

## Chapter 28 Study Guide

### Study Tip

Divide the class into pairs, and have students quiz each other about the Vocabulary and the Key Concepts.

### Thinking Visually

The diagram should begin at the top with phylum Arthropoda. On the second level should be subphyla Crustacea, Chelicerata, and Uniramia. Under Crustacea should be the decapods and the barnacles. The decapods include crayfishes, lobsters, and crabs. Under Chelicerata should be class Merostomata, the horseshoe crabs, and class Arachnida, which includes spiders, mites, ticks, and scorpions. Under Uniramia should be class Chilopoda, or the centipedes; class Diplopoda, or the millipedes; and class Insecta, the insects.

## Chapter 28 Assessment

### Reviewing Content

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

### Understanding Concepts

11. The variety of respiratory organs among arthropods enables arthropods to live in both terrestrial and aquatic environments. Terrestrial arthropods obtain oxygen through tracheal tubes or book lungs. Aquatic arthropods use gills or book gills to remove oxygen from water.

12. Most terrestrial arthropods dispose of nitrogen-containing waste by using Malpighian tubes, which remove wastes from the blood, concentrate them, and then add them to undigested food before it leaves via the anus. In aquatic arthropods cellular wastes diffuse from the body into the water.

13. All have a brain. Two nerves that run around the esophagus connect the brain to a ventral nerve cord. Ganglia along the cord coordinate movements of the legs and wings.

14. It covers and protects the cephalothorax.

15. Decapods are motile, whereas barnacles are sessile. Barnacles have no abdominal segments and do not use mandibles.

## Chapter 28 Study Guide

### 28-1 Introduction to the Arthropods

#### Key Concepts

- Arthropods have a segmented body, a tough exoskeleton, and jointed appendages.
- The evolution of arthropods, by natural selection and other evolutionary processes, has led to fewer body segments and highly specialized appendages for feeding, movement, and other functions.
- When they outgrow their exoskeletons, arthropods undergo periods of molting.

#### Vocabulary

exoskeleton, p. 715  
chitin, p. 715  
appendage, p. 715  
tracheal tube, p. 717  
spiracle, p. 717  
book lung, p. 717  
Malpighian tubule, p. 717  
molting, p. 719

### 28-2 Groups of Arthropods

#### Key Concepts

- Arthropods are classified based on the number and structure of their body segments and appendages, particularly their mouthparts.
- Crustaceans typically have two pairs of antennae, two or three body sections, and chewing mouthparts called mandibles.
- Chelicerates have mouthparts called chelicerae and two body sections, and nearly all have four pairs of walking legs.
- Uniramians have jaws, one pair of antennae, and unbranched appendages.

#### Vocabulary

cephalothorax, p. 721  
thorax, p. 721  
abdomen, p. 721  
carapace, p. 721  
mandible, p. 721  
cheliped, p. 721  
swimmeret, p. 721  
chelicera, p. 722  
pedipalp, p. 722  
spinneret, p. 723

### 28-3 Insects

#### Key Concepts

- Insects have a body divided into three parts—head, thorax, and abdomen. Three pairs of legs are attached to the thorax.
- The growth and development of insects usually involve metamorphosis, which is a process of changing shape and form. Insects undergo either incomplete metamorphosis or complete metamorphosis.
- Ants, bees, termites, and some of their relatives form complex associations called societies.

#### Vocabulary

incomplete metamorphosis, p. 729  
nymph, p. 729  
complete metamorphosis, p. 729  
pupa, p. 729  
pheromone, p. 731  
society, p. 732  
caste, p. 732

### 28-4 Echinoderms

#### Key Concepts

- Echinoderms are characterized by spiny skin, an internal skeleton, a water vascular system, and suction-cuplike structures called tube feet. Most adults have five-part radial symmetry.
- The water vascular system carries out many essential body functions in echinoderms, including respiration, circulation, and movement.
- Classes of echinoderms include sea urchins and sand dollars; brittle stars; sea cucumbers; sea stars; sea lilies and feather stars.

#### Vocabulary

endoskeleton, p. 734  
water vascular system, p. 735  
madreporite, p. 735  
tube foot, p. 735

### Thinking Visually

Construct a diagram that models the classification of the phylum Arthropoda. Your classification system should be based on similarities and differences. It should show a hierarchy, or the arrangement of the subgroups within the phylum. Be sure to use taxonomic nomenclature (phylum, subphylum, and so forth).



