### Chapter 33 Organizer

Refer to pages 475-7 of the Teacher Guide for an explanation of the National Science Education Standards correlations.

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<th>Activities/Features</th>
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<td><strong>Section 33.1</strong>&lt;br&gt;Innate Behavior National Science Education Standards UCP.2-4: A.1, A.2; C.1, C.6; F.4: G.1, G.2 (1 session)</td>
<td>1. Distinguish among the types of innate behavior.&lt;br&gt;2. Demonstrate, by example, the adaptive value of innate behavior.</td>
<td>MiniLab 33-1: Testing an Isopod’s Response to Light, p. 890&lt;br&gt;Problem-Solving Lab 33-1, p. 897&lt;br&gt;Investigate BioLab: Behavior of a Snail, p. 804&lt;br&gt;BioTechnology: Tracking Sea Turtles, p. 906</td>
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<td><strong>Section 33.2</strong>&lt;br&gt;Learned Behavior National Science Education Standards UCP.2, UCP.3: A.1, A.2; C.6; E.1, E.2; F.4; F.6; G.1-3 (2 sessions)</td>
<td>3. Distinguish among types of learned behavior.&lt;br&gt;4. Demonstrate, by example, types of learned behavior.</td>
<td>MiniLab 33-2: Solving a Puzzle, p. 900&lt;br&gt;Problem-Solving Lab 33-2, p. 902</td>
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### Key to Teaching Strategies

- **L1** Level 1 activities should be appropriate for students with learning difficulties.<br>- **L2** Level 2 activities should be within the ability range of all students.<br>- **L3** Level 3 activities are designed for above-average students.<br>- **ELL** ELL activities should be within the ability range of English Language Learners.<br>- **COOP LEARN** Cooperative Learning activities are designed for small group work.<br>- **ALL** These strategies represent student products that can be placed into a best-work portfolio.<br>- **CP** These strategies are useful in a block scheduling format.

### Need Materials? Contact Carolina Biological Supply Company at 1-800-334-5551 or at http://www.carolina.com

### MATERIALS LIST

**BioLab**<br>p. 904 snails, dropper, spring water, plastic petri dish, scissors, stereo-microscope, pencil, rubber band, masking tape<br>**MiniLabs**<br>p. 890 isopods (5), plastic petri dish, black paper, paper towel, water, transparent tape, paper, pencil<br>p. 900 paper puzzle, clock with second hand, paper, pencil

### Assessment Resources

- Chapter Assessment, pp. 193-198
- Mindjogger Videodiscs<br>- Performance Assessment in the Biology Classroom<br>- Alternate Assessment in the Science Classroom<br>- Computer Test Bank<br>- BDOL Interactive CD-ROM, Chapter 33 quiz

### Teacher Classroom Resources

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<td><strong>Section 33.2</strong>&lt;br&gt;Learned Behavior</td>
<td>Reinforcement and Study Guide, pp. 147-148&lt;br&gt;Critical Thinking/Problem Solving, p. 33&lt;br&gt;BioLab and MiniLab Worksheets, pp. 148-150&lt;br&gt;Laboratory Manual, pp. 243-246&lt;br&gt;Content Mastery, pp. 163-164, 166</td>
<td>Section Focus Transparency 80&lt;br&gt;L1&lt;br&gt;ELL</td>
</tr>
</tbody>
</table>

### Additional Resources

- Spanish Resources<br>- English/Spanish Audiocassettes<br>- Cooperative Learning in the Science Classroom<br>- Lesson Plans/Block Scheduling

### NATIONAL GEOGRAPHIC

**Products Available From Glencoe**
- To order the following products, call Glencoe at 1-800-334-7344:

**Products Available From National Geographic Society**
- To order the following products, call National Geographic Society at 1-800-368-2728:
  - Book National Geographic Book of Mammals

**Teacher's Corner**

### GLENCOE TECHNOLOGY

The following multimedia resources are available from Glencoe.
- **Biography: The Dynamics of Life**
  - CD-ROM<br>  - Video: Bird Courtship<br>  - Video: Territorial Behavior<br>  - Video: Salmon Migration
  - Exploration: Learned Behavior<br>  - Video: Elephant Behavior<br>

**Videos**
- Predators of North America<br>  - Strange Creatures of the Night

**Index to National Geographic Magazine**
- The following articles may be used for research relating to this chapter:

**Territorial Behavior**

**Salmon Migration**
**Theme Development**

Students will examine the theme of **innate behavior** as they consider the kinds of behaviors animals have in common and behaviors that are unique to a species. The theme of **evolution** is important to the study of behavior because of the adaptive value of behavior and the fact that behavior, just like physical features of animals, evolves.

---

**Getting Started Demo**

Ask students to bring in a caged pet. Have the class list behaviors of the pet that they think are learned and those that are not learned.

**Skills Development**

**What You’ll Learn**

- You will distinguish between innate and learned behavior.
- You will identify the adaptive value of specific types of behavior.

**Why It’s Important**

Animals have patterns or behavior that help them survive and reproduce. Some of these behavior patterns are inherited and some are learned. You will recognize that humans, like other animals, have both types of behavior, and that these behavior patterns enable you to survive as well.

**Getting Started**

Animal Behavior

Observe the behavior of a small animal for one minute. How does the observed behavior of the animal help it to survive?

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**Internet Connection**

To find out more about animal behavior, visit the Glencoe Science Web Site. www.glencoescience.com/sec/science

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**Multiple Learning Styles**

- **Kinesthetic** Portfolio, pp. 890, 900; Quick Demo, p. 891, 901; Tech Prep, p. 901
- **Visual-Spatial** Biology Journal, p. 891; Quick Demo, p. 891; Project, p. 893; Extension, p. 897
- **Auditory-Musical** Enrichment, p. 893; Biology Journal, p. 898
- **Intrapersonal** Display, p. 894; Project, p. 899; Reteach, p. 903
- **Interpersonal** Meeting Individual Needs, p. 801; Linguistic Tech Prep, p. 892

---

**1 Focus**

Bellringer

Before presenting the lesson, display Section Focus Transparency 79 on the overhead projector and have students answer the accompanying questions.

---

**1.4 Section Focus Transparency 79**

- **Innate Behavior**
  - Have you ever watched a bird feed its young? Nestlings greet a parent returning to the nest with cries and open bills. Parent birds practically stuff the food down their offspring’s throats, then fly off to find more food. Why do baby birds open their bills wide? Why do parent birds respond to open bills by feeding their offspring? These actions are examples of behavior that appears in birds without being taught or learned. Animals exhibit many kinds of behavior in nature, both inherited and learned.

---

**Key Concepts**

**Prepare**

**Response Segment**

No response segment.

