have to take the Biology Competency Test. A component of this test will be the Performance Assessment Tasks. Following are five **sample** performance tasks, each of which corresponds to a unit in Amsco's review book *Preparing for the New Jersey Biology Competency Test*, by Rick Hallman. Below are the scoring rubrics.

### General Rubric: Scoring Guide for Open-Response Items

Open-response questions require students to generate, rather than just recognize, a correct response. Responses to open-response questions are scored using a scoring guide, or rubric, for each question. The scoring guides indicate what knowledge and skills students must demonstrate to earn 1, 2, 3, or 4 points. Answers to the open-response questions are not scored for spelling, punctuation, or grammar.

#### **4-Point Response**

The response demonstrates a thorough understanding of the concept, and clearly and correctly provides the information that is being asked.

#### **3-Point Response**

The response demonstrates a general understanding of the concept.

#### **2-Point Response**

The response demonstrates a limited understanding of the concept

#### **1-Point Response**

The response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured.

## Unit I: Scientific and Laboratory Procedures

### Performance Task 1 – How the Garden Grows

A student named Anne had a garden. She wanted to find out what conditions would be best for growing her favorite plants. Anne bought ten clay pots and decided to perform an **experiment**<sup>1</sup> in which she would test what type of **substrate**<sup>2</sup> was best for plant growth.

To carry out her experiment, Anne placed five plants in pots filled with **sand**<sup>3</sup> and five plants in pots filled with **soil**.<sup>4</sup> All ten plants were of the same type, given equal amounts of water, and exposed to equal amounts of sunlight. The experiment lasted for two weeks.



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<sup>1</sup> experiment – an operation carried out under controlled conditions in order to discover an unknown effect or law, to test or establish a hypothesis, or to illustrate a known law

<sup>2</sup> substrate – the base on which an organism lives, such as soil

<sup>3</sup> sand – a loose granular material that results from the disintegration of rocks; consists of particles smaller than gravel but coarser than silt

<sup>4</sup> soil – the upper layer of earth that may be dug or plowed and in which plants grow

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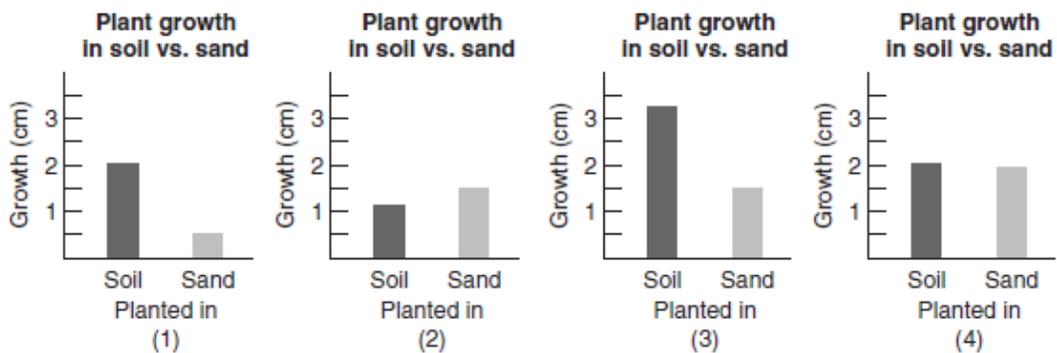
The table below shows the growth (that is, increase in height) of each of Anne’s plants. Answer the following questions based on the information in the table.

**Growth of Plants in Sand and in Soil**

Plants in Soil	Increase in Height (Centimeters)	Plants in Sand	Increase in Height (Centimeters)
1	2.0	1	0.5
2	1.9	2	0.6
3	2.2	3	0.4
4	2.1	4	0.7
5	1.9	5	0.6

**Your task:**

- Using evidence from the table, state **ONE** conclusion about plant growth that you can draw from this experiment.
- Given your conclusion, discuss **ONE** reason why Anne’s experiment would have these results.
- Which bar graph correctly represents the averaged results of this experiment? Explain how you arrived at your conclusion.



