Mr. Wilfong's Snow Packet

Biology

Days 17 - 21

Instructions: Read ALL instructions carefully.

1. This document contains 3 chapter assignments for this class. Please spread them out over the five days.

2. Be sure to follow all directions on the pages below and given by your teacher in class. You may be asked to turn in work on your own paper or digitally.

3. Turn in the completed work to your teacher on the day you return to school. If you have technology issues, family emergencies, or illness you may have up to five days to turn work in.

Name_____ Class_____ Date _____

Summary

30–1 The Chordates

A chordate is an animal that has, for at least some stage of its life, a hollow nerve cord, a notochord, pharyngeal pouches, and a tail.

The hollow nerve cord runs along the back of the body. Nerves branch from it and connect to organs and muscles.

The notochord is a long supporting rod that runs just below the nerve cord. Most chordates have a notochord only as embryos.

Pharyngeal pouches are paired structures in the throat. In some chordates, they develop into gills.

Most chordates are vertebrates. Vertebrates have a backbone made of segments called vertebrae. The backbone replaces the notochord. The backbone gives support and protects the spinal cord. It also gives the muscles a place to attach.

Two groups of chordates do not have backbones. Tunicates are filter feeders that live in the ocean. Adult tunicates have neither a notochord nor a tail. Larval tunicates have the chordate characteristics.

The other group of chordates without a backbone is the lancelet. Lancelets are small, fishlike animals. Adult lancelets have all four chordate characteristics. They also have a definite head region.

30–2 Fishes

Fishes are animals with backbones that live in water. They usually have paired fins, scales, and gills.

Fishes were the first vertebrates to evolve. The evolution of jaws and paired fins was the most important development in fish evolution. Jaws improved defense and expanded food choices. Paired fins gave more control of body movement.

Fishes have various modes of feeding. Fishes are herbivores, carnivores, parasites, filter feeders, and detritus feeders. One fish may even have several different modes of feeding, depending on the food available.

Most fishes breathe with gills. Gills have many tiny blood vessels. This provides a large surface area for oxygen and carbon to be exchanged. Most fishes breathe by pulling water through the mouth and pumping it over the gills and out through openings in the sides of the pharynx.

Fishes have a closed circulatory system that pumps blood in a single loop—from the heart to the gills, from the gills to the body, and back to the heart. The heart is made up of four parts: the sinus venosus, atrium, ventricle, and bulbus arteriosus. The ventricle is the actual pumping portion of the heart. The atrium is a one-way compartment for blood that is going to enter the ventricle.

Most fishes get rid of wastes as ammonia. Some wastes pass through the gills into the water. Other wastes are removed from the blood by the kidneys. Kidneys also help fishes control the amount of water in their bodies.

Fishes have well-developed nervous systems. The brain has several parts. The olfactory bulbs and cerebrum are involved with the sense of smell. The optic lobes process information from the eyes. The cerebellum coordinates body movements. Most fishes have a lateral line system that senses currents and vibrations in the water.

Most fishes move by contracting muscles on either side of the backbone. Fins propel the fish forward and help it steer. Many fishes have a gas-filled swim bladder that keeps them from sinking.

Fishes reproduce in a number of ways. Their eggs are fertilized either externally or internally, depending on the species. Some lay eggs. They are called oviparous. In ovoviviparous fishes, the eggs develop inside the female. The embryos are fed by an attached yolk sac. In viviparous fishes, the embryos get their food from the mother's body, not from an egg.

All fishes can be classified into three groups: jawless fishes, cartilaginous fishes, and bony fishes. Lampreys and hagfishes are jawless fishes. Their bodies are supported by a notochord. They do not have true teeth or jaws. They are parasites and scavengers.

The cartilaginous fishes include sharks, rays, and skates. All members of this group of fishes have a skeleton made of cartilage. Most also have toothlike scales covering their skin.

Bony fishes have skeletons made of bone. Almost all bony fishes belong to the group known as the ray-finned fishes. Their fins have thin, bony spines that are joined together by a thin layer of skin.

30–3 Amphibians

Amphibians have some—but not all—of the adaptations necessary to live on land. As larvae, they live in water. As adults, they live on land. Adult amphibians breathe with lungs and have moist skin that has mucous glands. They do not have scales and claws.

Early amphibians had several adaptations that helped them live on land. Leg bones became stronger to hold weight and allow movement. Lungs and moist skin allowed them to get oxygen from air. The breastbone supported and protected internal organs.