---

**Planning**

- Gather isopods, lamps, and petri dishes for MiniLab 33.1.
- Purchase pieces of plethysmograph and gather a variety of live animals for the Quick Demos.
- Obtain a terrarium and materials for the Alternative Lab.

---

**Section 33.1 Innate Behavior**

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**Vocabulary**

- Behavior
- Innate behavior
- Adaptive value
- Natural selection

---

**Assessment Planner**

- **Portfolio Assessment**
  - Portfolio, TWE, pp. 890, 900
  - Assessment, TWE, p. 897
  - MiniLab, TWE, p. 900

- **Performance Assessment**
  - Assessment, TWE, pp. 891, 899
  - Alternative Lab, TWE, pp. 894-895
  - Problem-Solving Lab, TWE, p. 902
  - BioLab, TWE, pp. 904-905

- **BioLab**
  - SE, pp. 904-905
  - MiniLab, SE, pp. 890, 900

- **Knowledge Assessment**
  - Section Assessment, SE, pp. 897, 903
  - Chapter Assessment, SE, pp. 907-909

- **Skill Assessment**
  - MiniLab, TWE, p. 899
  - Problem-Solving Lab, TWE, p. 896


Animals carry on many activities—such as finding food, avoiding predators, caring for young, finding shelter, and attracting mates—that enable them to survive. These behavior patterns, therefore, have adaptive value. For example, a parent gull that is not incubating eggs or caring for chicks joins a noisy flock of gulls to dive for fishes. If the parent cannot catch a lot of fishes, not only will it die, but its chicks will not survive either. Therefore, this feeding behavior has adaptive value for the gull.

Inherited Behavior

Inheritance plays an important role in the ways animals behave. You don’t expect a duck to tunnel underground or a mouse to fly. But a domestic dog or a cat might lose its nose to a mouse run away when a cat appears? Why does a mallard duck fly south for the winter? The behavior patterns are genetically programmed. An animal’s genetic makeup determines how that animal reacts to certain stimuli.

Natural selection favors certain behaviors

Often, a behavior exhibited by an animal species is the result of natural selection. The variability of behavior among individuals affects their ability to survive and reproduce. Individuals with behavior that makes them more successful as survivors and reproducers will produce more offspring. These offspring will inherit the genetic basis for the successful behavior. Individuals without the behavior will die or fail to reproduce. You can observe the behavior of isopods in the MiniLab on this page. Inheritance plays an important role in this behavior.

1. Place six isopods in the center of the dish and add the cover. Place the dish near a lamp or next to a classroom window with light. Observe the dish as shown in the diagram. CAUTION: Peel isopod gently.

2. Wait five minutes and observe the dish. Count and record in your lab notebook the number of isopods on the dark side or the light side. This is your “five minute observation.”

3. Repeat step 2 at least three more times, waiting five minutes before each observation.

### Data Table

<table>
<thead>
<tr>
<th>Observation in minutes</th>
<th>Number of isopods present</th>
</tr>
</thead>
<tbody>
<tr>
<td>Light side</td>
<td>Dark side</td>
</tr>
<tr>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>15</td>
<td>20</td>
</tr>
<tr>
<td>20</td>
<td>25</td>
</tr>
</tbody>
</table>

**Analysis**

1. Do isopods tend to move toward light or dark areas? Support your answer with specific numbers from your data. What might the behavior of isopods toward light or darkness be—innate or learned? Explain your answer.

2. What might be the adaptive advantage for the observed isopod behavior and their response to light? Explain how natural selection may have influenced this isopod behavior.

3. Prepare a bar graph that depicts your data.

### Gifted

**Design an Experiment**

**Kinetesthetic** Ask students to hypothesize how different animals' responses to a loud noise. Have students design and carry out experiments and write their observations in their portfolios. Ask them to speculate whether the behavior they observed is innate.

---

**Observing Bird Behavior**

**Visual-Spatial** Ask students to observe local birds for one week and record their observations in their journals. Ask them to speculate about which behaviors are instinctive. Have them compare their observations with those of other students. Elicit whether students classify similar behaviors in the same way.

---

**Quick Demo**

**Kinetesthetic** Have students examine the blink response by asking them to hold a small piece of plexiglass in front of their faces and try to keep their eyes open while the partner gently tosses a crumpled piece of notebook paper at the glass.

---

**Quick Demo**

**Visual-Spatial** Have a variety of animals in class. Expose each animal to a single stimulus, such as a bright light. Have students observe their varied responses. Ask students to speculate about the survival value of each animal's response to that stimulus.

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**MiniLab 33.1**

**MiniLab and MiniLab Work-sheets, p. 147**

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**Assessment**

**Performance** Have students design experiments to determine the preferences of mealworms for light or dark, damp or dry, and smooth or rough surfaces. Have students use their data to determine if preferences differ at each stage. Elicit whether students use a scientific approach to conduct their experiments. Have students conduct similar experiments on both the larval stage and the adult beetle to determine if preferences differ at each stage.

---

**Resource Manager**

BioLab and MiniLab Work-sheets, p. 147
Instinctive Behavior

Compare the fixed action pattern of a toad capturing prey with a light- or-flight response. Both are quick, automatic responses to stimuli. But some behaviors take a longer time because they involve more complex actions. An instinct (Benn stinger) is a complex pattern of innate behavior. Instinctive behavior patterns may have several parts and may take weeks to complete. Insective behavior begins when the animal recognizes a stimulus and continues until all parts of the behavior have been performed.

As shown in Figure 33.4, greylag geese instinctively remove eggs that have rolled from the nest and will go through the motions of egg retrieval even when the eggs are taken away. You can see that survival of the young may be dependent on this behavior.

Courtship behavior ensures reproduction

Much of an animal’s courtship behavior is instinctive. Courtship behavior is the behavior that males and females of a species carry out before mating. Like other instinctive behaviors, courtship has evolved through natural selection. Imagine what would happen to the survival of a species if members were unable to recognize other members of that same species. Individuals often can recognize one another by the behavior patterns each performs. In courtship, behavior ensures that members of the same species will find each other and mate. Obviously, such behavior has an adaptive value for the species. Different species of fireflies, for example, can be seen at dusk flashing different light patterns. However, female fireflies of one species respond only to those males exhibiting the species-correct flashing pattern.

Some courtship behaviors help prevent females from mating males before they have had the opportunity to mate. For example, in some spiders, the male is smaller than the female and risks the chance of being eaten if she approaches him. Before mating, the male in some species presents the female with a nuptial gift, an insect wrapped in a silk web. While the female is unwrapping and eating the insect, the male is able to mate with her without being attacked. After mating, however, the male may be eaten by the female anyway.

In some species, nuptial gifts play an important role in allowing the female to exercise a choice as to which male to choose for a mating partner. The hanging fly, shown in Figure 33.5, is such a species.

