Refer to pages 4T-5T of the Teacher Guide for an explanation of the National Science Education Standards correlations.


**Materials List**

- **BioLab**
  - p. 734 planarian culture, petri dish, springwater, camel hair brush, microscope slide, stereomicroscope, single-edged razor blade, marking pencil
- **MiniLabs**
  - p. 719 microscope, watch glass, drop-per, culture dish, hydra culture, brine shrimp culture, water
  - p. 732 microscope, prepared slide of pork worm larvae

**Quick Demos**

- p. 716 dried marine sponges
- p. 720 microprojector, prepared slides of nematocysts
- p. 728 slide projector, planarian culture, water, 35-mm deep- well slide

**Alternative Lab**

- p. 714 stereomicroscope, forceps, balance, wax pencil, beakers, petri dish, sea sponges, unused synthetic sponges

**Section 26.1 Sponges**

<table>
<thead>
<tr>
<th>NSES UCP</th>
<th>C.1, C.3-6 (1 session)</th>
<th>C.3, C.5-6; F.1, F.5; G.1</th>
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</thead>
<tbody>
<tr>
<td><strong>Objectives</strong></td>
<td></td>
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<tr>
<td>1. Relate the sessile life of sponges to their food-gathering adaptations.</td>
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<tr>
<td>2. Describe the reproductive adaptations of sponges.</td>
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<tr>
<td><strong>Activities/Features</strong></td>
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<tr>
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<td>Problem-Solving Lab 26-1: p. 715</td>
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**Section 26.2 Cnidarians**

<table>
<thead>
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<tbody>
<tr>
<td><strong>Objectives</strong></td>
<td></td>
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<tr>
<td>3. Distinguish the different classes of cnidarians.</td>
<td></td>
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<tr>
<td>4. Sequence the stages in the life cycle of cnidarians.</td>
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<tr>
<td>5. Evaluate the adaptations of cnidarians for obtaining food.</td>
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<tr>
<td><strong>Activities/Features</strong></td>
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<td>Problem-Solving Lab 26-2: p. 724</td>
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**Section 26.3 Flatworms**

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<thead>
<tr>
<th>NSES UCP</th>
<th>A.1, A.2, C.1, C.3, C.5-6, F.1, F.5; G.1, G.2 (1 session)</th>
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<tbody>
<tr>
<td><strong>Objectives</strong></td>
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<tr>
<td>6. Distinguish the adaptive structures of parasitic flatworms and free-living planarians.</td>
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<tr>
<td>7. Explain how parasitic flatworms are adapted to their way of life.</td>
<td></td>
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<tr>
<td><strong>Activities/Features</strong></td>
<td></td>
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<tr>
<td>Problem-Solving Lab 26-3: p. 727</td>
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<td>Inside Story: A Planarian, p. 728</td>
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<tr>
<td>Investigate BioLab: Observing Planarian Regeneration, p.734</td>
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**Section 26.4 Roundworms**

<table>
<thead>
<tr>
<th>NSES UCP</th>
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</tr>
</thead>
<tbody>
<tr>
<td><strong>Objectives</strong></td>
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<tr>
<td>8. Compare the structural adaptations of roundworms and flatworms.</td>
<td></td>
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<tr>
<td>9. Identify the characteristics of four roundworm parasites.</td>
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<tr>
<td><strong>Activities/Features</strong></td>
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<tr>
<td>MiniLab 26-2: Observing the Larval Stage of a Pork Worm, p. 732</td>
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<tr>
<td>Problem-Solving Lab 26-4: p. 733</td>
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</table>

**Teacher Classroom Resources**

**Section 26.1 Sponges**

- Reinforcement and Study Guide, p. 115
- Concept Mapping, p. 26
- Critical Thinking/Problem Solving, p. 26
- Content Mastery, pp. 129-132
- Section Focus Transparency 63
- Basic Concepts Transparency 46
- Basic Concepts Transparency 47

**Section 26.2 Cnidarians**

- Reinforcement and Study Guide, p. 116
- BioLab and MiniLab Worksheets, p. 117
- Laboratory Manual, pp. 187-188
- Section Focus Transparency 64
- Basic Concepts Transparency 45
- Basic Concepts Transparency 46
- Basic Concepts Transparency 47

**Section 26.3 Flatworms**

- Reinforcement and Study Guide, p. 117
- Laboratory Manual, pp. 189-190
- Content Mastery, pp. 129-132
- Section Focus Transparency 65
- Reteaching Skills Transparency 39

**Section 26.4 Roundworms**

- Reinforcement and Study Guide, p. 118
- BioLab and MiniLab Worksheets, pp. 118-120
- Content Mastery, pp. 129-132
- Section Focus Transparency 66

**Assessment Resources**

- Chapter Assessment, pp. 151-156
- MindJogger Videoquizzes
- Performance Assessment in the Biology Classroom
- Alternate Assessment in the Science Classroom
- Computer Test Bank
- BDOL Interactive CD-ROM, Chapter 26 quiz

**Materials**

- Levels
  - Level 1 activities should be appropriate for students with learning difficulties.
  - Level 2 activities should be within the ability range of all students.
  - Level 3 activities are designed for above-average students.
  - ELL activities should be within the ability range of English Language Learners.

- **GlencoTech**
  - Video: Ocean Cnidarians
  - Video: Coral Reefs
  - BioQuest: Biodiversity Park
  - Videsodic Program
  - Ocean Cnidarians
  - The Infinite Voyage
  - To the Edge of the Earth

**Index to National Geographic Magazine**

The following articles may be used for research relating to this chapter:


**Spanish Resources**

- English/Spanish Audiotapes
- Cooperative Learning in the Science Classroom
- Lesson Plans/Block Scheduling

**Additional Resources**

- Cooperative Learning in the Science Classroom
- Critical Thinking/Problem Solving
- Reinforcement and Study Guide
- Content Mastery
- MindJogger Videoquizzes
- Performance Assessment in the Biology Classroom
- Alternate Assessment in the Science Classroom
- Computer Test Bank
- BDOL Interactive CD-ROM, Chapter 26 quiz

**MATERIALS LIST**

- **BioLab** p. 734 planarian culture, petri dish, springwater, camel hair brush, microscope slide, stereomicroscope, single-edged razor blade, marking pencil
- **MiniLabs** p. 719 microscope, watch glass, drop-per, culture dish, hydra culture, brine shrimp culture, water p. 732 microscope, prepared slide of pork worm larvae

**Key to Teaching Strategies**

- Level 1 activities should be appropriate for students with learning difficulties.
- Level 2 activities should be within the ability range of all students.
- Level 3 activities are designed for above-average students.
- ELL activities should be within the ability range of English Language Learners.

**COOPERATION** Cooperative Learning activities are designed for small group work.

- These strategies represent student products that can be placed into a best-work portfolio.
- These strategies are useful in a block scheduling format.
Chapter 26

Sponges, Cnidarians, Flatworms, and Roundworms

**What You’ll Learn**
- You will compare and contrast the characteristics of sponges, cnidarians, flatworms, and roundworms.
- You will describe how sponges, cnidarians, flatworms, and roundworms are adapted to their habitats.

**Why It’s Important**
Sponges and cnidarians are two major groups of animals that are important to aquatic biology. Flatworms and roundworms include many species that cause diseases that affect both plants and animals.

---

**Gather butcher paper and colored markers for the Check for Understanding.**

---

**What Is a Sponge?**
Sponges are asymmetrical aquatic animals that have a variety of colors, shapes, and sizes. Many are bright shades of red, orange, yellow, and green. Some sponges are ball-shaped; others have many branches. Sponges can be as small as a quarter or as large as a door. Although sponges do not resemble more familiar animals, they carry on the same life processes as all animals. Figure 26.1 shows a natural sponge harvested from the ocean.

**Sponges are pore-bearers**
Sponges are classified in the invertebrate phylum Porifera, which means "bearer of pores." Of the 1000 described species of sponges, most live in the ocean, with only a few species found in freshwater environments.