Amphibian larvae are filter feeders or herbivores. They have long, coiled intestines. This helps them break down plant material. Adults have a much shorter intestine because they are carnivores.

In most larvae, gas exchange occurs through the skin as well as lungs. Lungs usually replace gills when an amphibian becomes an adult. However, some gas exchange occurs through the skin and the lining of the mouth.

In adult amphibians, the circulatory system forms a double loop. The first loop carries oxygen-poor blood from the heart to the lungs. It returns oxygen-rich blood to the heart from the lungs. The second loop carries oxygen-rich blood from the heart to the body and returns to the heart with oxygen-poor blood. The amphibian heart has three separate chambers: left atrium, right atrium, and ventricle.

Kidneys remove wastes from blood. Urine passes to the cloaca. From there, it either passes directly to the outside or is stored in a small bladder.

Amphibian eggs do not have shells. The female usually lays eggs in water. The male fertilizes them externally. The eggs hatch into larvae, which are often called tadpoles. Tadpoles gradually change into adults that live on land.

Amphibians have well-developed nervous systems and sense organs. Frogs have keen vision to spot and respond to moving insects. Tympanic membranes, or eardrums, receive sound vibrations.

The amphibian groups are salamanders, frogs and toads, and caecilians. Salamanders have long bodies, legs, and tails. Frogs and toads do not have tails and can jump. Caecilians do not have legs.

Name_____ Class_____ Date _____

Section 30–1 The Chordates (pages 767–770)

Key Concepts

- What characteristics do all chordates share?
- What are the two groups of nonvertebrate chordates?

What Is a Chordate? (page 767)

1. List the four key characteristics of a chordate.

a. _____

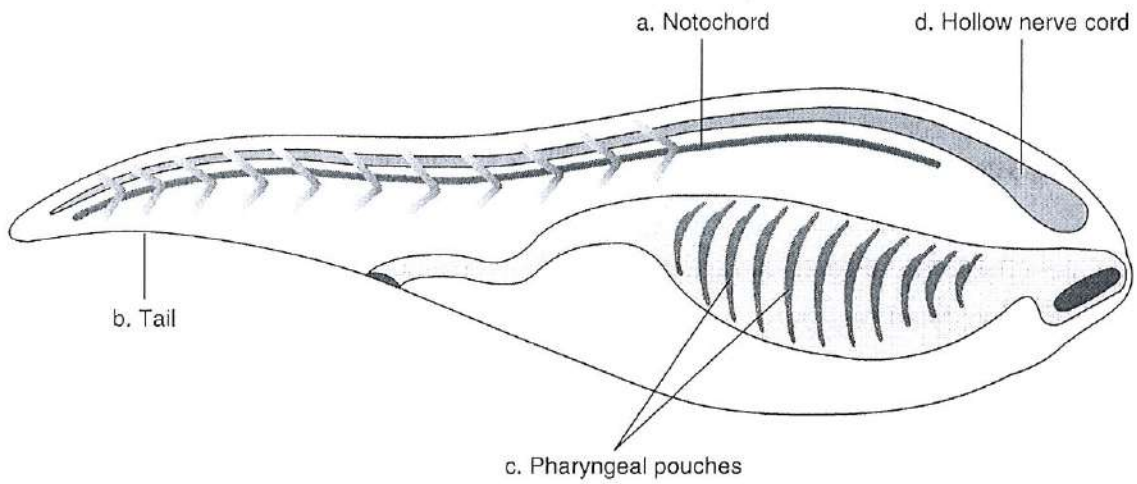
b. _____

c. _____

d. _____

Use the diagram below to match the description of the chordate characteristic with its structure.

Structure



Description

_____ 2. Connects nerves to internal organs, muscles, and sense organs

_____ 3. Long supporting rod located just below the nerve cord

_____ 4. Paired structures in the throat region

_____ 5. Contains bone and muscle

Most Chordates Are Vertebrates (page 768)

6. What structure do most vertebrates have? _____

7. What chordate structure becomes the spinal cord in vertebrates? _____

Name_____ Class_____ Date _____

8. The backbone is made of individual segments called _____ that enclose and protect the spinal cord.
9. Circle the letter of each sentence that is true about vertebrates.
   a. A vertebrate's backbone is part of an endoskeleton.
   b. The endoskeleton supports and protects the animal's body.
   c. The endoskeleton must be shed as the animal grows.
   d. The endoskeleton is made entirely of nonliving material.