Territoriality reduces competition

You may have seen a chipmunk chase another chipmunk away from seeds on the ground under a bird feeder. The chipmunk was defending its territory. A territory is a physical space an animal defends against other members of its species. It may contain the animal’s breeding area, feeding area, and potential mating area. Animals that have territories will defend their space by driving away other individuals of the same species. For example, a male sea lion patrols an area of beach where he has been driven away by the behavior of female sea lions. He does not bother a neighboring male that has a harem of his own because both have marked their territories, and each respects the common boundaries. But if an unmarked, young male tries to enter the sea lion’s territory, the owner of the territory will attack and drive the intruder away from his harem.

Although it may not appear so, setting up territories actually reduces conflicts, controls population growth, and provides for efficient use of environmental resources. When both animals space themselves out, they don’t compete for the same resources within a limited space. Therefore, territorial behavior improves the chances of survival of the young, and, therefore, survival of the species. If the male has selected an appropriate site and the young survive, he may inherit his ability to select an appropriate territory. Therefore, territorial behavior has survival value, not only for individuals, but also for the species. The male stickleback shown in Figure 33.6 is another animal that exhibits territoriality, especially during breeding season. Recall that pheromones are chemicals that communicate information among individuals of the same species. Many animals produce pheromones to mark territorial boundaries. For example, wolve contain pheromones that warn other wolves to stay away. The male pronghorn antelope uses a pheromone secreted from facial glands. One advantage of using pheromones is that they work both day and night.

Visual Learning

Figure 33.5. What adaptive value does this behavior have? The behavior helps to ensure that all offspring can be provided for.

Enrichment

Auditory-Musical

Crickets chirp as part of their courtship and territorial behaviors. The number of chirps in a specific length of time decreases as the temperature gets colder. Have students set up a means for observing this behavior. Crickets are available in pet shops and from biological supply companies.

Resource Manager

Visual-Spatial

Habitat students observe how pheromones influence behavior by carrying out the following activity. Place three snails of one species on one side of a pan, and three snails of another species on the opposite side. Allow the snails to move about on their respective sides of the pan for about 10 minutes and then remove the snails from the pan. Immediately place all the snails back in the pan at the center of the pan. Observe which way each snail moves. Clean the pan with warm, soapy water. Repeat the process three times and record your observations. Write a summary of your observations that includes a conclusion about why the snails moved as they did.

Pheromones Studies

Visual-Spatial

Habitat students observe how pheromones influence behavior by carrying out the following activity. Place three snails of one species on one side of a pan, and three snails of another species on the opposite side. Allow the snails to move about on their respective sides of the pan for about 10 minutes and then remove the snails from the pan. Immediately place all the snails back in the pan at the center of the pan. Observe which way each snail moves. Clean the pan with warm, soapy water. Repeat the process three times and record your observations. Write a summary of your observations that includes a conclusion about why the snails moved as they did.

Enrichment

Auditory-Musical

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Display
Interspersed or individual: Ask a group of students to make a photo collage of aggressive behaviors of pets and other local animals. Have them post their display on the classroom bulletin board.

Materials
- Glass terrarium or aquarium tank with cover, sand, 1 female and 5 male field crickets, dry oatmeal in a jar lid, apple slices, 4 matchboxes, 5 jars with lids, 4 different colors of nail polish

Procedure
Give students the following directions:
1. Set up a terrarium with about 2 cm of sand in the bottom and numbered matchboxes in all 4 corners.
2. Place different colored spots of nail polish on the thoraxes of four male crickets. One male will not need polish. The female can be identified by her long ovipositor at the end of her abdomen.
3. Keep the five crickets in separate jars for at least one day prior to beginning the experiment.
4. Place four males in the terrarium and observe and record their behavior for 15 minutes.
5. Examine the terrarium for about 10 minutes each day for 5 days. Note which cricket becomes dominant and the behavior it exhibits.

Expected Results
One cricket will become dominant and the others will avoid him.

Analysis
1. How could you tell that your crickets set up a dominance hierarchy? One cricket chirped more, was initially more aggressive, and later others avoided him.
2. Describe the differences in behavior of the crickets before and after the hierarchy was established. Before: much aggression and chirping; after: crickets avoided the dominant male.
Problem Solving Lab 33.1

Purpose

Students will determine that hibernation in squirrels is controlled by an internal annual biological clock.

Process Skills

think critically, analyze information, identify and control variables, design an experiment, interpret scientific illustrations

Teaching Strategies

Point out that not all months of the year are listed.

Discuss human circadian patterns as an introduction to periods of hibernation.

Help students determine the approximately annual cycle of behavior by noting the peaks of body weight and the time lapse between these peaks.

Thinking Critically

1. Squirrels spend about 120 days in hibernation and close to 200 days out of hibernation.

2. They were controlling variables by eliminating them from the experiment. Outside stimuli could provide cues as to when it might be time to hibernate.

3. To show that temperature was not influencing start of hibernation, changing length of light time to more or less than 12 hours per day, altering food selection.

4. Place newborn squirrels into the proper time of the year.

5. Students will determine that squirrels hibernate.

6. Designing an Experiment

Determine which stimuli cause an earthworm to return to its burrow. For more help, refer to the Performance Task Assessment for Graph from Data in PASC, p. 39.

Resource Manager

Critical Thinking/Problem Solving, p. 33

Reinforcement and Study Guide, pp. 145-146

Content Mastery, p. 162

Skill

Teach students how to draw graphs that would illustrate the pattern of hibernation for squirrels that were born in the Andes Mountains of South America and then brought to the United States for experimentation to determine their year-long rhythms.

Assessment

Portfolio

Evaluate students list five major groups (phylum or class) of animals they have studied. For each phylum or class, ask them to identify one innate behavior and explain its adaptive value. p. 41

4 Close

Discussion

Male katydids sing to attract females. In Panamanian forests, where bats are common, male katydids on plants shake their bodies vigorously to attract females. The females detect the shaking of the plant and respond to the male. The males cannot detect the shaking. Ask students to explain the behavior of the male katydids.

3 Assess

Check for Understanding

Ask students to prepare a concept map using all the vocabulary words in this section.

Reteach

Have students make a table that lists types of innate behaviors down the left side. Across the top, have them write the following headings: Definition, Inheritance, Outcome of behavior, Survival value. Have them fill in the table.

Extension

Visual-Spatial Ask students to construct a nearby zoo. As they observe animals, have them note innate behaviors and explain their survival value.

3 Assess

Check for Understanding

Ask students to prepare a concept map using all the vocabulary words in this section.

Reteach

Have students make a table that lists types of innate behaviors down the left side. Across the top, have them write the following headings: Definition, Inheritance, Outcome of behavior, Survival value. Have them fill in the table.