## CHAPTER RESOURCES

#### Print:

- **Teaching Resources**, Chapter Vocabulary Review, Graphic Organizer
- **Chapter Tests: Levels A and B**, Chapter 28 Test

#### Technology:

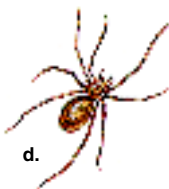
- **Computer Test Bank**, Chapter 28 Test
- **iText**, Chapter 28 Assessment

## Chapter 28 Assessment

### Reviewing Content

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

- All arthropods have
  - gills.
  - jointed appendages.
  - antennae.
  - chelicerae.
- An arthropod's exoskeleton performs all of the following functions except
  - production of gametes.
  - protection of internal organs.
  - support of the animal's body.
  - preventing loss of body water.
- Most terrestrial arthropods breathe using branched, air-filled structures called
  - gills.
  - tracheal tubes.
  - book gills.
  - book lungs.
- Most arthropods have
  - no circulatory system.
  - an open circulatory system.
  - a closed circulatory system.
  - skin gills.
- Crustaceans are the only arthropods that have
  - three pairs of legs.
  - two pairs of antennae.
  - chitin in their exoskeleton.
  - chelicerae.
- Which of the organisms below belongs in the subphylum Chelicerata?



- Unlike spiders, horseshoe crabs have
  - antennae.
  - a madreporite.
  - mandibles.
  - ten legs.

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- All insects have
  - two pairs of legs.
  - two pairs of antennae.
  - two pairs of wings.
  - three body sections.
- Most adult echinoderms show
  - bilateral symmetry.
  - top and bottom symmetry.
  - radial symmetry.
  - no symmetry.
- Oxygen is moved around the body of a sea star in its
  - stemlike stalk.
  - water vascular system.
  - madreporite.
  - bony plates.

### Understanding Concepts

- How have the various respiratory structures found in arthropods contributed to their overall success?
- Compare the process of excretion in terrestrial arthropods with that in aquatic arthropods.
- Describe the structure of arthropods' nervous system.
- What is the function of a crustacean's carapace?
- How are barnacles different from decapods?
- What is the function of a mandible?
- Distinguish between chelicerae and pedipalps.
- How are the mouthparts of mites and ticks adapted to a specific lifestyle?
- State obvious differences in the body structure of the different groups of uniramians.
- How have the characteristics of insects contributed to their evolutionary success?
- Describe some of the special feeding adaptations found in insects.
- How does the term *society* relate to ants, bees, and termites?
- Describe how echinoderms eliminate nitrogenous wastes.
- Briefly describe the process of sexual reproduction in sea stars.
- How has the predation of the sea star called the crown-of-thorns affected coral reefs?



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 740)

- It is adapted for biting and grinding food.
- Both chelicerae and pedipalps are appendages adapted as mouthparts. Chelicerae contain fangs used to capture and paralyze prey, and pedipalps are usually modified to handle prey.
- Ticks and mites are parasites. Their mouthparts are adapted to dig into a host's tissues and suck out fluids.
- Centipedes have many segments, each with one pair of legs. Millipedes have many segments, each with two pairs of legs. The bodies of insects are divided into three sections—head, thorax, and abdomen—with three pairs of legs attached to the thorax.
- The characteristics of insects have enabled them to thrive in many different habitats.
- Insect adaptations for feeding include: mouthparts adapted to specific feeding functions, e.g., grinding or sucking; saliva containing digestive enzymes; in bees, chambers for the storage of food.
- Ants, bees, and termites form societies in which individuals work together for the benefit of the whole group. Individuals specialize in performing specific roles or tasks.
- In most echinoderms, nitrogen-containing cellular wastes are excreted primarily in the form of ammonia, which is passed into surrounding water through the thin-walled tissues of tube feet and skin gills.
- The eggs and sperm of sea stars are released into open water, where fertilization occurs. Eventually the larvae, which have bilateral symmetry, swim to the ocean bottom, where they mature into adults that have radial symmetry.
- The crown-of-thorns feeds on coral and has destroyed extensive areas of the Great Barrier Reef.