Nonvertebrate Chordates (pages 769–770)

10. How are tunicates and lancelets similar to each other? _____

_____

11. What evidence indicates that vertebrates and nonvertebrate chordates evolved from a common ancestor? _____

_____

_____

12. Circle the letter of each characteristic found only in tunicate larvae and not in tunicate adults.
   a. tunic
   b. tail
   c. hollow nerve cord
   d. notochord
13. Is the following sentence true or false? Both larval and adult tunicates are filter feeders.

_____

14. Circle the letter of each characteristic found in lancelets.
   a. definite head region
   b. jaws
   c. notochord
   d. fins
15. Is the following sentence true or false? Lancelets use the pharynx for feeding and gas exchange. _____
16. How is blood moved through the body of a lancelet? _____

_____

_____

Reading Skill Practice

A Venn diagram is a useful tool to compare and contrast two things. Construct a Venn diagram to compare and contrast the characteristics of tunicates and lancelets. See Appendix A in your textbook, for more information about Venn diagrams. Do your work on a separate sheet of paper.

Name_____ Class_____ Date _____

Section 30–2 Fishes (pages 771–781)

Key Concepts

- What are the basic characteristics of fishes?
- What were the important developments during the evolution of fishes?
- How are fishes adapted for life in water?
- What are the three main groups of fishes?

What Is a Fish? (page 771)

1. Write the function of each characteristic of fishes.
   a. Paired fins _____
   b. Scales _____
   c. Gills _____
2. Is the following sentence true or false? The characteristics of living fishes are very uniform and almost no diversity exists among fishes. _____

Evolution of Fishes (pages 772–773)

3. Circle the letter of each sentence that is true about the evolution of fishes.
   a. Fishes were the first vertebrates to evolve.
   b. Fishes arose directly from tunicates and lancelets.
   c. Fishes changed little during the course of their evolution.
   d. Early fishes were jawless and covered with bony plates.
4. Which period is known as the Age of Fishes?
   a. Cambrian
   b. Ordovician
   c. Silurian
   d. Devonian
5. Jawless fishes with little armor of the Devonian Period were the ancestors of modern _____ and _____.
6. Why were jaws an extremely useful adaptation? _____
   _____
   _____
7. A strong tissue that supports the body and is more flexible than bone is _____
8. Is the following sentence true or false? Paired fins gave fishes less control over their movement. _____

Form and Function in Fishes (pages 774–778)

9. What are the different modes of feeding found in fishes? _____
   _____

Name_____ Class_____ Date _____

10. Is the following sentence true or false? A single fish may exhibit only one mode of feeding. _____

Match the internal organ with its function.

Internal Organ	Function
_____ 11. Pyloric ceca	a. Short tube connecting the fish's mouth to the stomach
_____ 12. Intestine	b. Where food is first partially broken down
_____ 13. Pancreas	c. Fingerlike pouches in which food is processed and nutrients absorbed
_____ 14. Esophagus	d. Adds digestive enzymes and other substances to food as it moves through the gut
_____ 15. Anus	e. Completes the process of digestion and nutrient absorption
_____ 16. Stomach	f. Opening through which undigested material is eliminated

17. What does the capillary network in each gill filament provide? _____

_____

_____

18. Describe how fishes with gills exchange gases. _____

_____

_____

_____

19. The protective bony cover over the gill slit from which water is pumped out of a fish's body is called a(an) _____.

20. How do lungfishes survive in oxygen-poor water? _____

_____

_____

21. Is the following sentence true or false? Fishes have an open circulatory system.

_____

Match each chamber of the heart in fishes with its function.

Heart Chamber	Function
_____ 22. Ventricle	a. Collects oxygen-poor blood from the veins
_____ 23. Sinus venosus	b. Large muscular cavity that serves as a one-way compartment for blood entering the ventricle
_____ 24. Bulbus arteriosus	c. Thick-walled, muscular chamber that is the actual pumping portion of the heart
_____ 25. Atrium	d. Large, muscular tube that connects to the ventricle and moves blood through the aorta toward the gills

Name_____ Class_____ Date _____

26. What form of nitrogenous waste do most fishes excrete?

_____

27. How does the function of kidneys in saltwater fishes differ from their function in freshwater fishes? _____

_____

_____

Match the structures of the fish's brain with their functions.