Extension

Visual-Spatial Ask students to construct a nearby zoo. As they observe animals, have them note innate behaviors and explain their survival value.
Learned Behavior

**What Is Learned Behavior?**

Learning, or learned behavior, takes place when behavior changes through practice or experience. The more complex an animal’s brain, the more elaborate the patterns of its learned behavior. As you can see in Figure 33.12, innate types of behavior are more common in invertebrates, and learned types of behavior are more common in vertebrates. In humans, many behaviors are learned.

Learning has survival value for all animals in changing environments because it permits behavior to change in response to varied conditions. Learning allows an animal to adapt to changes, an ability that is especially important for animals with long life spans. The longer that an animal lives, the greater the chance that its environment will change and that it will encounter unfamiliar situations.

**Kinds of Learned Behavior**

Just as there are several types of innate behavior, there are several types of learned behavior. Some learned behavior is simple and some is complex. Which group of animals do you think carries out the most complex type of learned behavior?

Habituation: A Simple Form of Learning

Horses normally shy away from an object that suddenly appears from the trees or bushes, yet after a while they disregard noisy cars that speed by the pasture honking their horns. This lack of response is called habituation.

Imprinting: A Permanent Attachment

Have you ever seen young ducklings following their mother? This behavior is the result of imprinting.

Imprinting is a form of learning in which an animal, at a specific critical time of life, forms a social attachment to another object. Many kinds of birds and mammals do not immediately know how to recognize members of their own species. Instead, they learn to make this distinction early in life. Imprinting takes place only during a specific period of time in the animal’s life and is usually irreversible. For example, birds that leave the nest immediately after hatching, such as geese, imprint on their mother. They learn to recognize and follow her within a day of hatching.

In birds such as ducks, imprinting takes place during the first day or two after hatching. A duckling rapidly learns to recognize and follow the first conspicuous moving object it sees. Normally, that object is the duckling’s mother. Learning to recognize their mother and follow her ensures that food and protection will always be nearby.

Learning by Trial and Error

Do you remember when you first learned how to ride a bicycle? You probably tried many times before being able to successfully complete the task. Next, building, like riding a bicycle, may be a learning experience. The first time a jackal builds its nest, the child has to work to build an effective one. The jackal may learn to perfect the shape of the nest after a great deal of experience.
MiniLab 33-2

Purpose
Students will conduct an experiment to test the nature of trial-and-error learning.

Process Skills
interprets data, think critically, collects data, draw a conclusion

Teaching Strategies
Have students work in teams of two. One can be the time keeper while the other does the puzzle. The time keeper should not watch the student doing the assembly but should be told when the assembler begins and completes the puzzle.

Expected Results
Students times needed to complete the puzzle will decline with each trial.

Analysis
1. times decreased
2. No, the ability to work the puzzle pieces in advance and place on card stock. Save puzzle pieces in plastic bags for students in later classes.
3. Enlarge puzzle pieces shown here to approximately twice their size for your students.

Procedure
1. Copy the data table below.
2. Obtain a paper puzzle from your teacher.
3. Time how long it takes you to assemble the puzzle pieces into a perfect square.
4. Record the time it took and call trial 1.
5. Disassemble the square and mix the pieces.
6. Record trials 2 through four more trials.

Data table

<table>
<thead>
<tr>
<th>Trial</th>
<th>Time needed to complete square puzzle</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>

Analysis
1. Using your data, explain how the time needed to complete the puzzle changed from trial 1 to trial 5.
2. Was the final completion of the puzzle an example of learned behavior?
3. Yes, because the time it took to do the puzzle decreased as learning took place.
4. Student answers may vary.

Insight: Learning by association
When you first got a new kitten, it would meow as soon as it smelled the aroma of cat food in the can you were opening. After a few weeks, the sound of the can opener alone attracted your kitten, causing it to meow. Your kitten had become conditioned to respond to a stimulus other than the smell of food. Conditioning is learning by association. A well-known example of an early experiment in conditioning is illustrated in Figure 33.15.

Insight: The most complex type of learning
In a classic study of animal behavior, a chimpanzee was given two bamboo poles, neither of which was long enough to reach some fruit placed outside its cage. By connecting the two tapering short pieces to make one longer pole, the chimpanzee learned to solve the problem of how to reach the fruit. This type of learning is called insight. Insight is learning in which an animal uses previous experience to respond to a new situation.

Much of human learning is based on insight. When you were a baby, you learned a great deal by trial and error. As you grew older, you relied more on insight. Solving math problems is a daily instance of using insight. Probably your first experience with mathematics was when you learned to count. Based on your concept of numbers, you then learned to add, subtract, multiply, and divide. Years later, you continue to solve problems in mathematics based on your past experiences. When you encounter a problem you have never experienced before, you solve the problem through insight.
Student will determine that the song of certain bird species is partially innate but mostly learned behavior.

**Problem Process Skills**
- Analyze information, apply concepts, think critically, interpret scientific illustrations
- Advise students that the term “wild” refers to the sparrow raised in its natural surroundings.
- Units along the left axis are kiloyces per second. Units along the bottom axis are in seconds.

**Expected Results**
- Students will recognize that a sparrow’s song is innate behavior. Most experimental evidence points to the fact that singing may be a combination of the two types of behavior, but in certain species, learning is critical in order to sing the species song correctly.

**Purpose**
- Students will determine that the song of certain bird species is partially innate but mostly learned behavior.

**Analysis**
- Sound spectrograms show electrophysically recorded and visually study the song patterns of birds. Using this tool, they recorded spectrograms for white-crowned sparrows. The top spectrogram is of a wild, white-crowned sparrow. The bottom spectrogram is of a white-crowned sparrow hatched and raised in isolation from all other birds. “Segments” of the song have been identified with the letters A-C.

**Thinking Critically**
1. In general, how do the two spectrograms compare?
2. Which segment of the sparrow’s song may be innate or learned? Explain your answers.
3. Doesn’t it appear that the majority of the sparrow’s song is learned or innate? Explain your answer.
4. In a different experiment, a recording of a white-crowned sparrow song was repeatedly played for a young bird raised in isolation. If bird song is mainly learned, predict the outcome of the experiment.

**Assessment**
- **Performance** Have students design an experiment to test the hypothesis that birds raised in isolation will learn their proper song from a recording only immediately after hatching. Use the Performance Task Assessment in PASC, p. 23.

**Cultural Diversity**
- Discuss with students the important contributions of African American organic chemist, Bertram O. Fraser-Reid. His most important work involved synthesizing artificial insect pheromones to ride substitutes for dangerous insecticides. In Canada, the western pine beetle causes billions of dollars of damage to trees each year. Fraser-Reid reasoned that if he released artificial pheromones of female pine beetles in a part of the forest that contained no females, it might attract male pine beetles to the spot, thus preventing them from laying eggs. Fraser-Reid’s initial research laid the groundwork for future studies.