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**Visual-Spatial! Have students observe the live freshwater sponge, Spongilla, with hand lenses. Ask students to note the asymmetrical shape of the sponge and its many pores. Explain that all sponges have a large number of pores.**

---

**Theme Development**
The themes of evolution and homeostasis are emphasized in this chapter. Evolutionary relationships among the animal phyla are stressed, as are adaptations to the environment and the homeostatic mechanisms at work in the different animals.

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**Resource Manager**
Section Focus Transparency 63 and Master LS EL LLL

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**L2**

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**L1**

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**L1**

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**Purpose**

Students will observe the basic features of a sponge and examine how it accomplishes filter feeding.

**Teaching Strategies**

- Explain that sponges obtain food in a process called filter feeding.
- Point out that food particles in water are pulled into collar cells and digested. Nutrients from food are then distributed by amoebocytes to other body cells.

**Critical Thinking**

Sponges carry on the same life processes as all animals. They are multicellular organisms that do not have cell walls around their cells.

**Resource Manager**

Basic Concepts Transparencies 43 and 46 and Concept Mapping, p. 26

Critical Thinking/Problem Solving, p. 26

---

**A Sponge**

Sponges have no tissues, organs, or organ systems. The body plan of a sponge is simple, being made up of only two layers of cells with no body cavity. Between these two layers is a jellylike substance that contains other cells as well as the components of the sponge’s internal support system. Sponges have four types of cells that perform all the functions necessary to keep them alive.

**Critical Thinking**

Why are sponges classified as animals?

1. **Occlusion**
   - Water and wastes are expelled through the osculum, the large opening at the top of the sponge. A sponge no bigger than a pen can move more than 20 L of water through its body per day.

2. **Pore cell**
   - Surrounding each pore is a single pore cell. Pore cells bring water carrying food and oxygen into the sponge’s body.

3. **Epithelial cell**
   - Epithelial cells are thin and flat, and they can respond to touch or irritants, chemical, and so on, by sticking up “pores” in the sponge.

4. **Speciﬁc cell**
   - Speciﬁcs are structures produced by other cells that form the support systems of sponges. Speciﬁc small, needlelike structures located between the cell layers of a sponge.

5. **Amoebocytes**
   - Amoebocytes, located between the two cell layers of a sponge, carry nutrients to other cells, aid in reproduction, and produce chemicals that help make up the spicules of sponges.

6. **Collar cell**
   - Living the interior of sponges are collar cells. Each collar cell has a flagellum that whips back and forth, drawing water through the pores of the sponge.

---

**Materials**

stereomicroscope, forceps, balance, wax marking pencil, 150 mL beakers, Petri dish bottoms, sea sponges (one piece each of four different types: grass, yellow, sheep’s wool, hard head—each piece 3 cm X 3 cm X 2 cm), unused synthetic sponges (one piece each of four different types—each piece 3 cm X 3 cm X 2 cm)

**Procedure**

Give students the following directions.

1. Examine each piece of sponge at its thinnest point under the microscope.
2. Draw the skeletal framework of each sponge. Label each sponge piece.
3. Predict which type of sponge will hold more water. Base your prediction on microscopic examination of the sponge structures.
4. Place each sponge piece in a Petri dish and obtain its mass. Soak each sponge piece in a beaker of water for 10 minutes and again obtain the mass of each sponge. Calculate the mass of the water absorbed by each sponge. Compare the data for all sponges.

**Expected Results**

Natural sponges have greater water-holding capacity than synthetic sponges.

**Analysis**

1. Which sponges, natural or synthetic, have greater water-holding capacity?
2. Of what adaptive value is it for a sponge to be able to take in large amounts of water? They are filter feeders. Taking in more water increases the chances of taking in more food.

---

**Problem-Solving Lab 26-1**

**Applying Concepts**

Why are there more species of marine sponges than freshwater sponges? Most sponges are marine. They live in a saltwater environment. It is an advantage for sponges to live in a marine environment rather than in a freshwater environment. A series of statements is provided below. Read them over and then answer the questions that follow.

**Analysis**

A. The internal tissues of marine organisms are isotonic with their surroundings.
B. Oceans do not have problems with rapid changes in velocity (rate of flow) of water.
C. Young marine animals often spend the early part of their life cycles as free-floating organisms.

---

**Thinking Critically**

1. Using statement A, how might a freshwater environment vary from a marine environment? How might this be a disadvantage for freshwater sponges?
2. Using statement B, how might a freshwater environment vary from a marine environment? How might this be a disadvantage for freshwater sponges?
3. Using your collective answers, explain why few sponge species are found in freshwater environments.

---

**Assessment**

Portfolio Ask students to research the number of sponge species that live in freshwater environments.

**Assessment**

Skill Design and conduct an experiment to determine whether the temperature of water affects the water-holding capacity of a sponge. Use the Performance Task Assessment List for Designing an Experiment in PASG, p. 23.
Most sponges reproduce sexually. Some sponges have separate sexes, but most sponges are hermaphrodites. A hermaphrodite (Hermi-aphrodite) is an individual animal that can produce both eggs and sperm. Hermaphroditism increases the likelihood of fertilization in sessile or slow-moving animals. Eggs and sperm are formed from amoebocytes. During reproduction, sperm released from one sponge can be carried by water currents to another sponge, where fertilization may occur.

Fertilization in sponges may be either external or internal. A few sponges have external fertilization, in which the eggs and sperm are both released into the water; fertilization occurs outside the animal’s body. Most sponges have internal fertilization, in which eggs remain inside the animal’s body, and sperm are carried to the eggs in the flow of water. In sponges, the collar cells collect the sperm and transfer them to amoebocytes. The amoebocytes then transport the sperm to ripe eggs. Most sponges reproduce sexually through internal fertilization. The result is the development of free-swimming, flagellated larvae, shown in Figure 26.3.

Some freshwater sponges that live in temperate waters produce seedlike gemmules, called gemmules, in the fall. The adult sponges die over the winter, but the gemmules survive and grow into new sponges in the spring.

Support and defense systems in sponges

Sponges are soft-bodied invertebrates, yet they can be found in waters as deep as 8500 m. You might think that the water pressure at such depths would flatten sponges, yet they all have an internal support system that helps them withstand such pressure. Some sponges have sharp, hard spicules located between the cell layers. Spicules may be made of glasslike material or of calcium carbonate. Some species, such as the coral sponge shown in Figure 26.4, have thousands of tiny, sharp, needlelike spicules that make them hard for animals to eat. Other sponges have an internal skeleton made of silica or of spongian, a fibrous proteinlike material. Sponges can be classified according to their spicules and/or skeletons.

Besides sharp spicules, some sponges may have other methods of defense. Some tropical sponges contain chemicals that are toxic to fish and to other predators. Many sponges produce toxins that are poisonous to sharks. Scientists are studying sponge toxins to identify those that possibly could be used as medicines.


What Is a Cnidarian?
Cnidarians (ni DARE uns) are a group of marine invertebrates made up of more than 9000 species of jellyfish, corals, sea anemones, and hydras. Cnidarians can be found worldwide, but coral species generally prefer the warmer oceans of the South Pacific and the Caribbean.

Cnidarians have radial symmetry
Though cnidarians are a diverse group, all possess the same basic body structure, which supports the theory that they had a single origin. All cnidarians have radial symmetry.

A cnidarian’s body is made up of two cell layers with one body opening. The cell layers of cnidarians are organized into separate tissues with specific functions. Cnidarians have a simple nervous system, and both cell layers have cells that can contract as though they were muscles. The two cell layers of a cnidarian are derived from the ectoderm and endoderm of the embryo. The ectoderm of the cnidarian embryo develops into a protective outer layer of cells, and the endoderm is internal and adapted mainly to assist in digestion.