Structure	Function
_____ 28. Olfactory bulb	a. Controls the functioning of many internal organs
_____ 29. Cerebrum	b. Primarily processes the sense of smell in fishes
_____ 30. Optic lobe	c. Coordinates body movements
_____ 31. Cerebellum	d. Involved with the sense of smell, or olfaction
_____ 32. Medulla oblongata	e. Processes information from the eyes

33. Circle the letter of each sentence that is true about the sense organs of fishes.
    a. Fishes have poorly developed sense organs.
    b. Many fishes have chemoreceptors that sense tastes and smells.
    c. Fishes have a lateral line system used for sensing sounds.
    d. Some fishes can sense low levels of electric current.
34. What are two ways that fins help fish to move?
    a. _____
    b. _____
35. The streamlined body shapes of most fishes help reduce the amount of _____ as they move through the water.
36. What is the function of the swim bladder? _____

_____

_____

37. In which mode of fish reproduction do the embryos develop inside the mother's body using the egg yolk for nourishment?
    a. oviparous
    b. ovoviviparous
    c. viviparous
    d. herbivorous

Groups of Fishes (pages 778–780)

38. Fishes are divided into groups according to _____ structure.

Name_____ Class_____ Date _____

39. Complete the table about the groups of fishes.

GROUPS OF FISHES

Type	Description	Examples
	No true teeth; skeletons made of fibers and cartilage; keep their notochord as adults	
Cartilaginous fishes		Sharks, rays, skates
		Ray-finned fishes, such as flounder, angelfish, and flying fish and lobe-finned fishes, such as lungfishes and the coelacanth

40. Is the following sentence true or false? Hagfishes are filter feeders as larvae and parasites as adults. _____

41. Circle the letter of each characteristic of a shark.
    a. torpedo-shaped body
    b. secretes slime
    c. many teeth
    d. winglike fins

42. Is the following sentence true or false? Lobe-finned fishes have fleshy fins supported by bones that are sometimes jointed. _____

Ecology of Fishes (page 781)

43. Fishes that spend most of their lives in the ocean but migrate to fresh water to breed are called _____.

44. Fishes that live in fresh water but migrate to the ocean to breed are called _____.

Name_____ Class_____ Date _____

Section 30–3 Amphibians (pages 782–789)

Key Concepts

- What is an amphibian?
- How are amphibians adapted for life on land?
- What are the main groups of living amphibians?

What Is an Amphibian? (page 782)

1. Is the following sentence true or false? Amphibian adults are fishlike aquatic animals that respire using gills. _____
2. Circle the letter of each characteristic of amphibians.

   a. scales b. claws c. moist skin d. mucous glands

Evolution of Amphibians (pages 782–783)

3. List three challenges that had to be overcome by vertebrates colonizing land habitats.

   a. _____

   b. _____

   c. _____

4. List three adaptations that evolved in amphibians that helped them live at least part of their lives out of water.

   a. _____

   b. _____

   c. _____

5. Amphibians became the dominant form of animal life during the _____ Period, also known as the Age of Amphibians.
6. Why did most amphibian groups become extinct by the end of the Permian Period?

   _____

   _____

   _____

7. What three orders of amphibians survive today?

   a. _____

   b. _____

   c. _____

Form and Function in Amphibians (pages 784–787)