**The Role of Communication**
- When you think about the interactions that happen among animals as a result of their behavior, you realize that some sort of communication is in place. Communication is an exchange of information that results in a change of behavior. Black-headed gulls visually communicate their availability for mating with instinctive courtship behavior. The put on the head from a dog’s owner after the dog retrieves a stick signals a job well done.

**Most animals communicate**
- Animals have several channels of communication open to them. They signal each other by sounds, sights, touches, or smells. Sounds radiate in all directions and can be heard a long way off. The sounds of the humpback whale can be heard 1200 km away. Sounds such as songs, growls, and calls communicate a lot of information quickly. For example, the song of a male cricket tells his sex, his location, his social status, and, because communication by sound is usually species-specific, his species.

**Expected Results**
- Students will recognize that a sparrow’s song is innate behavior. Most experimental evidence points to the fact that singing may be a combination of the two types of behavior, but in certain species, learning is critical in order to sing the species song correctly.

**Analysis**
- Sound spectrograms show electrophysically recorded and visually study the song patterns of birds. Using this tool, they recorded spectrograms for white-crowned sparrows. The top spectrogram is of a wild, white-crowned sparrow. The bottom spectrogram is of a white-crowned sparrow hatched and raised in isolation from all other birds. “Segments” of the song have been identified with the letters A-C.

**Thinking Critically**
1. In general, how do the two spectrograms compare?
2. Which segment of the sparrow’s song may be innate or learned? Explain your answers.
3. Doesn’t it appear that the majority of the sparrow’s song is learned or innate? Explain your answer.
4. In a different experiment, a recording of a white-crowned sparrow song was repeatedly played for a young bird raised in isolation. If bird song is mainly learned, predict the outcome of the experiment.

**Assessment**
- **Performance** Have students design an experiment to test the hypothesis that birds raised in isolation will learn their proper song from a recording only immediately after hatching. Use the Performance Task Assessment in PASC, p. 23.

**Cultural Diversity**
- Discuss with students the important contributions of African American organic chemist, Bertram O. Fraser-Reid. His most important work involved synthesizing artificial insect pheromones to ride substitutes for dangerous insecticides. In Canada, the western pine beetle causes billions of dollars of damage to trees each year. Fraser-Reid reasoned that if he released artificial pheromones of female pine beetles in a part of the forest that contained no females, it might attract male pine beetles to the spot, thus preventing them from laying eggs. Fraser-Reid’s initial research laid the groundwork for future studies.

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Behavior of a Snail

**Objectives**
- To observe a snail
- To observe the behavior of snails
- To hypothesize and test the behavior of snails
- To observe the behavior of snails to touch

**Materials**
- Spring water
- Dishes
- Probe
- Rubber band
- Pencil
- Scissors

**Safety Precautions**
- Always wear goggles in the lab.
- Do not strike the snail too hard with the rubber band.

**Preparation**
1. Copy the data table.
2. Prepare a stimulator probe by taping a small piece of a cut rubber band to the tip of a pencil.
3. Cover the bottom of a small dish with spring water.
4. Obtain a snail from your teacher and place it in the dish.
5. Use a dissecting microscope to examine and locate its head. Its head has two antennae that it can extend and retract.

**Procedure**
1. Place the dish on your desk.
2. Lightly touch the snail's anterior end using the end of the rubber band probe. Note if it responds (yes or no), and record the direction the snail moves. Consider this trial 1.
3. Lightly touch the snail's posterior end using the rubber band probe. Record your observations and conduct a total of five trials.
4. Repeat step 7 for four more trials.
5. Lightly touch the snail's posterior end using the rubber band probe. Note if it responds (yes or no), and record the direction the snail moves. Consider this trial 1.
6. Lightly touch the snail's anterior end using the end of the rubber band probe. Note if it responds (yes or no), and record the direction the snail moves. Consider this trial 1.
7. Repeat step 7 for four more trials.
8. Repeat step 7 for four more trials.
9. Repeat step 9, touching the middle of the snail's body.
10. Test the snail's ability to become habituated from stimulation to its anterior end.
   a. Continue to touch the snail's anterior end with the probe every 10 seconds until habituation occurs. Continue testing for a reasonable length of time if habituation does not occur.
   b. Count and record the number of stimulations needed for habituation.
11. Habituation studies

**Data and Observations**
Both ends are sensitive to touch. Students may detect no response when performing a specific trial. Habituation will usually not occur.

**Analyze and Conclude**
1. Hypothesizing: Are the responses shown by snails to touch learned or innate? Explain your answer.
2. Observing: Describe the direction that a snail moves when its anterior and posterior ends are stimulated. Does one end appear to be more sensitive than the other? Is the middle sensitive to touch? Is the speed of response slow or rapid?
3. Hypothesizing: Explain how the behavior of responding to touch may be an adaptation for survival.
4. Experimenting: Why did you perform several trials for each experiment involving stimulation of the anterior, posterior, and middle of the snail?
5. Defining Operationally: Define the term habituation.
6. Concluding: Explain how your data may be used to support the observation that snails are not easily habituated to touch. Use actual data to support your answer.
7. Predicting: How might this lack of habituation serve as an adaptation for survival?

**Assessment**
Performance: Ask students to plan an experiment that could be used to test a snail's response to rapid changes in light intensity. Use the Performance Task Assessment List for Designing an Experiment in PASC, p. 23.

**Going Further**
- Experimentation: Form a hypothesis regarding snail behavior when given a choice between light and dark conditions. Design and carry out an experiment to test your hypothesis.
- **Science:** To find out more about animal behavior, visit the Glencoe Science Web Site. www.glencoe.com/sec/science
The Florida green turtle (Chelonia mydas mydas) is an endangered species that nests on sandy beaches. It is found in temperate and tropical waters, including the northwestern coast of the United States. Like other sea turtles, the Florida green turtle spends virtually all of its life at sea; however, adult female turtles visit several times a year to lay their eggs.

Students become familiar with tagging and with satellite telemetry as methods of tracking animal movements.

### Purpose

Students can learn about animal behavior by investigating the Florida green turtle (Chelonia mydas mydas) in its natural habitat. They can use satellite telemetry to track the turtle's movements and gather data about its feeding behavior.

### Background

Four species of sea turtles found along the U.S. coast are on the endangered species list: Kemp’s ridley, hawksbill, Florida green, and leatherback. A fifth species, the loggerhead, is threatened.

The Florida green turtle nests from June to October, and a female will nest every two to four years. During a nesting year, the female will lay clutches of about 115 eggs at 12-day intervals.