Cnidarians display only two basic body forms, which occur at different stages of their life cycles. These two forms are the polyp and medusa, **Figure 26.5**. A polyp (POL up) is the stage with a tube-shaped body and a mouth surrounded by tentacles. A medusa (MEE dus uh) is the stage with a body shaped like an umbrella with tentacles hanging downward. The hydra has a typical polyp body form. How do hydras capture their food? You can find out by reading the Inside Story on the next page.

In cnidarians, one body form may be more conspicuous than the other. In jellyfishes, for example, the medusa stage is the dominant body form. The polyp stage of a jellyfish is small and not very noticeable. In hydras, the polyp stage is dominant, with a small and delicate medusa stage. The coral and sea anemones have only the polyp stage.

**Digestion in Cnidarians**
Cnidarians are predators that capture or poison their prey with nematocysts. A nematocyst (nih MAY uh shis) is a capsule that contains a coiled, threadlike tube. The tube may be sticky or barbed, and it may contain toxic substances. Nematocysts, located in stinging cells, are discharged like toy poppoms, but much faster, in response to touch or chemicals in the environment. Prey organisms are then taken in for digestion.

In cnidarians, you can see the origin of a digestive process similar to that of animals that evolved later. Once captured by nematocysts on the ends of tentacles, prey is brought to the mouth by contraction of the tentacles. The inner cell layer of cnidarians surrounds a space called a gastrovascular cavity (gas troh VACK yuh kleh) in which digestion takes place. Cells adapted for digestion line the gastrovascular cavity and release enzymes over the newly captured prey. Any undigested materials are ejected back out through the mouth. This process is called extracellular digestion.

### Building Models

**Inside Story**

**Figure 26.5** The two basic forms of cnidarians are the polyp form (a) and the medusa form (b).

Hydra **(HR uh duh)** is a bell-shaped cnidarian that has a stalk and a mouth. You can observe a cnidarian feeding in the **MiniLab 26-1 Observing Hydra**.

1. Place brine shrimp in a culture dish of freshwater to avoid introducing salt into the watch glass.
2. Add a drop of brine shrimp to the watch glass while continuing to observe the Hydra through the microscope.
3. Observe the Hydra under low-power magnification.
4. Look at the Hydra with the focused light source.

Hydra are available from biological supply houses. Add pieces of broken glass to the original container, and observe how students observe the animals. Hydra will cling to glass fragments. Remove the glass to allow students to follow the glass as it is digested by Hydra in an attempt to disperse the animals.

1. Hatch brine shrimp from eggs 2 to 3 days prior to classroom use.

Analysis

1. Describe how the hydra is captured and fed upon.
2. Is your hypothesis supported or rejected?
3. Sequence the events that take place when a hydras captures and feeds upon its prey.
4. Explain how your observations support the fact that hydras have both nervous and muscular systems.

1. Explain how your observations support the fact that hydras have both nervous and muscular systems.

### Assessment

**MiniLab 26-1 Observing Hydra**

- **Watching Hydra Feeds**
- **Hydra are carnivores**. They show the typical polyp body plan and symmetry associated with all members of this phylum. Observe how they capture their food.

- **Procedure**
  1. Use a dropper to place a hydras into a watch glass filled with water. Watch several minutes for the animal to adapt to its new surroundings. CAUTION: Use caution when working with a microscope and glassware.
  2. Observe the hydras under low-power magnification.
  3. Formulate a hypothesis as to how this animal obtains its food, and observe its behavior.
  4. Place brine shrimp in a culture dish of freshwater to avoid introducing salt into the watch glass.
  5. Observe the hydras under high-power magnification.
  6. Note which structures the hydras use to capture food.

**Analysis**

1. Describe how the hydras captured and fed upon their prey.
2. Use your hypothesis supported or rejected?
3. Sequence the events that take place when a hydras captures and feeds upon its prey.
4. Explain how your observations support the fact that hydras have both nervous and muscular systems.

1. Explain how your observations support the fact that hydras have both nervous and muscular systems.

### Assessment

**MiniLab 26-1 Observing Hydra**

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**Analysis**

1. Describe how the hydras captured and fed upon their prey.
2. Use your hypothesis supported or rejected?
3. Sequence the events that take place when a hydras captures and feeds upon its prey.
4. Explain how your observations support the fact that hydras have both nervous and muscular systems.

1. Explain how your observations support the fact that hydras have both nervous and muscular systems.
Cnidarians display a remarkable variety of colors, shapes, and sizes. Some can be as small as the tip of a pencil. The flowerlike forms of sea anemones are often brilliant shades of red, purple, and blue. Most cnidarians go through both the polyp and medusa stages at some point in their life cycles.

Critical Thinking
How is having poisonous stinging cells an advantage for a sessile organism?

Oxygen enters cells directly
Because of a cnidarian’s simple, two-cell-layer body plan, as shown in the Inside Story, no cell in its body is ever far from water. Oxygen dissolved in water diffuses directly into the body cells, and carbon dioxide and other wastes diffuse out of the cells directly into the surrounding water.

Nervous regulation in cnidarians
Cnidarians have a simple nervous system called a nerve net. A nerve net conducts nerve impulses from all parts of the cnidarian’s body, but there is no control center such as the brain found in other animals. The impulses from the nerve net bring about contractions of musclelike cells in the tentacles and body of a cnidarian. For example, when touched, a hydra reacts by contracting its musclelike cells.

Reproduction in cnidarians
All cnidarians have the ability to reproduce sexually and asexually. Sexual reproduction occurs in only one phase of the life cycle, usually the medusa stage, unless there is no medusa stage. Asexual reproduction may occur in either the polyp or medusa stage. Cnidarians that remain in the polyp stage, such as hydras, corals, and sea anemones, can reproduce sexually as polyps. Polyps reproduce asexually by a process known as budding, as shown in Figure 26.6.

The most common form of reproduction in cnidarians can be illustrated by the life cycle of a jellyfish, shown in Figure 26.7 on the next page. As you can see, the sexual medusa stage alternates with the asexual polyp stage, from generation to generation. Male medusae release sperm and female medusae release eggs into the water, where fertilization occurs. The resulting zygote develops into an embryo and then into a larva. Recall that a larva is an intermediate stage in animal development. The free-swimming larva eventually settles and grows into a polyp, which, in turn, reproduces asexually to form new medusae. Even though these two stages alternate in a cnidarian life cycle, this form of reproduction is not alternation of generations as seen in plants because cnidarians are diploid animals in both medusa and polyp stages.

Figure 26.6
The main form of reproduction in polyps is budding. During this process, small buds grow as extensions of the body wall (a). In some species, such as corals, a colony develops as the buds break away and settle nearby (b).

Budding Hydra
Visual-Spatial Have students examine prepared slides of budding hydra under a microscope. Ask them to make scientific drawings of the hydra in their biology journals.
Building a Model

Kinesthetic Have student groups make clay or salt dough (one part salt, one part flour, one part water) models of the life cycle of a jellyfish. Tell them that when they are finished you will ask the group questions about the jellyfish life cycle. They will need to use their models to demonstrate their answers. Remind students to wear safety goggles and an apron when handling modeling materials.

Reinforcement

Make a transparency of Figure 26.7 with just the figures. Write out the captions before you make the transparency and number each figure. Ask students to make a list of corresponding numbers on a sheet of paper and describe each stage.

GLENCOE TECHNOLOGY

VIDEO DISC

The Secret of Life Life Cycle of a Jellyfish

Resource Manager

Basic Concepts Transparency 47 and Master L1 L2

Reinforcement and Study Guide, p. 116 E3

Content Mastery, p. 130 L1

Laboratory Manual, pp. 197-188 E2

Diversity of Cnidarians

Most of the 9000 described species of cnidarians belong to one of three classes: Hydrozoa, Scyphozoa, and Anthozoa.