**How the Garden Grows**  
**Scoring Rubric**

<b>4 POINTS</b>	<b>3 POINTS</b>	<b>2 POINTS</b>	<b>1 POINT</b>
<ul style="list-style-type: none"> <li>• Thoroughly explains correct conclusion about plant growth in soil versus in sand.</li>   <li>• Uses extensive data from table to explain why plants would grow better in soil than in sand.</li>   <li>• Without any misconceptions, explains choice of correct bar graph and how that decision was made by averaging results of experiment.</li> </ul>	<ul style="list-style-type: none"> <li>• Explains correct conclusion about plant growth in soil versus in sand.</li>   <li>• Uses some data from table to explain why plants would grow better in soil than in sand.</li>   <li>• Explains choice of correct bar graph and how that decision was made by averaging results of experiment.</li> </ul>	<ul style="list-style-type: none"> <li>• States, but does not explain, one conclusion about plant growth in soil versus in sand.</li>   <li>• Does not use data from table, but does explain why plants would grow better in soil than in sand.</li>   <li>• Chooses correct bar graph but does not explain how that decision was made by averaging results of experiment.</li> </ul>	<ul style="list-style-type: none"> <li>• Does not state or explain correct conclusion about plant growth in soil versus in sand.</li>   <li>• Says plants would grow better in soil than in sand, but does not explain.</li>   <li>• Does not choose correct bar graph and does not explain how that decision was made.</li> </ul>

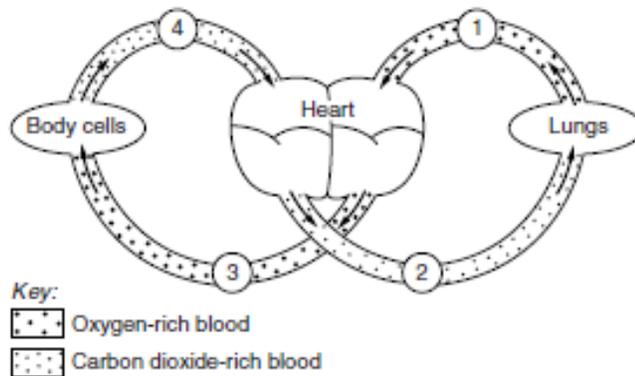
## Unit II: Matter, Energy, and Organization of Living Things

### Performance Task 2 – How the Blood Circulates

The diagram below is a schematic representation of the **circulatory system**.<sup>1</sup> In other words, it is not meant to be a realistic drawing of body parts, but only to show the basic scheme of the system — the relationships among its parts and the sequence of events that occur in the system.

The circulation of blood is vital to the process of **respiration**,<sup>2</sup> since the blood carries fresh oxygen to the cells of the body and returns carbon dioxide to the lungs to be expelled.

As you have learned, **arteries**<sup>3</sup> are the blood vessels that carry blood away from the heart. Which blood vessels in the diagram are arteries? The arrows indicate that blood vessels 2 and 3 carry blood away from the heart, so they are arteries. Blood vessels 1 and 4, which return blood to the heart, are **veins**.<sup>4</sup> Study the diagram below and then answer the questions that follow.



<sup>1</sup> circulatory system – responsible for the movement of blood through the blood vessels of an animal

<sup>2</sup> respiration – the process of supplying the cells and tissues with oxygen and ridding them of carbon dioxide

<sup>3</sup> arteries – the blood vessels that carry blood away from the heart

<sup>4</sup> veins – the blood vessels that carry blood toward the heart

**Your task:**

1. Refer to the diagram. Blood that is rich in oxygen is found in which two of the numbered blood vessels? State **ONE** purpose of this blood in the body.
2. Compared with blood vessel 1, is there more or less carbon dioxide in blood vessel 2? Explain why your answer would be true.
3. Based on the diagram, which of the following statements is true? Give **ONE** reason for this fact.
  - a. All arteries carry oxygen-rich blood.
  - b. All veins carry oxygen-rich blood.
  - c. Arteries from the heart to the lungs carry oxygen-rich blood.
  - d. Veins from the lungs to the heart carry oxygen-rich blood.