### Teaching Strategies

- Have students locate the Caribbean Sea on a map. Point out that satellite tracking is especially useful for following the movements of animals that travel large distances.
- Go over with students the definition of the word telemetry. Telemetry is the science of transmitting data over a distance via radio waves. It comes from the Greek words tele, meaning “distance,” and metron, meaning “measure.”

### Investigating the Technology

#### Thinking Critically

- Telemetry data from a Florida green turtle suggest that the animal has spent the past several days in an offshore location characterized by coral reefs and seagrass meadows. Past telemetry data from other green turtles indicate that these animals periodically interrupt their travels to stop at this location and to forage on coral reefs and seagrass meadows. A hypothesis is developed that could explain how these animals are able to communicate. The hypothesis is that communication is possible through either visual, auditory, or chemical signals.

#### Investigating the Technology

- To find out more about sea turtle behavior, visit the Glencoe Science Web Site: www.glencoe.com/sec/science

#### Chapter 33 Technology

**Glencoe Technology**

**Chapter 33: Animal Behavior**

- Tracking Equipment

- **VideoDisc**
  - The Secret of Life
  
- **Video Tape**
  - MindJogger Videodiscs

**Resource Manager**

- Chapter Assessment, pp. 393-398
- MindJogger Videodiscs
- Computer Test Bank
- BDOL Interactive CD-ROM, Chapter 33 quiz

### Summary

- **Main Ideas**
  - **Innate Behavior**
    - Behavior is anything an animal does in response to stimuli. Many behaviors are adaptive and are shaped by natural selection.
    - Innate behavior is inherited. Innate behaviors include automatic responses and instincts. Automatic responses include reflexes and fight-or-flight responses.
    - Innate behavior is characterized by a complex pattern of innate behavior.
    - Behaviors such as courtship rituals, displays of aggressive behavior, territoriality, dominance hierarchies, hibernation, and migration are all forms of instinctive behavior.
  - **Learned Behavior**
    - Learning takes place when behavior changes through practice or experience. Learned behavior has adaptive value.
    - Learning includes habituation, imprinting, trial and error, and conditioning. The most complex type of learning is learning by insight.
    - Some animals use language, whereas most communicate through either visual, auditory, or chemical signals.

### Vocabulary

- **aggression (p. 894)**
- **behaviour (p. 890)**
- **conditioning (p. 890)**
- **circadian rhythm (p. 895)**
- **communication (p. 902)**
- **conditioning (p. 890)**
- **imprinting (p. 895)**
- **language (p. 903)**
- **habituation (p. 890)**
- **learning (p. 890)**
- **migration (p. 890)**
- **rhythm (p. 890)**

### Chapter 33 Assessment

#### Main Ideas

1. Your adult dog is chewing on a bone when a puppy approaches. Your dog growls at the puppy. What type of behavior is your dog exhibiting?
   - a. aggression
   - b. competition
   - c. dominance
   - d. curiosity

2. A change in temperature or the presence of a female may be the stimulus that results in a change in an animal’s behavior.
   - a. response
   - b. reflex
   - c. stimulus
   - d. habituation

3. Animals with behavior that makes them more successful at surviving and reproducing will produce more:
   - a. offspring
   - b. population
   - c. territory
   - d. eggs

4. All inherited behavior of animals is behavior.
   - a. aggressive
   - b. learned
   - c. innate
   - d. conditioned

5. When a tadpole flips out its sticky tongue to catch an insect flying past, it is exhibiting:
   - a. learned behavior
   - b. courtship behavior
   - c. territory
   - d. innate behavior

### Underlying Main Ideas

1. Animals with behavior that makes them more successful at surviving and reproducing will produce more:
   - a. offspring
   - b. population
   - c. territory
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2. Animals with behavior that makes them more successful at surviving and reproducing will produce more:
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5. Animals with behavior that makes them more successful at surviving and reproducing will produce more:
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   - b. population
   - c. territory
   - d. eggs

### Using the Vocabulary

To reinforce chapter vocabulary, use the Content Mastery Booklet and the activities in the Interactive Tutor for Biology: The Dynamics of Life on the Glencoe Science Web Site: www.glencoe.com/sec/science
6. What type of behavior is shown in this diagram?
   a. conditioning
   b. imprinting
   c. instinctive
   d. habituation

7. Caribou are ______ when they move from their winter homes in the forests to the tundra for the summer.
   a. laboratory
   b. imprinting
   c. migrating
   d. learning

8. Of these, which is NOT an example of instinctive behavior resulting from internal or external cues?
   a. circadian rhythm
   b. migration
   c. habituation
   d. imprintation

9. Establishing ________ reduces the need for aggressive behavior among members of the same species.
   a. reflexes
   b. territories
   c. conditioning
   d. habituation

10. Your cat exhibits ________ behavior if potential mates are attracted to this display.
    a. courtship
    b. aggressive
    c. language
    d. aggressive

11. ________ is different from deep sleep because an animal exhibiting this behavior has a lowered body temperature.
    a. sleep
    b. hibernation
    c. dreaming
    d. learning

12. The ability to form a dominance hierarchy is an example of ________ behavior pattern because it is inherited.
    a. instinctive
    b. learning
    c. instinctive
    d. conditioning

13. When a mouse is learning to go through a maze, the food reward at the end of the maze is ________ because it is based on a need the animal has.
    a. present
    b. absent
    c. conditional
    d. unexpected

14. The use of ________ is an example of ________ behavior because it has also been shown in this display.
    a. symbols; language
    b. symbols; learning
    c. symbols; instinctive
    d. symbols; reflex

15. By accident, a gull drops a snake on the road. The small snake breaks, and the gull eats the small snake. The gull continues to drop small objects on the road. What type of behavior is this?
    a. aggression
    b. startle
    c. courtship
    d. aggressive

16. When a chicken is using an example of ________, it is learning ________.
    a. language; language
    b. language; learning
    c. language; instinctive
    d. language; reflexive

17. APPLYING MAIN IDEAS
   a. The root of a word can help you group words together as you learn them. If you learn that transpiration is the process of water vapor moving to the air, think about how it is similar to ________.
   b. Explain how Ivan Pavlov used the methods of science to study conditioning behavior.

18. Concept Mapping Complete the concept map by using the following vocabulary terms: innate behavior, imprinting, habituation, conditioning, insight.

19. THinking Critically
   a. Charles Darwin visited the Galapagos Islands in 1835. He was amazed that the animals would allow him to touch them. Why were they not afraid?
   b. When a chicken is displaying a behavior, the chickens in the display display ________ behavior because it has also shown in this display.
   c. The snail’s shell breaks, and the gull eats the animal has. What type of behavior is this?
   d. Explain how Ivan Pavlov used the methods of science to study conditioning behavior.