Most hydrozoans form colonies

The class Hydrozoa includes two groups—the hydroids, such as hydra, and the siphonophores, including the Portuguese man-of-war. Most hydroids consist of branching polyp colonies that have formed by budding. The siphonophores include floating colonies that drift on the ocean's surface as well as colonies that form swimming medusae. Hydrozoans have open gastrovascular cavities with no internal divisions. It's difficult to understand how the organism shown in Figure 26.8 could be a closely associated group of individual animals. The Portuguese man-of-war, Physalia, is an example of a siphonophore hydrozoan colony. Each individual in a Physalia colony has a different function that helps the entire organism survive. For example, just one individual forms a large, blue, gas-filled float. Regulation of the gas in the float allows the colony to dive to lower depths or rise to the surface. Other polyps hanging from the float have different functions, such as reproduction and feeding. The polyps all function together for the survival of the colony.

Scyphozoans are the jellyfishes

Have you ever seen a jellyfish like the one shown in Figure 26.9? Some jellyfishes are transparent, but others are pink, blue, or orange. The medusa stage is dominant in this class. Like other cnidarians, scyphozoans have musclelike cells in their outer cell layer that can contract. When these cells contract together, the medusa contracts, which propels the animal through the water. The fragile and sometimes luminescent bodies of jellyfishes can be beautiful, but most people know about jellyfishes more by their painful stings. Jellyfishes can be found everywhere in the oceans, from arctic to tropical waters, and have been seen as deep as 1000 m. The gastrovascular cavity of scyphozoans has four internal divisions. Most anthozoans build coral reefs

Anthozoans are cnidarians that exhibit only the polyp form. All anthozoans have many divisions in their gastrovascular cavity. Sea anemones are anthozoans that live as individual animals. Sea anemones are thought to live for centuries. Some tropical sea anemones may have a diameter of more than a meter. Sea anemones can be found in tropical, temperate, and arctic seas. Corals are anthozoans that live in colonies of polyps in warm ocean waters around the world. They secrete cuplike calcium carbonate (limestone) shelters around their soft bodies for protection. Colonies of many coral species build the beautiful coral reefs that provide food and shelter for many other marine species. When a coral polyp dies, the limestone skeleton it leaves behind adds a tiny piece to the structure of the reef. The living portion of a coral reef is a thin, fragile layer that grows on top of the skeletons left behind by the ocean's current.

Visual Learning

Naturalist Show students a few examples of prehistoric swims and cnidarians. Have them make a chart listing the type of animal, structural features they used to identify the animal, and adaptations the animal has that make it suited to its environment.

BIOLOGY JOURNAL

Coral Art

Visual-Spatial Ask students to design a postage stamp that will commemorate coral animals' importance, and beauty. Give students colored markers and plain white paper. Remind them that little can be written on a postage stamp. Provide photos of corals. Have students place their designs in their journals.

Meet Individual Needs

Learning Disabled

Visual-Spatial Ask a group of students to visit a saltwater aquarium, either at a pet shop, restaurant, zoo, or marine park, and take photographs for a photo essay about sea anemones. You might also provide a preserved anemone for them to dissect.

Gorgonian Corals and Fish

Figure 26.7 In the cnidarian life cycle, a free-swimming larva develops into a polyp. The structure of this larva gives scientists clues about the origin of cnidarians.

One by one, the tiny medusae break away from the parent polyp, and, when they mature, the cycle begins again.

The zygoite grows and develops into a met istula. The bilamellate becomes a free-swimming larva. The larva, covered with cilia, swims to an area suitable for attachment and settles.

In the asexual phase, a polyp grows and begins to form buds that become tiny medusae. As the buds build up, the polyp resembles a stack of plates.

Figure 26.8 The jellyfish Chrysaora hyoscella has the common name compass jellyfish due to the radiating brown lines on its medusa.

Figure 26.9 The jellyfish Physalia physalis is a colonial hydrozoan.

Figure 26.10 Some scyphozoan jellyfishes are found primarily in tropical waters, but they sometimes drift into temperate waters where they may be washed up on shore.
Factors are interrelated. Review the meaning of symbiotic relationships. Algae and corals have a mutualistic relationship with zooxanthellae. The effects of abiotic factors on organisms are usually related. For example, temperature and levels of illumination in an ocean vary with depth.

Thinking Critically
1. Identify the abiotic and biotic factors being studied in this ocean environment.
2. In Graph A, what seems to be the correlation between number of coral species present and depth?
3. In Graph B, what seems to be the correlation between number of species present and the temperature?
4. In Graph A, what seems to be the correlation between number of coral species present and depth? Use actual numbers from the graph in your answer.
5. What are the advantages of a two-layered body plan in cnidarians?

3 Assess
Check for Understanding
Have students draw a hydra cross section and add arrows to show the exchange of oxygen and carbon dioxide and how food reaches all cells.

Reteach
Interpersonal Draw a football field on the chalkboard. Divide the class into two teams. Ask questions about cnidarians. If a student answers correctly, advance the ball 10 yards towards that team’s goalpost. If the answer is not correct, the question goes to the other team. The team that reaches its goalpost first wins.

Extension
Have students write about the different ways that corals obtain food. Ask them to describe how each one of these food-getting strategies are used during a 24-hour cycle.

Assessment
Performance Ask students to make a travel brochure for tourists who wish to see cnidarians. They should include all cnidian groups in their brochure. Use the Performance Task Assessment List for Booklet or Pamphlet in PASC, p. 57.

4 Close
Activity
Have students observe the movement of a live hydra in a deep-well 35 mm projector slide on a slide projector. Ask them to review the adaptations of the hydra to its environment.

Problem-Solving Lab 26.2
Objective
Students will study two graphs that show how certain abiotic factors influence the location of coral species.

Process Skills
Think critically, interpret data, compare and contrast, make and use graphs

Teaching Strategies
Review the meaning of symbiosis and mutualism, abiotic and biotic factors.

Suggest to students that they analyze each graph separately. However, point out that abiotic factors are interrelated.

Thinking Critically
1. Abiotic—ocean depth, temperature, biotic—coral
2. The number of coral species decreases rapidly until about 20 m, when it levels off.
3. Temperatures between 22°C and 30°C seem to be more favorable to coral diversity. Fewer species survive at temperatures below 22°C.
4. Zooxanthellae require sunlight in order to carry out photosynthesis. The corals live near the surface of the ocean. Temperature decreases as depth increases. In tropical regions, corals that live close to the surface are more likely to be exposed to high temperatures and, therefore, are more at risk for bleaching.

The earliest known cnidarians date to the Precambrian Era, about 610 million years ago. Because cnidarians are soft-bodied animals, they do not preserve well as fossils, and their origins are not well understood. The earliest coral species were not reef builders, so reefs cannot be used to date early cnidarians. The larval form of cnidarians resembles protists, and because of this, scientists consider cnidarians to have evolved from protists.

Origins of Sponges and Cnidarians
As shown in Figure 26.11, sponges represent an old animal phylogeny. The earliest fossil evidence for sponges dates this group to the Paleozoic Era, about 700 million years ago. Scientists infer that sponges may have evolved directly from a group of flagellated protozoans that today resemble the collar cells of sponges.

Section Assessment
Understanding Main Ideas
1. Compare the medusa and polyp forms of cnidarians.
2. Diagram the reproductive cycle of a jellyfish.
3. What are the advantages of a two-layered body plan in cnidarians?
4. How are corals different from other cnidarians?

Thinking Critically
5. Coral reefs are being destroyed at a rapid rate. What effect would you expect the destruction of a large coral reef to have on other ocean life?

Activity
In a table, distinguish the main groups of cnidarians, list their characteristics, and give examples of a member from each group. For more help, refer to Organizing Information in the Skill Handbook.

Section Assessment
1. Polyps, the sessile stage of cnidarians, have a mouth that points downward. The medusa, the free-swimming stage, has a mouth pointing downward.
2. Make sure students follow the steps shown in Figure 26.7.
3. The cell layers of cnidarians are organized into separate tissues, which enable an animal to be more efficient in carrying out life functions.
4. Corals secrete calcium carbonate shelters around their bodies.
5. Other ocean life will be destroyed.
6. Make sure students have listed the characteristics and examples of the three cnidarian groups.

