

## Chapter 29 Study Guide

### Study Tip

Divide the class into small groups, and ask each group to brainstorm a list of challenging questions that cover all the chapter concepts. Then, have the members of each group work together to answer the questions devised by another group.

### Thinking Visually

The hydra flowchart might include: food enters gastrovascular cavity through mouth; digested and absorbed in gastrovascular cavity; wastes expelled through mouth. Earthworm: food enters mouth; moves through pharynx, crop, gizzard, and intestines; wastes leave through anus.

## Chapter 29 Assessment

### Reviewing Content

- |      |      |      |       |
|------|------|------|-------|
| 1. b | 4. a | 7. b | 10. b |
| 2. a | 5. d | 8. c |       |
| 3. d | 6. d | 9. c |       |

### Understanding Concepts

11. Specialized cells, tissues, and organ systems; body symmetry; segmentation; some type of skeleton; an anterior and posterior end; and appendages
12. Specialized cells led to the development of tissues and organ systems.
13. Sponges, or phylum Porifera
14. With cephalization, animals can respond to the environment more quickly and in more sophisticated ways. This is an advantage for feeding and defense.
15. Ectoderm, endoderm, mesoderm
16. Acoelomates have no body cavity; pseudocoelomates have a body cavity partially lined with mesoderm; coelomates have a true body cavity lined completely with mesoderm.

## Chapter 29 Study Guide

### 29-1 Invertebrate Evolution

#### Key Concepts

- As animals became larger and more complex, specialized cells joined together to form tissues, organs, and organ systems that work together to carry out complex functions.
- All invertebrates except sponges exhibit some type of body symmetry—either radial symmetry or bilateral symmetry.
- Invertebrates with cephalization can respond to the environment in more sophisticated ways than can simpler invertebrates.
- Most invertebrates with bilateral symmetry also have segmented bodies. Over the course of evolution, different segments have often become specialized for specific functions.
- Most animal phyla have a true coelom that is lined completely with tissue derived from mesoderm.
- Worms, arthropods, and mollusks are protostomes, and echinoderms are deuterostomes.

#### Vocabulary

radial symmetry, p. 748  
bilateral symmetry, p. 748  
cephalization, p. 748  
coelom, p. 749

### 29-2 Form and Function in Invertebrates

#### Key Concepts

- The simplest animals break down food primarily through intracellular digestion, but more complex animals use extracellular digestion.
- Respiratory organs have large surface areas that are in contact with the air or water. In order for diffusion to occur, these respiratory surfaces must be kept moist.

- Most complex animals move blood through their bodies using one or more hearts and either an open or a closed circulatory system.
- Most animals have an excretory system that rids the body of metabolic wastes and controls the amount of water in their tissues.
- Invertebrates show three trends in the evolution of the nervous system: centralization, cephalization, and specialization.
- Invertebrates have one of three main kinds of skeletal systems: hydrostatic skeletons, exoskeletons, or endoskeletons.
- Most invertebrates reproduce sexually during at least part of their life cycle. Depending on environmental conditions, however, many invertebrates also reproduce asexually.

#### Vocabulary

intracellular digestion, p. 751  
extracellular digestion, p. 751  
open circulatory system, p. 754  
closed circulatory system, p. 754  
hydrostatic skeleton, p. 756  
exoskeleton, p. 757  
endoskeleton, p. 757  
external fertilization, p. 758  
internal fertilization, p. 758

### Thinking Visually

Create two flowcharts describing the steps in the digestion of food. One flowchart should describe digestion in a hydra. The second flowchart should describe digestion in an earthworm.



## CHAPTER RESOURCES

#### Print:

- **Teaching Resources**, Chapter 29 Vocabulary Review, Graphic Organizer
- **Chapter Tests**, Levels A and B, Chapter 29 Test
- **Laboratory Assessment With Scoring Guide**, Laboratory Assessment 8

#### Technology:

- **Computer Test Bank**, Chapter 29 Test
- **iText**, Chapter 29 Assessment

## Chapter 29 Assessment

### Reviewing Content

Choose the letter that best answers the question or completes the statement.