**How the Blood Circulates**  
**Scoring Rubric**

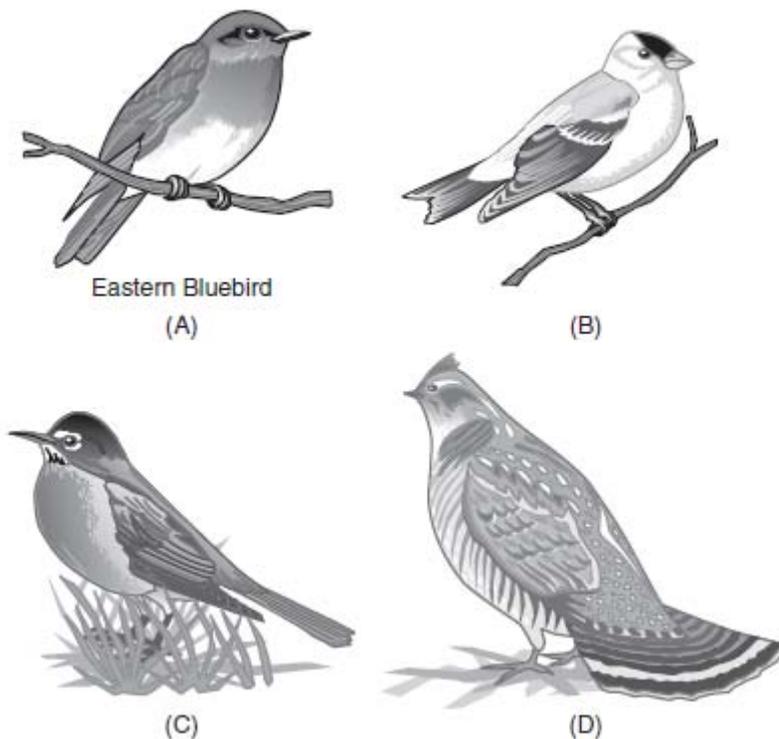
<b>4 POINTS</b>	<b>3 POINTS</b>	<b>2 POINTS</b>	<b>1 POINT</b>
<ul style="list-style-type: none"> <li>• Correctly identifies both oxygen-rich blood vessels and states their purpose in the body.</li> <li>• Correctly identifies that blood vessel 2 has more carbon dioxide than blood vessel 1 and explains why this is true.</li> <li>• Without any misconceptions, states correct answer choice and explains why veins from the lungs carry oxygen-rich blood to the heart.</li> </ul>	<ul style="list-style-type: none"> <li>• Correctly identifies one of the oxygen-rich blood vessels and states its purpose in the body.</li> <li>• Correctly identifies that blood vessel 2 has more carbon dioxide than blood vessel 1 but does not explain why this is true.</li> <li>• Without any misconceptions, states correct answer choice and states only that veins from the lungs carry oxygen-rich blood to the heart.</li> </ul>	<ul style="list-style-type: none"> <li>• Either correctly identifies one of the oxygen-rich blood vessels <i>or</i> states their purpose in the body.</li> <li>• Incorrectly identifies that blood vessel 1 has more carbon dioxide than blood vessel 2, but does correctly explain what should be true.</li> <li>• Chooses an incorrect answer choice but does state that veins from the lungs carry blood to the heart.</li> </ul>	<ul style="list-style-type: none"> <li>• Correctly identifies one of the oxygen-rich blood vessels but does not state its purpose in the body.</li> <li>• Does not identify either blood vessel as carrying carbon dioxide; gives partially correct answer of why one vessel should carry more than the other.</li> <li>• Chooses an incorrect answer choice and states only that arteries and/or veins both carry blood.</li> </ul>

## Unit III: Diversity and Biological Evolution

### Performance Task 3 – How to Classify Bird Species

A class of biology students was studying the traits of different North American birds. They wanted to see if they could determine how closely related the different birds are based on their biological **classification**<sup>1</sup> and physical characteristics. Now you will attempt the same task based on the information and diagrams presented here.

The state bird of New Jersey is the American goldfinch. It is in the **class**<sup>2</sup> Aves (as are all other living birds), order Passeriformes, family ploceidae, **genus**<sup>3</sup> *Carduelis*, and **species**<sup>4</sup> *tristis*. The state bird of New York is the Eastern bluebird (see figure). It is in the order Passeriformes, family turdidae, genus *Sialia*, and species *sialis*. The state bird of Connecticut is the American robin. It is in the order Passeriformes, family turdidae, genus *Turdus*, and species *migratorius*. The state bird of Pennsylvania is the ruffed grouse. It is in the order Galliformes, family tetraonidae, genus *Bonasa*, and species *umbellus*.