3 Assess
Check for Understanding
Have students draw a hydra cross section and add arrows to show the exchange of oxygen and carbon dioxide and how food reaches all cells.

Reteach
Interpersonal Draw a football field on the chalkboard. Divide the class into two teams. Ask questions about cnidarians. If a student answers correctly, advance the ball 10 yards towards that team’s goalpost. If the answer is not correct, the question goes to the other team. The team that reaches its goalpost first wins.

Extension
Have students write about the different ways that corals obtain food. Ask them to describe how each one of these food-getting strategies are used during a 24-hour cycle.

Assessment
Performance Ask students to make a travel brochure for tourists who wish to see cnidarians. They should include all cnidian groups in their brochure. Use the Performance Task Assessment List for Booklet or Pamphlet in PASC, p. 57.

4 Close
Activity
Have students observe the movement of a live hydra in a deep-well 35 mm projector slide on a slide projector. Ask them to review the adaptations of the hydra to its environment.
Section 26.3 Flatworms

Prepare

Key Concepts
- In this section, students will study the adaptive structures of parasitic flatworms and planarians. They will learn about how these worms are adapted to their environments.

Planning
- Purchase single-edged razors and spring water for the BioLab.

1 Focus

Bellringer

Before presenting the lesson, display Section Focus Transparency 65 on the overhead projector and have students answer the accompanying questions.

SECTION PREVIEW

Objectives
- Distinguish the adaptive structures of parasitic flatworms and free-living planarians.
- Explain how parasitic flatworms are adapted to their way of life.

Vocabulary
- pharynx
- regeneration
- ciliated

What Is a Flatworm?

To most people, the word worm describes a long, spaghetti-shaped animal. Many animals have this general appearance, but now it is understood that many wormlike animals can be classified into different phyla. The least complex worms belong to the phylum Platyhelminthes. Figure 26.12. These flatworms are acelomates with thin, solid bodies. The most well-known members of this phylum are the parasitic tape-worms (class Cestoda) and flukes (class Trematoda), which cause diseases in other animals, among them frogs and humans. The most commonly studied flatworms in biology classes are the free-living planarians (class Turbellaria). You can learn about the evolutionary relationships among these classes of flatworms in the Problem-Solving Lab on this page. Flatworms range in size from 1 mm up to several meters. There are approximately 14 500 species of flatworms found in marine and freshwater environments and in moist habitats on land.

Feeding and digestion in planarians

A planarian feeds on dead or slow-moving organisms. It extends a tube-like, muscular organ, called the pharynx (pronounced "fear-inks"), out of its mouth. Enzymes released by the pharynx begin digesting food outside the animal’s body. Then food is sucked into the gastrovascular cavity, where food particles are broken up. Cells lining the digestive tract obtain food by phagocytosis. Food is thus digested in individual cells.

Nervous control in planarians

Some flatworms have a nerve net, and others have the beginnings of a central nervous system. A planarian has a nervous system that includes two nerve cords that run the length of its body, as you can see in Figure 26.13, sensory pits that detect chemicals and movement in water, and eyespots that detect light and dark. At the anterior end of the nerve cord is a small swelling called a ganglion. Located in the head, the ganglion receives messages from the eyespots and sensory pits, then communicates with the rest of the body along the nerve cords. Messages from the nerve cords trigger responses in a planarian’s muscle cells. The nervous system enables a planarian to respond to the stimuli in its environment.

2 Teach

Process Skills
- think critically, predict

Teaching Strategies
- Students may need additional help in understanding the nature of the three diagrams.
- Student groups of 2 or 1 may work well for this activity.

ThinkingCritically

One of the three evolutionary patterns is correct. Pick the one that you consider to be correct. Defend your answer by explaining your reasoning. Include in your answer why the other two could not be correct.

Assessment

Knowledge Ask students to describe those traits that flatworms do and do not share with cnidarians. Use the Performance Task Assessment List for Making Observations and Inferences in PASC, p. 17. [2]

ResourceManager

Section Focus Transparency 65 and Master [L1 L2]

Laboratory Manual: pp. 189-190 [L2]

PROJECT

Planarian Behavior
- Kinetoscope: Have students design experiments that explore planarian behavior. They might investigate responses to food, touch, heat, cold, or other variables. Make sure they plan experiments in which there is only one variable, a control, and quantitative data to be collected.

Portfolio

Marine Flatworms
- Linguistic: Have students visit a marine aquarium, zoo, or pet store specializing in saltwater species to research marine flatworms. Have them write a summary of their findings to include in their portfolios.

GLENCOETechnology

VIDEODISC The Secret of Life Flatworm Cross Section
Critical Thinking

Why is having a head an advantage to a swimming animal?

Pharynx

The pharynx is a muscular tube that can be extended outside the animal’s body through its mouth. It is used to suck food into the planarian’s gastrointestinal cavity. Notice that the mouth is a body opening located in the midsection of the planarian.

Head

Flatworms have a clearly defined head. The head senses and responds to changes in the environment.

Sensory pits

Located on the sides of the head, these pits are used to detect food, chemicals, and movements in the environment.

Mouth

Located in the midsection of the planarian, it is adapted to obtaining food by drawing in water and food particles. The mouth has a muscular pharynx extending from it. The pharynx and mouth work together to suck food in and expel wastes.

Flame cells

Excess water is removed from the planarian’s body by a system of flame cells. The water from flame cells collects in tubules and leaves the body through pores on the body surface. Flame cells are so named because the constant movement of the cilia inside flame cells resembles the flickering of a candle’s flame.

Cilia

Hairlike cilia are located on the ventral surface of planarians. Cilia help the worm to pull itself along.

Eyespots

Eyespots are sensitive to light and enable the animal to respond to the amount of light present.

Regeneration

If a planarian is cut horizontally, the section containing the head will grow a new tail, and the tail section will grow a new head. Thus, a planarian that is damaged or cut into two pieces may grow into two new organisms—a form of asexual reproduction. Go to the BioLab at the end of this chapter to observe regeneration in planarians.

Feeding and digestion

in parasitic flatworms

Although the basic structure of a parasitic flatworm is similar to that of a planarian, it is adapted to obtaining nutrients from inside the bodies of its hosts. The organism can be free-living or parasitic, examples.

Reproduction

In planarians, asexual reproduction (proh GLAH tihd) is asexual reproduction. Thus, a planarian that is damaged or cut into two pieces, each half can regenerate the missing half through their ability to regenerate parts of their body. New flatworms consist of 2000 proglottids.

Flatworm Life Cycles

Flatworms are free-living flatworms. Tapeworms and flukes are parasitic flatworms. These parasites live in the bodies of many vertebrates including dogs, cats, cattle, monkeys, and people.

Tapeworm bodies have sections

Some adult tapeworms that live in animal intestines can grow to more than 10 meters in length. The body of a tapeworm is made up of a head and individual repeating sections called proglottids, shown in Figure 26.14. A proglottid (proh GLAH tihd) is a detachable section of a tapeworm that contains muscles, nerves, flame cells, and male and female reproductive organs. Each proglottid may contain up to 100 000 eggs, and some tapeworms consist of 2000 proglottids.

How is having a head an advantage to a swimming animal?

1. Head

Flatworms have a clearly defined head. The head senses and responds to changes in the environment.

2. Sensory pits

Located on the sides of the head, these pits are used to detect food, chemicals, and movements in the environment.

3. Mouth

Located in the midsection of the planarian, it is adapted to obtaining food by drawing in water and food particles. The mouth has a muscular pharynx extending from it. The pharynx and mouth work together to suck food in and expel wastes.