20. Hibernation
    a. seasonal sleep
    b. migration
    c. instinctive
    d. reflexive

21. A dominance hierarchy would reduce aggression at common feeding sites.
22. No, most likely they would have already imprint on their own mother by the time they are five days old.
23. Ivan Pavlov observed dogs’ natural behavior when food was presented. He hypothesized that the dogs could be conditioned to respond to the sound of a bell if it were food. He designed an experiment to test his hypothesis. He rang a bell each day he fed the dog, then again when the dog smelled food. Finally, when he rang the bell with no food stimulus, the dog salivated. He concluded that the dog had been conditioned to respond to a stimulus because it did not normally associate with food.
Vertebrates

Vertebrate characteristics, such as all these animals have in common. All these animals are characterized by a vertebral column, which supports the body and provides protection for the nervous system. Vertebrates include fish, amphibians, reptiles, birds, and mammals.

Fishes

All fishes are aquatic and breathe through gills. They have three different classes: cartilaginous fishes, jawless fishes, and bony fishes.

Jawless Fishes

Jawless fishes, such as lampreys and hagfishes, are the simplest vertebrates. They lack jaws, but they have an endoskeleton made of cartilage, like sharks and rays, but they do not have jaws.

Cartilaginous Fishes

Cartilaginous fishes, such as sharks, are the second-most-evolved group of fishes. They have endoskeletons made of cartilage, paired fins, and a lateral line system that enables them to detect movement and vibrations in water.

Bony Fishes

Bony fishes, such as salmon, have jawbones, paired fins, and a three-chambered heart. They are the largest class of fishes and include the most species.

Amphibians

Amphibians are ectothermic vertebrates that spend part of their life cycle in water. They breathe through their skins, lungs, and gills. Amphibians include salamanders, newts, and frogs.

Reptiles

Reptiles are terrestrial vertebrates that are covered in scaly skin. They include lizards, snakes, turtles, and crocodiles.

Birds

Birds are the most evolutionarily advanced vertebrates, with feathers, their efficient respiratory system, and a complex brain.

Mammals

Mammals are warm-blooded vertebrates that produce milk to feed their young. They include humans, whales, elephants, and many other species.

1 Focus

Bellringer

Collect pictures of many different kinds of vertebrates and place them on the bulletin board. Number each picture. As students look at the pictures, ask them to identify the kinds of vertebrates and place them on the bulletin board. Ask students what they observed in all seven vertebrate classes. Ask them to list as many vertebrates as they can discuss in this unit. Ask students to list as many vertebrates as they can discuss in this unit.
Vertebrates

Reptiles

Reptiles are ectotherms with dry, scaly skin and clawed toes. They include snakes, lizards, turtles, crocodiles, and alligators. With the exception of snakes, all reptiles have four legs that are positioned somewhat underneath their bodies. Most reptiles have a three-chambered heart, but crocodilians have a four-chambered heart in which oxygenated blood is kept entirely separate from blood without oxygen. The scaly skin of reptiles reduces the loss of body moisture on land, but scales also prevent the skin from atrophying or releasing gases to the air. Reptiles are entirely dependent upon lungs for this essential gas exchange.

Visual Learning

Direct students’ attention to the photos of the snake and the crocodile. Ask them to explain how the snake and the crocodile are alike and how they are different. They are both ectotherms with skin that is dry, thick, and covered with scales. They both have lungs and lay eggs with leathery shells. The snake does not have legs, whereas the crocodile has four legs. The snake has a three-chambered heart and the crocodile has a four-chambered heart.

Quick Demo

Visual-Spatial: Show students a live snake, lizard, or turtle from the local environment or borrowed from a pet shop. Have students point out the reptile features of the animal.

Display

Visual-Spatial: Have students prepare a bulletin board display of local reptiles. Have them do research to determine if there are any local endangered reptiles.

GLENCOE TECHNOLOGY

CD-ROM

Biology: The Dynamics of Life

Exploration: The Five Kingdoms

Disc 3

BioQuest: Biodiversity Park

Disc 3, 4

COOP LEARN

First Aid for Snake Bite

Interpersonal: Have a group of students investigate and demonstrate first aid for snake bites to the class.

PROJECT

Reptile Misconceptions

Ask students to research and report on misconceptions about reptiles such as that snakes slink along with their tongues and you can tell the age of a rattlesnake by counting its rattles.
Endangered State Birds

Linguistic: Have students do research to find out which endangered birds live in your state. Have them prepare a videotaped public service announcement about the birds’ status with information about what can be done to enhance their chances of survival. LS

Vertebrates

Birds

Birds are the only class of animals with feathers. Feathers, which are lightweight, modified scales, help insulate birds and enable them to fly. Birds have forelimbs that are modified into wings. Like reptiles, birds have scales on their feet and clawed toes; unlike reptiles, they are endotherms—animals that maintain a constant body temperature. Endotherms must eat frequently to provide the energy needed for producing body heat.

Penguins are flightless birds with wings and feet modified for swimming and a body surrounded by a thick layer of insulating fat. This young emperor penguin may reach a height of 1 m and weigh nearly 34 kg.

Bird Flight

Birds have thin, hollow bones with cross braces that provide support for strong flight muscles while reducing their body weight. Birds also have a heart that has a divided ventricle in which oxygen is available during both inhalation and exhalation.

Feathers keep birds warm and streamline them for flight; feather colors are often important in courtship or camouflage. The peacock attracts the peahen with its display of tail feathers.

Feathers

Like reptiles, birds lay amniotic eggs. Unlike reptiles, birds incubate their eggs in nests, keeping eggs warm until the young birds hatch. The smallest bird is the bee hummingbird, which weighs nearly 34 kg. Emperors penguins may reach a height of 1 m and weigh nearly 34 kg.

VITAL STATISTICS

Birds

Size ranges:
- Largest: Ostrich, height: 2.4 m, mass: 356 kg; swallow: 13 cm, mass: 1.5 g
- Distribution: Worldwide in all habitats

Widest wing span:
- Wandering albatross: 3.7 m

Fastest flyer:
- White-throated spaniel swift, 173 kph
- Largest: Ostrich, length: 13.3 m, mass: 1.5 kg
- Longest yearly migration: Arctic tern, 40,000 km
- Numbers of species: Class: Aves—9,860 species in 27 present-day orders

Order: Passeriformes—perching song birds, 5,400 species
Order: Ciconiiformes—swans, ducks, geese, 163 species
Order: Falconiformes—eagles, hawks, falcons, 298 species

Distribution:
- Worldwide in all habitats

Wings Adapted for Flight

Flight is also supported by feathers that streamline a bird’s body and shape the wings. Wing shape and size determine the type of flight a bird is capable of.