### HOMEWORK GUIDE

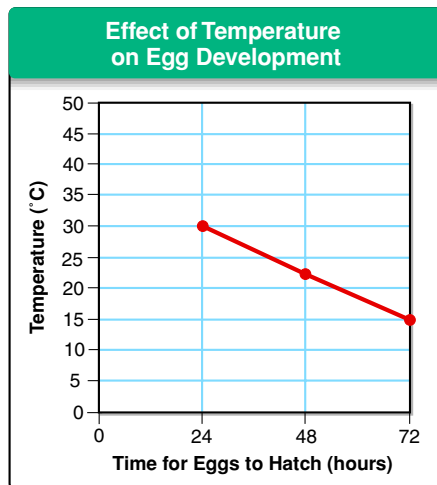
Section:	Questions:
Section 28-1	1-4, 11-13, 35
Section 28-2	5-7, 14-19, 27, 29, 30
Section 28-3	8, 20-22, 26, 28, 31, 33, 34
Section 28-4	9, 10, 23-25, 32

## Critical Thinking

26. The adaptation enables honeybees to carry pollen from one flower to another, thus pollinating the flowers in the process. The adaptation also enables honeybees to collect food and carry it back to the hive.
27. Crabs have soft shells soon after they molt because the new exoskeleton has not had time to become hardened.
28. The animal is not an insect, because insects have three distinct body regions, one pair of antennae, one pair of compound eyes, three pairs of mouthparts, and three pairs of walking legs.
29. As the temperature decreases, the time for the eggs to hatch increases. It would take about 62 hours for the eggs to hatch at 18°C, and 40 hours for them to hatch at 25°C. On the basis of the trend shown on the graph, it might take 88 hours for eggs to hatch at 10°C.
30. The crayfish is responding to the greater amount of oxygen dissolved in surface water than at lower depths. In addition, the movement of the crayfish's legs can further increase the amount of oxygen dissolved in the stagnant pool and create a flow of this oxygenated water over the gills, where respiration occurs.
31. Adults and larvae do not compete with one another for food. Also, different types of food may be abundant at different times of the year, and these differences may correlate to stages in the insect's life cycle.
32. Unlike arthropods, echinoderms have spiny skin, radial symmetry, an internal skeleton, a water vascular system, and suction-cuplike structures called tube feet.
33. Pheromones warn of danger and enable males and females to communicate during courtship and mating, thus helping to ensure survival of individuals and species.
34. As insects moved into different environments over time, they evolved through natural selection adaptations that allowed them to succeed in those environments. Among these adaptations are flight, different ways of responding to stimuli, and a life cycle in which the young differ from adults in appearance and feeding methods.

## Critical Thinking

26. **Applying Concepts** The legs and bodies of honeybees are covered with hair that collects pollen and other materials. How is this adaptation helpful to flowering plants and honeybees?
27. **Applying Concepts** Blue crabs usually have hard shells. During certain times of the year some of the blue crabs have thin, papery shells. In terms of the life processes of arthropods, explain why these blue crabs have soft shells.
28. **Classifying** An animal is discovered that has an exoskeleton, sucking mouthparts, head fused with thorax, no wings, and four pairs of walking legs. Would you classify the animal as an insect? Explain your answer.
29. **Analyzing Data** Brine shrimp are small crustaceans found in salty lakes and ponds. The graph shows the effect of water temperature on the time it takes for brine shrimp eggs to hatch. Based on the graph, what can you conclude about the relationship between water temperature and hatching time? How many hours would it take for eggs to hatch at 18°C and at 25°C? Can you predict the amount of time it would take for eggs to hatch at 10°C?



30. **Inferring** In a stagnant pool of water, a crayfish may spend much of its time lying with one side of its carapace near the surface of the water. In this position, it will move the walking legs on that side in a back-and-forth motion. To what external stimulus is the crayfish responding? Explain the value of this behavior.

35. Proteins are organic compounds composed of amino acids needed for the growth and repair of cells. Polysaccharides are complex carbohydrates.

31. **Inferring** In many insect species, insect adults and larvae feed on different substances. How might this characteristic help members of those species survive?
32. **Comparing and Contrasting** How are echinoderms structurally different from arthropods?
33. **Applying Concepts** What role do pheromones play in insect survival?
34. **Inferring** Insects today inhabit almost every environment on Earth, and they exhibit a wide variety of adaptations that enable them to survive in those environments. How might natural selection have contributed to insect diversity?
35. **Connecting Concepts** Chitin is made of protein and polysaccharides. What are these two substances? You might want to review relevant concepts in Chapter 2.

## Writing in Science

In your own words, write a description of how molting takes place in an arthropod, and what happens immediately after molting. Include an explanation of why it is necessary for an arthropod to undergo molting periodically. (Hint: Before you write, use a flowchart to organize the steps in the molting process.)

## Performance-Based Assessment

**Around the Neighborhood** Make a photograph collection of arthropods in your neighborhood. Use field guides to identify the arthropods in your photographs. Mount the photographs in a display that indicates the major characteristics of arthropods and the various groups of arthropods.

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