4. Flame cells

Excess water is removed from the planarian’s body by a system of flame cells. The water from flame cells collects in tubules and leaves the body through pores on the body surface. Flame cells are so named because the constant movement of the cilia inside flame cells resembles the flickering of a candle’s flame.

5. Cilia

Hairlike cilia are located on the ventral surface of planarians. Cilia help the worm to pull itself along.

6. Eyespots

Eyespots are sensitive to light and enable the animal to respond to the amount of light present.

7. Regeneration

If a planarian is cut horizontally, the section containing the head will grow a new tail, and the tail section will grow a new head. Thus, a planarian that is damaged or cut into two pieces may grow into two new organisms—a form of asexual reproduction. Go to the BioLab at the end of this chapter to observe regeneration in planarians.

8. Feeding and digestion

in parasitic flatworms

Although the basic structure of a parasitic flatworm is similar to that of a planarian, it is adapted to obtaining nutrients from inside the bodies of its hosts. The organism can be free-living or parasitic, examples.

9. Reproduction

In planarians, asexual reproduction (proh GLAH tihd) is asexual reproduction. Thus, a planarian that is damaged or cut into two pieces, each half can regenerate the missing half through their ability to regenerate parts of their body. New flatworms consist of 2000 proglottids.
**Section 26.4 Roundworms**

**Key Concepts**

Students will compare and contrast the structural adaptations of roundworms and learn about the characteristics of the roundworms Ascaris, Trichinella, hookworms, and pinworms.

**Planning**

- Obtain a live vinegar eel culture for the Quick Demo.

**Reseat**

In their groups, some have students draw and label the structures of a planarian. Have other students diagram the life cycle of Taenia solium or the Schistosoma fluke.

**Extension**

- Interpersonal: Ask a group of students to interview a veterinarian and report on the procedures for diagnosing and treating parasitic worms in pets.

**Assessment**

- Knowledge: Have students assume they are preparing an exhibit about planarians for a science fair. Ask them to design and construct their exhibit. Have them label the structures of a planarian. Have other students sketch the roundworm in one of the columns and explain how the structures of the roundworm discussed in the left column are adapted for that role. Have students construct a table that lists the names of each roundworm parasites. Vocabulary: roundworm, enter their snail hosts.

**Activity**

Show students a selection of one-frame cartoons about animals by Gary Larson. Ask them to design a cartoon about planarians that is humorous and scientifically accurate.

**Resource Manager**

Reteaching Skills Transparency 39 and Master 1. Make sure students have labeled the head, eyespots, sensory pits, cilia, flame cells, mouth, and pharynx.

2. They live in intestines surrounded by digested food.

3. It enables the worm to sense food and appropriate habitat as it swims.

4. Tapeworms have mouthparts with hooks while planarians have a pharynx that can extend out of the mouth. Tapeworms do not have complex nervous or muscular tissue, whereas planarians have these tissues. Tapeworms have a knob-shaped head and a body made up of segments called proglottids but have no digestive system.

5. Workers could wear boots and gloves. Human wastes should be kept out of the area where they mature. Fertilized eggs pass out of the intestine and the cycle begins again.

6. This organism would most likely be a parasite that attaches to its host by means of suckers, or hooks and uses food that the host has already digested.

**What Is a Roundworm?**

Roundworms belong to the phylum Nematoda. They are widely distributed, living in soil, animals, and both freshwater and saltwater environments. More than 12,000 species of roundworms are known to scientists. Most roundworm species are free-living, but many are parasitic, including those shown in Figure 26.16. In fact, virtually all plant and animal species are affected by parasitic roundworms. Roundworms are tipped at both ends. They have a thick outer covering that protects them from being digested.

**Diagram and label the structures of a planarian.**

**Thinking Critically**

5. Examine the life cycle of a parasitic fluke, and suggest ways to prevent infection on a rice farm.

6. Observing and Inferring. What can you infer about the way the life of an organism that has no mouth or digestive system, but is equipped with a sucker? For more help, refer to Thinking Critically in the Skill Handbook.

**Section Assessment**

- Understanding Main Ideas
  1. Diagram and label the structures of a planarian.
  2. Why don’t tapeworms have a digestive system?
  3. What is the adaptive advantage of a nervous system to a free-living flatworm?
  4. How is the body of a tapeworm different from that of a planarian?

- Critical Thinking
  5. Examine the life cycle of a parasitic fluke, and suggest ways to prevent infection on a rice farm.

- Skills
  6. Observing and Inferring: What can you infer about the way life of an organism that has no mouth or digestive system, but is equipped with a sucker? For more help, refer to Thinking Critically in the Skill Handbook.

**Gifted/Visually Impaired/ Learning Disabled**

**Kinesthetic** Have gifted students make clay models of the worms studied in this section. Provide these models to students who have visual problems or learning disabilities for use in studying these organisms.

**Portfolio**

**Roundworm Data Table**

- Have students construct a table like the one shown in the left column. Have students sketch the roundworm in the second column, describe its habitat in the third column, and explain how the worm affects humans in the fourth column.
Warm-up

Origin

Trichinae. From the Greek word “trichinos” meaning “made of hair.” Trichinella species are slender, hair-like roundworms.

MiniLab 26-2

1. Observing the Larval Stage of a Pork Worm You can observe the larval stage of a pork worm [Trichinella spiralis] embedded within the muscle tissue of the host. It will look like a curled up hot dog surrounded by muscle tissue.

Procedure

1. Examine a prepared slide of pork worm larvae under the low-power magnification of your microscope.
2. Label a larval bay by locating the spiral worms “enclosed in a sac.” All other muscle tissue is rounded.
3. Estimate the size of the larva in mm.

Analysis

1. Describe the appearance of a pork worm larva.
2. Why might it be difficult to find larva embedded in muscle when meat inspectors use visual checking methods in packing houses to screen for pork worm contamination?

2. Diversity of Roundworms

Roundworms are parasites in most organisms on Earth. These free-living species are a common occurrence in many species, including parasites.

3. Process Skills

To identify, observe, and describe the life cycle stages of a roundworm, students must be able to observe, describe, and analyze data from a diagram of the pork worm life cycle.

4. Problem-Solving Lab 26-4

Purpose

Students will study a diagram of the pork worm life cycle.

Process Skills

apply concepts, think critically, interpret scientific diagrams

Teaching Strategies

■ Prepare slides of pork worm larvae available from biological supply houses.

■ Certain larvae will appear as round segments due to the plane of sectioning. Size of the larva will be close to 100 mm.

Analysis

1. Roundworm, microscopic, round, like a hot dog, spiral
2. Pork worm larvae are microscopic and cannot be identified by a visual inspection.
3. Samples of muscle tissue can be taken and viewed under a microscope.

Assessment

Portfolio Students have put their diagrams in their portfolios. Use the Performance Test Assessment List for Science Portfolio in PASC, p. 105.

Understanding Main Ideas

1. Compare the body structures of roundworms and flatworms.
2. Why do parents teach children to wash their hands before eating?
3. Describe the method of infection of one human roundworm parasites.
4. Compare how Ascaris and Trichinella are transmitted.

Thinking Critically

1. An infection of pinworms is spreading to children who attend the same preschool. Make a list of precautions that could be taken to help prevent its continued spread.

2. The cycle ends here in humans. Any larva in human muscle tissues remain there digested by their host organisms. On a flat surface, roundworms look like tiny, wriggling bits of sewing thread. They lack circular muscles but have pairs of lengthwise muscles. As one muscle of a pair contracts, the other muscle relaxes. This alternating contraction and relaxation of muscles causes roundworms to move in a thrashing fashion.

Roundworms have a pseudocoelom and are the simplest animals with a tubelike digestive system. Recall that a pseudocoelom is a body cavity partly lined with mesoderm. Unlike flatworms, roundworms have two body openings—a mouth and an anus. The free-living species have well-developed sense organs, such as eyespots, although these are reduced in parasitic forms.

Diversity of Roundworms

Roundworms are parasites in most organisms on Earth. Approximately half of the described roundworm species are parasitic and about 30 species infect humans.