Birds that fly through the branches of trees in a forest, such as chickadees, have elliptically shaped wings adapted to quick changes of direction. Wings of swallows and terns have shapes that allow them to fly through. These birds are predators that carry prey to the nest until some nests are 2 m across and 2 tons in mass.

Bird Adaptations

Vertebrates

Nest Builders

Like reptiles, birds lay amniotic eggs. Unlike reptiles, birds incubate their eggs in nests, keeping eggs warm until the young birds hatch. Like reptiles, birds lay amniotic eggs. Unlike reptiles, birds incubate their eggs in nests, keeping eggs warm until the young birds hatch.

The largest bird’s nest is built by the bald eagle. Every year, eagles add another layer of sticks to the nest until some nests are 2 m across and 2 tons in mass.

Distribution:
- Worldwide in all habitats

Activity

Kinesthetic: Have students determine what kinds of birds live on school grounds. Look up specifications for houses for these birds and build bird houses to place on school ground.
Mammals

Mammals are endotherms. Mammals are named for their mammary glands, which produce milk to feed their young. Most mammals have hair that helps insulate their bodies and sweat glands that help keep them cool. Mammals need a high level of energy for maintaining body temperature and high speeds of locomotion. An efficient four-chambered heart and the muscular diaphragm beneath the lungs help to deliver the necessary oxygen for these activities.

Mammal Diversity

All mammals have internal fertilization, and the young begin development inside the mother’s uterus. But from that point, developmental patterns in mammals diverge. Mammals are classified into three groups. Monotremes are mammals that lay eggs. Marsupials are mammals in which the young complete a second stage of development after birth in a pouch made of skin and hair on the outside of the mother’s body. Placental mammals carry their young inside the uterus until development is nearly complete.

Female mammals, such as this moose, feed their young milk secreted from mammary glands. Often, the young are cared for until they become adults.

Most mammals are placentals. They have extraordinary ranges in sizes and body structures. Many hoofed mammals, such as this deer, have an adaptation known as cud chewing that enables them to break down the cellulose of plants to make nutrients available to the animal.

Polar bear

The duck-billed platypus is a monotreme with webbed front feet adapted for swimming, and sharp claws for digging and burrowing into the soil. This young wallaby is a marsupial that is old enough to survive outside its mother’s pouch, but it still seeks protection there when danger threatens.

Hibernation

Many rodents hibernate during periods of extreme cold. During hibernation, the body temperature drops to about 5°C, and it goes into hibernation, which conserves the animal’s energy. Estivation

In hot desert environments, where water is limited, some small rodents survive without drinking. They obtain enough water from the foods they eat. Other desert mammals, such as the ferret fox, have large ears that act as heat loss. During periods of intense heat, some desert mammals go into a state of reduced metabolism called estivation. As a result, the animal’s body temperature is lowered and energy is conserved.
Mammals can be classified by the number and type of teeth. All mammals have diversified teeth used for different purposes. Incisors are used to cut food. Canines—long, pointed teeth—are used to stab or hold food. Molars and premolars have flat surfaces with ridges and are used to grind and chew food.

**Mammal Teeth**

Mammals have teeth adapted to their diet. Carnivores have sharp, pointed canines that help them tear apart prey. Herbivores have premolars and molars adapted to grinding the plant materials they eat.

**Reteach**

Show students slides or photos of the three groups of mammals and ask them to identify them by their teeth.

**Extension**

Kinesthetic: Mammals must use their teeth exclusively to eat as most mammals do not have hands or opposable thumbs to assist. Ask students to shell a peanut with their fingers taped together so that only the top point of the thumb can move. Ask them why diversified teeth are important to mammals.

**Performance**

Ask students to design an experiment that would test the suitability of fat as insulation. Lard or cooking fat can be used in their experiments.

**4 Close**

**Audiovisual**

Rent a feature film in which a wild mammal or mammals play an important role. Ask students to identify important features of the mammals in the film.

**Portfolio**

**Create a Pet**

Linguistic: Ask students to use their creativity and knowledge of vertebrates to create their ideal vertebrate pet. They should write a description and a diagram of this pet in their journals. Have them label their diagrams with all the features unique to the vertebrate group to which their pet belongs.

**Biology Journal**

**BioDigest**

**BioDigest Assessment**

**Thinking Critically**

1. An animal can control its body temperature, it is able to live in habitats with temperature extremes without upsetting homeostasis of the body.
2. A food source, protective membranes and fluids, and a tough outer shell on the egg help prevent injury and dehydration of the embryo as it develops on land.
3. They are both endotherms. All amphibians have a three-chambered heart, as do reptiles, with the exception of crocodilians. Reptiles have claws on their toes, whereas amphibians do not. Reptiles have thick, dry skin covered with scales, whereas amphibians have smooth, moist skin.
4. It might be an animal that grazes on woody branches and bark.
5. Fishes have internal skeletons, fins, and lateral line systems.

**BioDigest ASSESSMENT**

**Understanding Main Ideas**

1. Which of the following animals are endotherms?
   a. fishes, amphibians, reptiles, and birds
   b. birds and mammals
   c. fishes, amphibians, and reptiles
   d. fishes, amphibians, reptiles, birds, and mammals

2. Which of the following fishes have jaws?
   a. lampreys, sharks, and bony fishes
   b. lampreys only
   c. sharks, skates, and rays only
   d. carnivorous and bottom fishes only

3. Which of the following animals have eggs without shells?
   a. lizards, snakes, and turtles
   b. lizards, frogs, and toads
   c. crocodiles, and salamanders
   d. frogs, snakes, and alligators

4. Which amphibian has thick, bumpy skin with poison glands?
   a. frogs
   b. lizards
   c. salamanders

5. The first animals to lay amniotic eggs were
   a. fishes
   b. amphibians
   c. reptiles
   d. birds

6. Which reptile has a four-chambered heart?
   a. duck-billed platypus
   b. lizard
   c. snake
   d. alligator

7. The air sacs of birds enable them to
   a. eat more food
   b. receive more oxygen
   c. store food
   d. build large nests

8. Both birds and reptiles lay shelled, amniotic eggs; however, only birds or their offspring are able to
   a. guard
   b. incubate
   c. protect
   d. nurse

9. Because the hearts of all mammals have four chambers, more oxygen is delivered to their cells.
   a. energy
   b. oxygen
   c. heat
   d. sweat

10. Mammals are classified into subclasses based on their method of
    a. locomotion
    b. breathing
    c. feeding
    d. reproduction

**BioDigest ASSESSMENT**

**Understanding Main Ideas**

1. c 2. b 3. c 4. b

**BioDigest**

**BioDigest Assessment**

**Understanding Main Ideas**

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