<sup>1</sup> classification – the grouping and naming of organisms according to their evolutionary relationships and shared characteristics

<sup>2</sup> class – a major category in biological taxonomy ranking above the order and below the phylum

<sup>3</sup> genus – a group that has one or more closely related, different species classified within it

<sup>4</sup> species – a group of similar organisms that can breed and produce fertile offspring

Sample Performance Assessment Tasks for the NJ Biology Competency Test

Classification	American Goldfinch (NJ)	Eastern Bluebird (NY)	American Robin (CT)	Ruffed Grouse (PA)
Kingdom				
Phylum				
Class				
Order				
Family				
Genus				
Species				

**Your task:**

1. Copy the bird classification table onto a separate sheet of paper. Based on the data given, and your knowledge of biology, fill in the complete classification for each of the four state birds listed.
2. Which two birds are the most closely related? Give **ONE** reason for your answer.
3. Based on the information given, predict which bird would *least* resemble the other three. Explain your answer, stating **ONE** scientific fact given about the birds.
4. Look at the pictures of the four state birds. The Eastern bluebird is identified for you. Based on the classifications given and the similarities in their overall body shapes and beak shapes, identify the remaining three birds.

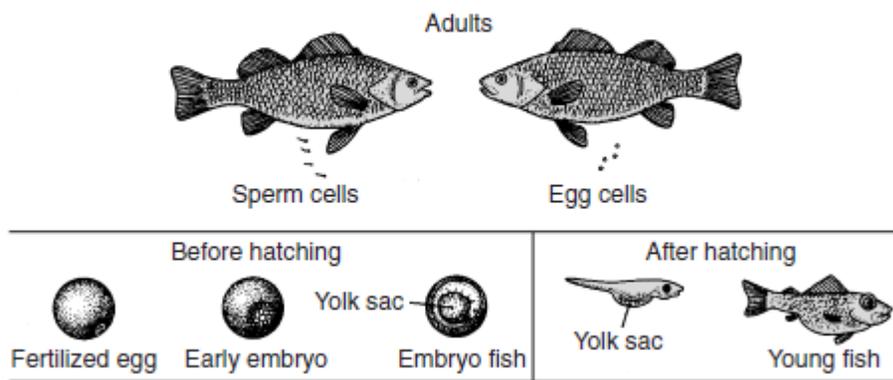
**How to Classify Bird Species**  
**Scoring Rubric**

<b>4 POINTS</b>	<b>3 POINTS</b>	<b>2 POINTS</b>	<b>1 POINT</b>
<ul style="list-style-type: none"> <li>• Correctly fills in all information about the four birds, leaving no empty spaces.</li> <li>• Correctly identifies the two birds that are most closely related and gives one correct reason for the choice.</li> <li>• Correctly predicts which bird would least resemble the other three and states one correct fact to justify answer.</li> <li>• Based on the classifications and physical characteristics, correctly identifies all three of the remaining birds in the chart.</li> </ul>	<ul style="list-style-type: none"> <li>• Correctly fills in all information about three of the four birds, or correctly fills in most of the information for all four birds.</li> <li>• Correctly identifies the two birds that are most closely related but gives incorrect reason for the choice.</li> <li>• Correctly predicts which bird would least resemble the other three but states incorrect fact to try to justify answer.</li> <li>• Based on the classifications and physical characteristics, correctly identifies two of the remaining three birds.</li> </ul>	<ul style="list-style-type: none"> <li>• Correctly fills in all information about two of the four birds, or correctly fills in some of the information for all four birds.</li> <li>• Correctly identifies the two birds that are most closely related but gives no reason for the choice.</li> <li>• Correctly predicts which bird would least resemble the other three but gives no fact to try to justify answer.</li> <li>• Based on the classifications and physical characteristics, correctly identifies one of the remaining three birds.</li> </ul>	<ul style="list-style-type: none"> <li>• Correctly fills in all information about one of the four birds, or correctly fills in only genus and species for all four birds.</li> <li>• Does not identify the two birds that are most closely related and gives an incorrect reason for the choice.</li> <li>• Does not predict which bird would least resemble the other three and gives either no, or an incorrect, fact for answer.</li> <li>• Based on the classifications and physical characteristics, lists but does not identify any of the remaining three birds.</li> </ul>

Unit IV: Reproduction and Heredity

Performance Task 4 – How Animals Reproduce and Develop

Most animals reproduce by the process of **sexual reproduction**.<sup>1</sup> In sexual reproduction, sperm from the male joins with an egg from the female. This process, called **fertilization**,<sup>2</sup> may take place either inside the female’s body (*internal fertilization*) or outside the female’s body (*external fertilization*).