Roundworm parasites invade humans through a variety of methods

- Avuls predominantly infects children who swallow eggs when they put their soiled hands into their mouths or eat vegetables that have not been washed.
- Hookworms cause people to feel weak and tired due to blood loss.
- Pinworms are the most common parasites in children. Pinworms invade the intestinal tract when children or something that has come in contact with contaminated soil.

4. Section Assessment

Understanding Main Ideas

1. Compare the body structures of roundworms and flatworms.
2. Why do parents teach children to wash their hands before eating?
3. Describe the method of infection of one human roundworm parasite.
4. Compare how Ascaris and Trichinella are transmitted.

Thinking Critically

1. An infection of pinworms is spreading to children who attend the same preschool.

Section Assessment

How can the pork worm parasite be controlled? Trichinellosis, the pork worm, is contracted when humans eat raw or undercooked pork products.

Analysis

- This diagram shows the life cycle of the pork worm. A cycle is a protective covering that encloses the dormant larval stage.
- Life cycle of a Pork Worm
- Events in Pigs
- Uncooked pig scraps with larvae are fed to pigs.
- Larvae are released from cysts during digestion.
- Larvae mature, mate, and produce thousands of new larvae.
- Larvae travel in blood streams to muscles and form cysts.

Thinking Critically

1. Would it be practical or impractical to disrupt the pork worm life cycle? At step 7? At step 8? At step 9? Explain your answers.
2. Why doesn’t the arrow return to the top of the diagram after step 9 as it does after step 5?

Assessment

Portfolio Ask students to write a paragraph to explain how the roundworm diseases they studied might be prevented.

4 Close

Activity

Set up stations around the classroom with photos or slides of the roundworms studied. Have students identify each worm.
Certain animals have the ability to replace lost body parts through regeneration. In regeneration, organisms regrow parts that were lost. This process occurs in a number of different phyla throughout the animal kingdom. Examples of animals that can regenerate include sponges, hydra, mudworms, sea stars, and reptiles. In this activity, you will observe regeneration in planarians. Planarians are able to form two new animals when one has been cut in half.

**Preparation**

- **Problem**
  - How can you determine if the flatworm Dugesia is capable of regeneration?

- **Objectives**
  - Observe the flatworm, Dugesia.
  - Conduct an experiment to determine if planarians are capable of regeneration.

- **Materials**
  - planarians
  - petri dish
  - spring water

**Procedure**

1. Obtain a planarian and place it in a petri dish containing a small amount of spring water. You can pick up a planarian easily with a camel hair brush.

2. Use a binocular microscope to observe the planarian. Locate the animal's head and tail region and its "eyes." Use diagram A as a guide.

3. Place the animal on a chilled glass slide. This will cause it to stretch or break apart. Use extreme caution when cutting with a razor blade. Wash your hands both before and after working with planarians.

4. Place the slide onto the microscope stage. While observing the worm through the microscope, use a single-edged razor blade to cut the animal in half across the midsection. Use section B as a guide.

5. Remove the head end and place it in a petri dish filled with spring water. Label the dish with the date, your name, and the word "head."

6. Add the tail section to a different petri dish and label it as in step 5, marking this dish "tail."

7. Repeat steps 1–6 with a second flatworm and add the correct pieces to the proper petri dish.

8. Place the petri dishes in an area designated by your teacher.

9. Prepare a data table that will allow you to record the appearance of your flatworms every other day for two weeks. Include diagrams and the number of days since starting the experiment in your data table.

10. Observe your animals under a binocular microscope and record observations and diagrams in your data table.

**Analyze and Conclude**

1. **Knowledge** To what phylum do flatworms belong? Are planarians free living or parasitic? What is your evidence?

2. **Observe** What new part did each original head piece regenerate? What new part did each original tail piece regenerate?

3. **Observe** Which section, head or tail, regenerated new parts faster?

4. **Interpreting** Are planarians able to regenerate new parts? Would regeneration be by mitosis or meiosis? Explain.

5. **Thinking Critically** What might be the advantage for an animal that can grow new body parts through regeneration?

6. **Thinking Critically** Would the term "clone" be suitable in referring to the newly formed planarians? Explain your answer.

7. **Conclusion** To what phylum do flatworms belong? Are planarians free living or parasitic? What is your evidence?

8. **Data and Observations** Students will observe the flatworms and will be able to see those structures shown in Figure A. Data table design will vary from student to student. Encourage students to diagram their observations. At the end of two weeks, students will observe that a new head has formed on the original tail section, and a new tail on the original head section.

**Conclusion**

Regeneration occurs through mitosis, no sexual reproduction or formation of gametes was needed.

**Questions you may ask:**

1. How can you determine if the flatworm Dugesia is capable of regeneration?

2. What new parts did each original head piece regenerate? What new part did each original tail piece regenerate?

3. Which section, head or tail, regenerated new parts faster?

4. Are planarians able to regenerate new parts? Would regeneration be by mitosis or meiosis? Explain.

5. What might be the advantage for an animal that can grow new body parts through regeneration?

**Analysis**

Planarians belong to the phylum Platyhelminthes. They are free living and can be found in ponds and streams living on their own.

**Answers**

1. The head section regenerated a new tail, and the tail regenerated a new head.

2. The head section regenerated a new tail, and the tail regenerated a new head.

3. The head section regenerated a new tail, and the tail regenerated a new head.

4. Yes, planarians can regenerate new body parts. Regeneration occurs through mitosis, no sexual reproduction or formation of gametes was needed.

5. Answers may vary; there is no need to find a mate, able to replace body parts faster than sexual reproduction, and are identical genetic makeup as all original animals.

6. Yes, clones may be formed asexually by mitosis. Regeneration in planarians is a type of cloning.

**Internet Address Book**

Note Internet addresses that you find useful in the space below for quick reference.
**Why are the corals dying?**

Coral reefs are some of Earth’s most spectacularly beautiful and productive ecosystems. A reef is composed of hundreds of corals that together create a structure of brightly colored shapes and patterns. In the reef’s crooks and crevices live a dazzling array of fishes and invertebrates.

Black-band disease is caused by several species of cyanobacteria that combine to form a band of black filaments. This invading community slowly moves across the coral. White-band disease causes the living tissue of a coral to peel away from its skeleton; this may be caused by bacteria. Rapid-wasting disease, possibly caused by a fungus, forms white patches that consume not only the living tissue but also the top layers of the coral skeleton.

Many of the world’s corals are losing their beautiful colors in a process called bleaching. The corals become gray or white in color. Some scientists hypothesize that coral bleaching is the result of a loss of cyanobacteria, the symbiotic protists that live in coral and give it much of its color as well as nutrients.

**Different Viewpoints**

It is not easy to tell whether microorganisms are causing the diseases or are attacking already damaged corals. Any effort to identify the problem is complicated by the great number of factors that can be involved. Coral reefs are affected by coastal development, pollution from sewage and agricultural runoff, higher water levels, or changes in ocean temperatures, make corals more vulnerable to opportunistic diseases.

**Going Further**

**Internet Address Book**

Note Internet addresses that you find useful in the space below for quick reference.

**GLENCOE TECHNOLOGY**

**VIDEO TAPE** MindJogger Videoquizzes

Chapter 26: Sponges, Cnidarians, Flatworms and Roundworms

**Computer Test Bank** BDOL Interactive CD-ROM, Chapter 26 Quiz

**Resource Manager**

Chapter Assessment, pp. 151-156

MindJogger Videoquizzes

All Chapter Assessment questions and answers have been validated for accuracy and suitability by The Princeton Review.

**Chapter 26 Assessment**

**Summary**

**Main Ideas**

- A sponge is an aquatic, sessile, asymmetrical, filter-feeding invertebrate.
- Sponges are made of four types of cells. Each cell type contributes to the survival of the organism.
- Most sponges are hemiprotandric with free-swimming larvae.