- The ancestors of most modern animal phyla first appeared during the
  - Burgess Period.
  - Cambrian Period.
  - Precambrian Era.
  - Ediacaran Period.
- A cladogram shows
  - evolutionary relationships.
  - size relationships.
  - symbiotic relationships.
  - functional relationships.
- Roundworms, which have body cavities that are partially lined with mesoderm, are classified as
  - acoelomates.
  - coelomates.
  - deuterostomes.
  - pseudocoelomates.
- An animal that relies primarily on intracellular digestion is the
  - sponge.
  - clam.
  - dragonfly.
  - earthworm.
- Which organ system does the diagram below illustrate?



- digestive system
  - circulatory system
  - excretory system
  - nervous system
- In order for the exchange of oxygen and carbon dioxide to take place, an animal's respiratory surfaces must be kept
    - cold.
    - dry.
    - hot.
    - moist.
  - In a closed circulatory system, blood
    - comes in direct contact with tissues.
    - remains within blood vessels.
    - empties into sinuses.
    - does not transport oxygen.

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assessment at PHSchool.com



- Malpighian tubules convert nitrogenous wastes into
  - urine.
  - ammonia.
  - uric acid.
  - urea.
- The simplest nervous systems are called
  - ganglia.
  - motor neurons.
  - nerve nets.
  - sensory neurons.
- Individual animals that produce both sperm and eggs are called
  - gametes.
  - hermaphrodites.
  - buds.
  - fragments.

### Understanding Concepts

- What features of Burgess Shale animals are found in most invertebrates living today?
- What effect did the development of specialized cells have on evolution?
- Which invertebrate phylum does not exhibit body symmetry?
- What is one major advantage of cephalization?
- List the three germ layers.
- Distinguish among the following terms: *acoelomate*, *pseudocoelomate*, and *coelomate*.
- Compare the processes of intracellular digestion and extracellular digestion.
- Why is the development of a one-way digestive system important to the evolution of animals?
- Describe two types of respiratory structures found in terrestrial invertebrates.
- Describe the two types of circulatory systems. Give an example of an animal that has each type.
- What are three forms of nitrogenous wastes excreted by animals?
- What three major trends in the evolution of the nervous system do invertebrates exhibit?
- In the gills of aquatic animals, how do the respiratory and circulatory systems interact? How does the interaction benefit the body as a whole?
- What is the function of an animal's heart?
- Compare and contrast internal and external fertilization.



If your class subscribes to the iText, your students can go online to access an interactive version of the Student Edition and a self-test.

### (Continued from page 760)

- Intracellular digestion is the process in which food is broken down inside cells. In extracellular digestion, food is broken down outside cells in specialized structures.
- A one-way digestive system often has specialized regions that allow food to be temporarily stored and processed in batches, like an assembly line.
- Sample answer: the mantle cavity is moist tissue that has an extensive surface area lined with blood vessels. Book lungs are made of parallel, sheetlike layers of thin tissue that contain blood vessels. Students might also mention spiracles and tracheal tubes.
- Open circulatory system: found in arthropods and most mollusks; does not keep blood contained within blood vessels; blood comes in direct contact with the tissues, collects in body sinuses, and makes its way back to the heart. Closed circulatory system: found in annelids and chordates; keeps the blood completely contained within blood vessels; materials diffuse from the blood to the tissue and vice versa through the walls of the blood vessels; blood kept at high pressure.
- Ammonia, urea, uric acid
- Centralization, cephalization, and specialization
- The circulatory system brings carbon dioxide to the gills. Gills are rich in blood vessels that bring blood close to the surface for gas exchange, the respiratory function. The circulatory system then carries the oxygen from the gills to the cells of the body, providing the cells with the necessary oxygen to carry out cellular respiration.
- An animal's heart moves blood through its body, either in a closed or an open circulatory system.
- In internal fertilization, eggs are fertilized inside the female's body. In external fertilization, eggs are fertilized outside the female's body.



### HOMEWORK GUIDE

Section:	Questions:
Section 29-1	1-3, 11-16, 28, 31, 33, 35
Section 29-2	4-10, 17-27, 29, 30, 32, 34, 36, 37