After the egg is fertilized, it develops into an **embryo**.<sup>3</sup> The process of **development**<sup>4</sup> may also take place either inside the female (*internal development*) or outside the female (*external development*). For example, a chicken lays an egg, which is already fertilized. The chicken then sits on the egg to keep it warm as the embryo in the egg develops. Thus, chickens have internal fertilization and external development.

The table on the next page shows some different animals, their classes and **habitats**,<sup>5</sup> and the types of fertilization and development they undergo. Study the table and then answer the questions that follow it.

<sup>1</sup> sexual reproduction – the process that requires two parents (a male and a female) to produce offspring

<sup>2</sup> fertilization – the process by which the nuclei of an egg cell and a sperm cell unite to form a zygote

<sup>3</sup> embryo – an organism in an early stage of development before it is born, hatched, or germinated

<sup>4</sup> development – the changes in an organism that occur from fertilization until death

<sup>5</sup> habitat – the place in which an organism lives; a specific environment and its community

## Sample Performance Assessment Tasks for the NJ Biology Competency Test

Animal	Class	Habitat	Fertilization	Development
Goldfish	Bony Fishes	Water	External	External
Bluebird	Birds	Land	Internal	External
Bee	Insects	Land	Internal	External
Dog	Mammals	Land	Internal	Internal
Frog	Amphibians	Water and land	External	External
Lizard	Reptiles	Land	Internal	External
Whale	Mammals	Water	Internal	Internal

### **Your task:**

1. Based on the information in the table, identify **ONE** environmental requirement for external fertilization. Explain.
2. Based on the information in the table, identify **ONE** physical requirement for internal development. Explain.
3. The salamander belongs to the class of Amphibians. Based on that fact, what would you expect to be the habitat of salamanders?
4. Alligators have internal fertilization and external development. Based on that fact and the data in the table, what class do you think they belong to?
5. Based on the data in the table, what **TWO** generalizations can you make about the class of mammals?

**How Animals Reproduce and Develop**  
**Scoring Rubric**

<b>4 POINTS</b>	<b>3 POINTS</b>	<b>2 POINTS</b>	<b>1 POINT</b>
<ul style="list-style-type: none"> <li>• Correctly, and without any misconceptions, identifies and explains one requirement for external fertilization.</li> <li>• Correctly, and without any misconceptions, identifies and explains one requirement for internal development.</li> <li>• Correctly identifies, and explains, the habitat of salamanders.</li> <li>• Correctly, and without any misconceptions, identifies and explains the class alligators belong to.</li> <li>• Correctly identifies and explains two generalizations about mammals.</li> </ul>	<ul style="list-style-type: none"> <li>• Correctly, but without any explanation, identifies one requirement for external fertilization.</li> <li>• Correctly, but without any explanation, identifies one requirement for internal development.</li> <li>• Correctly identifies, but does not explain, the habitat of salamanders.</li> <li>• Correctly identifies, but does not explain, the class that alligators belong to.</li> <li>• Correctly identifies two generalizations about mammals but without any explanation.</li> </ul>	<ul style="list-style-type: none"> <li>• Correctly, but with some misconceptions, identifies one requirement for external fertilization.</li> <li>• Correctly, but with some misconceptions, identifies one requirement for internal development.</li> <li>• Correctly identifies, but with some misconceptions, the habitat of salamanders.</li> <li>• Correctly, but with some misconceptions, identifies the class alligators belong to.</li> <li>• Correctly identifies and explains one generalization about mammals.</li> </ul>	<ul style="list-style-type: none"> <li>• Tries but does not correctly identify a requirement for external fertilization.</li> <li>• Tries but does not correctly identify a requirement for internal development.</li> <li>• Correctly identifies only part of the habitat of salamanders.</li> <li>• Does not correctly identify the class that alligators belong to.</li> <li>• Correctly identifies one generalization about mammals but without any explanation.</li> </ul>