**Vocabulary**

- External fertilization (p. 716)
- Hemiprotandric (p. 716)
- Internal fertilization (p. 716)

**Section 26.1 Sponges**

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**Vocabulary**

- External fertilization (p. 716)
- Hemiprotandric (p. 716)
- Internal fertilization (p. 716)

**Section 26.2 Cnidarians**

- All cnidarians are radially symmetrical, aquatic invertebrates that display two basic forms: medusa and polyp.
- Cnidarians feed by stinging or entangling their prey with cells called nematocysts, usually located at the ends of their tentacles.
- The three primary classes of cnidarians include the hydroids, hydromedusae, scyphozoa, jellyfishes, and anthozoans, corals and anemones.

**Vocabulary**

- Cnidarian (p. 719)
- Medusa (p. 719)
- Nematocyst (p. 719)
- Polyp (p. 719)

**Section 26.3 Flatworms**

- Flatworms are acelomate, thin, solid-bodied flatworms that belong to the phylum Platyhelminthes. They are grouped into three classes: free-living planaria, parasitic flatworms, and tapeworms.
- Planaria have well-developed nervous and muscular systems. These systems are reduced in parasitic flatworms. Flukes and tapeworms have other structural adaptations to their parasitic existence.

**Vocabulary**

- Planarian (p. 727)
- Syngang (p. 729)
- Oogonia (p. 728)

**Section 26.4 Roundworms**

- Roundworms are pseudocelomate, cylindrical worms with longhose muscles, relatively complex digestive systems, and two body openings.
- Roundworm parasites include parasites of plants, fungi, and animals, including humans (ascarids, hookworms, Trichinella, and pinwolves) are roundworm parasites of humans.

**Vocabulary**

- Roundworm (p. 728)

**Chapter 26 Assessment**

**Main Ideas**

Summary statements can be used by students to review the major concepts of the chapter.

**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

**Purpose**

Students learn about the importance of coral reefs, discover how they can be damaged, and explore methods for preventing damage.

**Background**

Corals contain zooxanthellae that have chlorophyll and carry out photosynthesis. During the day, most corals withdraw into the safety of their limestome tubes and let the zooxanthellae make food for them. At night, corals use their tentacles and nematocysts to capture planktonic organisms that drift by.

**Teaching Strategies**

- Point out to students that, since most coral reef lie in shallow waters near the shoreline, they are easily affected by coastal activities. The clearing of coastal land for development may increase erosion. Silt clouds the water and reduces the amount of sunlight available, limiting photosynthesis by zooxanthellae. Silt can also clog the tiny mouth opening of the coral polyps, affecting their ability to feed at night.

**Investigating the Issue**

Because coral reefs offer an enormous array of protected living spaces, the destruction of a reef would remove habitats needed by many species. Organisms that prey on any of these species would lose a food source. Coral reefs also absorb wave energy, so the destruction of a reef could leave the shore subject to erosion from wind and wave action.

**InternetMinds**

- MindJogger Videoquizzes

Chapter 26: Sponges, Cnidarians, Flatworms and Roundworms

- Have students work in groups as they play the videoquiz game to review key chapter concepts.
20. In what ways are cnidarians more complex than sponges?
21. You are examining a wormlike animal found in the intestine of a sheep. It has a head with tiny hooks. What kind of worm is it?
22. Of what advantage is hermaphroditism to a sessile animal?
23. Describe the features that would be important for a predator of jellyfishes.

**Chapter 26 Assessment**

**ASSESSING KNOWLEDGE & SKILLS**

8. Which of these is a type of cell found in sponges?
   a. epithelial cell
   b. muscle cell
   c. stinging cell
   d. nematocyst

9. An individual sponge is a __________ because it __________.
   a. reproduce by budding
   b. can regenerate lost body parts
   c. can produce both eggs and sperm
   d. has both pore cells and stinging cells

12. A ________ is an organism that has both male and female reproductive organs.
   a. flatworm
   b. polyp
   c. medusa
   d. planarian

13. Unlike sponges and cnidarians, flatworms have a clearly defined ________
   a. head
   b. flatworm
   c. polyp
   d. planarian

15. A ________ is a parasitic worm that uses a snail as an intermediate host and has a larval stage that can bore through the skin of humans.
   a. tapeworm
   b. fluke
   c. roundworm
   d. hookworm

16. Examine the diagram. The structure labeled ________ forms eggs and sperm.

**UNDERSTANDING MAIN IDEAS**

1. Which of these is a type of cell found in sponges?
   a. epithelial cell
   b. muscle cell
   c. stinging cell
   d. nematocyst

2. An individual sponge is a __________ because it __________.
   a. reproduce by budding
   b. can regenerate lost body parts
   c. can produce both eggs and sperm
   d. has both pore cells and stinging cells

3. Which of the following organisms obtain food by filter feeding?
   a. jellyfish
   b. pinworm
   c. tapeworm
   d. planarian

4. To what phylum do marine invertebrates with radial symmetry and two body layers belong?
   a. Porifera
   b. Cnidaria
   c. Platyhelminthes
   d. Cestoda

5. Both sponges and planarians have ________ larvae.
   a. sessile
   b. free-swimming
   c. polyp
   d. budding

6. In cnidarians, medusae reproduce sexually to produce polyps, which in turn reproduce sexually to form ________
   a. buds
   b. medusae
   c. planarians
   d. polyps

7. Sea anemones exhibit only the ________ type of body form.
   a. polyp
   b. bud
   c. medusa
   d. colony

8. Two basic body forms are found in ________
   a. sponges
   b. flatworms
   c. roundworms
   d. cnidarians

9. Ascidians are ________ have thin, solid bodies.
   a. roundworms
   b. flatworms
   c. nematodes
   d. planarians

10. Of the following, which is a pseudocoelomate animal?
    a. fluke
    b. roundworm
    c. tapeworm
    d. planarian

11. Eyespots, located on the head of a ________, are sensitive to light.
    a. medusa
    b. polyp
    c. tapeworm
    d. planarian

12. A ________ is an organism that has both male and female reproductive organs.
    a. flatworm
    b. polyp
    c. medusa
    d. planarian

13. Except sponges and cnidarians, flatworms have a clearly defined ________
    a. head
    b. flatworm
    c. polyp
    d. planarian

14. Parasitic worms have mouthparts with ________
    a. a stinging cell
    b. a flame cell
    c. a gastrovascular cavity
    d. a circular muscle

15. A ________ is a parasitic worm that uses a snail as an intermediate host and has a larval stage that can bore through the skin of humans.
    a. tapeworm
    b. fluke
    c. roundworm
    d. hookworm

16. Examine the diagram. The structure labeled ________ forms eggs and sperm.

**APPLYING MAIN IDEAS**

21. In what ways are cnidarians more complex than sponges?
22. You are examining a wormlike animal found in the intestine of a sheep. It has a head with tiny hooks. What kind of worm is it?
23. Of what advantage is hermaphroditism to a sessile animal?
24. Describe the features that would be important for a predator of jellyfishes.

**THINKING CRITICALLY**

25. Observing and Inferning While examining soil from the bottom of a pond, you notice tiny red worms wriggling aimlessly in your petri dish. What kind of worms are they?
26. Recognizing Cause and Effect At what points could the life cycle of a blood fluke be interrupted so that disease would be prevented?
27. Observing and Inferring Why is the phylogeny of cnidarians so little understood?
28. Comparing and Contrasting Both sponges and hydroids are sessile organisms that cannot pursue prey. Compare their methods of obtaining food.
29. Concept Mapping Complete the concept map by using the following vocabulary terms: medusa, nematocyst, polyp.

**TEST-TAKING TIP**

Ignore Everyone While you take a test, pay absolutely no attention to anyone else in the room. Don’t worry if your friends finish a test before you do. If someone tries to talk with you during a test, don’t answer. You run the risk of the teacher thinking you were cheating—even if you weren’t.