## Critical Thinking

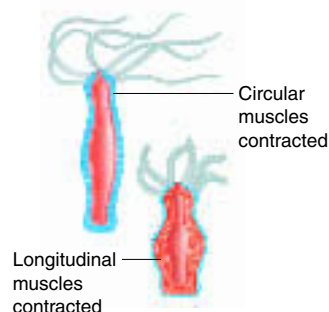
26. In small aquatic invertebrates, the toxic ammonia diffuses from the animal's body into the water as soon as it is produced, and before it can harm the animal.
27. The slimy coating of slugs helps prevent their bodies from drying out. The coating also aids in the absorption of oxygen and allows slugs to move across surfaces.
28. Animals with bilateral symmetry usually have specialized anterior and posterior ends as well as dorsal and ventral sides. Animals with bilateral symmetry usually move with anterior end first, so this end encounters new parts of the environment first. Sense organs are clustered at the anterior end into a head region; this is cephalization, which is advantageous for orienting, navigating, feeding, and defense.
29. Many terrestrial invertebrates convert ammonia into urea, a less toxic compound that can be concentrated to produce urine. Some terrestrial invertebrates convert ammonia into uric acid, which is concentrated into solid crystals. Both processes concentrate the waste product and therefore reduce water loss, but uric acid can be excreted as a dry, pasty solid.
30. Most respiratory structures found in invertebrates are thin and moist and have a large surface area. In aquatic invertebrates, respiratory structures are usually exposed directly to the water. The respiratory surfaces of terrestrial animals tend to be located inside the body, where they are protected from drying out.
31. Over the course of evolution, segments often became specialized for specific functions. Therefore, without segmentation, the process of specialization might have been impeded.

32. The diagrams show a hydrostatic skeleton, which consists of longitudinal and circular muscles that surround a fluid-filled cavity. When the muscles contract, they push against the fluid, causing the body to change shape.

33. Arthropods are more closely related to annelids than to cnidarians in evolutionary terms. Both arthropods and annelids have three germ layers, bilateral symmetry, cephalization, a true coelom, and protostome

## Critical Thinking

26. **Inferring** The excretory systems of terrestrial invertebrates, such as earthworms, convert ammonia to less toxic components. Why is this change unnecessary in small aquatic invertebrates, such as planarians?
27. **Applying Concepts** The external surface of slugs is slimy. What might the adaptive advantage of this characteristic be?
28. **Applying Concepts** Why is bilateral symmetry an important development in the evolution of animals?
29. **Applying Concepts** No matter where they live, all animals need to control the amount of water within their bodies as well as get rid of ammonia—a toxic nitrogenous waste. How were invertebrates able to perform these functions, especially as they moved to terrestrial environments?
30. **Comparing and Contrasting** Invertebrates use a variety of structures for respiration. How are these structures similar? How are they different?
31. **Inferring** What might have happened to the evolution of animals if segmentation had not occurred?
32. **Applying Concepts** The diagrams below show a type of skeletal system found in invertebrates. What is the name for this type of skeleton? Describe how it functions.



33. **Comparing and Contrasting** To which group—cnidarians or annelids—are arthropods more closely related in phylogenetic (evolutionary) terms? In your answer, note similarities and differences in anatomy, physiology, and embryology.

development. Cnidarians, in contrast, have only two germ layers and radial symmetry, no cephalization or coelom, and neither protostome nor deuterostome development.

34. If a flatworm's flame cells were damaged, its ability to remove excess water would be impaired.

35. Multicellularity, tissues, protostome development, pseudocoelom, coelom, deuterostome development

36. Both the eyespots of flatworms and the eyes of insects can detect the presence of light. That is all flatworm eyespots can detect, though. Insect eyes can also detect motion and color and form images.

34. **Predicting** Predict what might happen if a flatworm's flame cells were damaged.
35. **Applying Concepts** Rank the following developments in the order of their appearance during evolution: pseudocoelom, tissues, deuterostome development, multicellularity, coelom, protostome development.
36. **Comparing and Contrasting** Compare the eyespots of flatworms to the eyes of insects. How are they similar and different?
37. **Connecting Concepts** Use what you learned in Chapter 11 to compare the processes of meiosis and mitosis. Then, explain how these processes are involved in sexual and asexual reproduction.

## Writing in Science

Write a paragraph in which you describe, in your own words, what the first multicellular animals were like. Begin your paragraph with a topic sentence that states the main idea of the paragraph. (*Hint:* Before you write, make a list of the characteristics of the first multicellular animals. Then, organize these characteristics in logical order.)

## Performance-Based Assessment

**Creative Writing** Choose a kind of invertebrate, such as a cnidarian or annelid. Imagine that you are that invertebrate and are in the process of looking for employment. Prepare a résumé that will inform a potential employer of your specialized skills.

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