## Unit V: Environmental Systems and Interactions

### Performance Task 5 – How to Know Which Birds Migrate

Jon is a biology student who lives in New Jersey. He is also an avid bird-watcher. Over the past year, he has noticed that some birds seem to stay in his neighborhood all year, while others are there only at certain times of the year, that is, mainly in the spring. Along with a local **ornithology**<sup>1</sup> professor, Jon has decided to do a study of the birds that are seen in his area. He has observed and recorded the following information.

In the United States, some birds undertake a **migration**,<sup>2</sup> while others do not. Our migrating birds fly south in the winter and north in the summer. Their movements appear to be **seasonal**.<sup>3</sup> The table below lists several bird **species**;<sup>4</sup> their sizes; their diets; and the time of the year when they are most likely to be in New Jersey.

Your task is to answer the following questions based on the information in the table.



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<sup>1</sup>ornithology – the branch of zoology (animal studies) that deals with birds

<sup>2</sup>migration – a social behavior in which groups of animals travel long distances together to feed and breed

<sup>3</sup>seasonal – of, relating to, or varying in occurrence according to the season

<sup>4</sup>species – a group of similar organisms that can breed and produce fertile offspring

Sample Performance Assessment Tasks for the NJ Biology Competency Test

Bird Species	Length (cm)	Main Diet	When Seen in NJ
Yellow-billed cuckoo	305	Caterpillars	Summer
Blue jay	305	Acorns, corn, berries, seeds, insects	All year
Eastern kingbird	203	Flying insects	Summer
Golden-crowned kinglet	102	Insects and insect eggs	Winter
Bay-breasted warbler	152	Insects and berries	May and October (during migration)
Cardinal	203	Insects, fruit, seeds, corn, oats, rice	All year

**Your task:**

- Which **TWO** bird species probably spend the whole summer north of New Jersey?
- Based on the table, identify **ONE** characteristic of the birds that do not migrate. Explain how you know this.
- Based on the data in the table, if the bay-breasted warbler spends its winter in South America, where would it most likely spend its summer? Explain.
  - Mexico
  - Florida
  - Canada
  - New Jersey
- Jon noticed that some people put out sunflower seeds to feed the birds. The seeds most likely attracted which **TWO** species? Explain how you know this.

**How to Know Which Birds Migrate**  
**Scoring Rubric**

<b>4 POINTS</b>	<b>3 POINTS</b>	<b>2 POINTS</b>	<b>1 POINT</b>
<ul style="list-style-type: none"> <li>• Correctly identifies and explains which two birds spend their summer north of NJ.</li> <li>• Correctly identifies one characteristic of the birds that do not migrate and explains answer.</li> <li>• Gives correct answer choice and complete explanation without any misconceptions.</li> <li>• Correctly identifies which two birds would be attracted to the seeds and gives complete explanation without any misconceptions.</li> </ul>	<ul style="list-style-type: none"> <li>• Correctly identifies which two birds spend their summer north of NJ but does not explain answer.</li> <li>• Correctly identifies one characteristic of the birds that do not migrate but does not explain answer.</li> <li>• Gives correct answer choice without any explanation.</li> <li>• Correctly identifies which two birds would be attracted to the seeds and gives partial explanation.</li> </ul>	<ul style="list-style-type: none"> <li>• Correctly identifies one of two birds that spend their summer north of NJ and explains answer.</li> <li>• Identifies part of the characteristic of the birds that do not migrate and does not explain answer.</li> <li>• Gives correct answer choice with some misconceptions.</li> <li>• Correctly identifies which two birds would be attracted to the seeds but gives no explanation.</li> </ul>	<ul style="list-style-type: none"> <li>• Correctly identifies one bird that spends its summer north of NJ but does not explain answer.</li> <li>• Identifies an incorrect characteristic for birds that do not migrate.</li> <li>• Gives correct answer choice.</li> <li>• Correctly identifies one of the two birds that would be attracted to the seeds but gives no explanation.</li> </ul>