8. Circle the letter of each characteristic of a tadpole.

   a. carnivore

   b. herbivore

   c. long intestines

   d. short intestines

Name_____ Class_____ Date _____

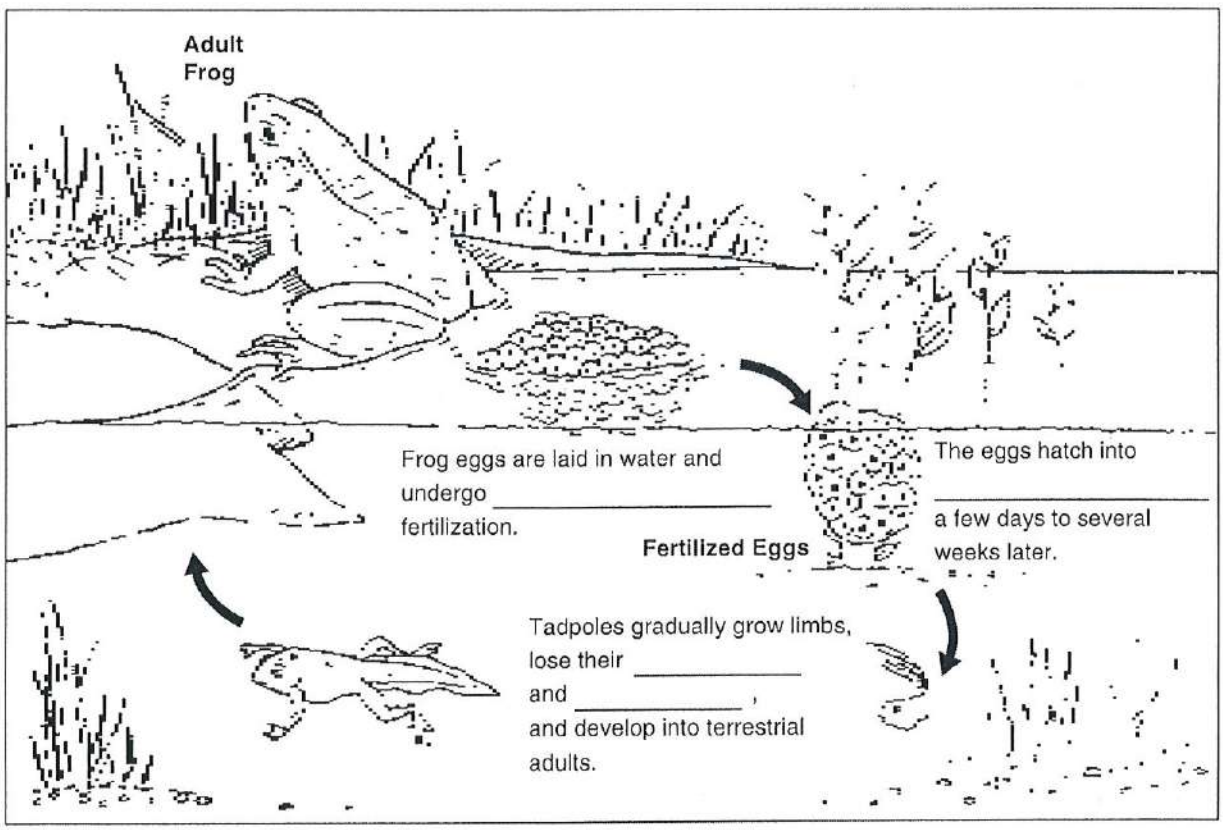
9. Circle the letter of each characteristic of an adult amphibian.
   a. carnivore
   b. herbivore
   c. sticky tongue
   d. long intestines
10. Briefly describe the path of food in a frog's digestive system.

_____

_____

_____

11. Circle the letter of each sentence that is true about respiration.
   a. In tadpoles, gas exchange occurs only through the skin.
   b. Lungs replace gills when an amphibian becomes an adult.
   c. Gas exchange in adults can also occur through the skin.
   d. All adult amphibians have lungs.
12. Amphibians have _____ that filter wastes from the blood.
13. Complete the captions in the diagram about the stages in the life cycle of a frog.



Name_____ Class_____ Date _____

14. How is the first loop in the circulatory system of an adult amphibian different from the second loop? _____

_____

_____

Match the type of amphibian with its method of movement.

Amphibian	Method of Movement
_____ 15. Tadpoles	a. Flattened tail for propulsion
_____ 16. Adult salamanders	b. Well-developed hind limbs for jumping
_____ 17. Frogs and toads	c. Legs push backward against the ground

18. Circle the letter of each sentence that is true about response in amphibians.
    a. An amphibian's brain is structured very differently from a fish's.
    b. An amphibian's eye is protected from damage and kept moist by the nictitating membrane.
    c. Frogs probably do not see color as well as fishes.
    d. Amphibians hear through tympanic membranes, or eardrums.

Groups of Amphibians (page 788)

19. Circle the letter of each characteristic of salamanders.
    a. tail
    b. carnivore
    c. herbivore
    d. short body
20. Circle the letter of each characteristic of frogs and toads.
    a. tail
    b. no tail
    c. able to jump
    d. adults have gills
21. Circle the letter of each characteristic of caecilians.
    a. legless
    b. long legs
    c. able to jump
    d. some scales

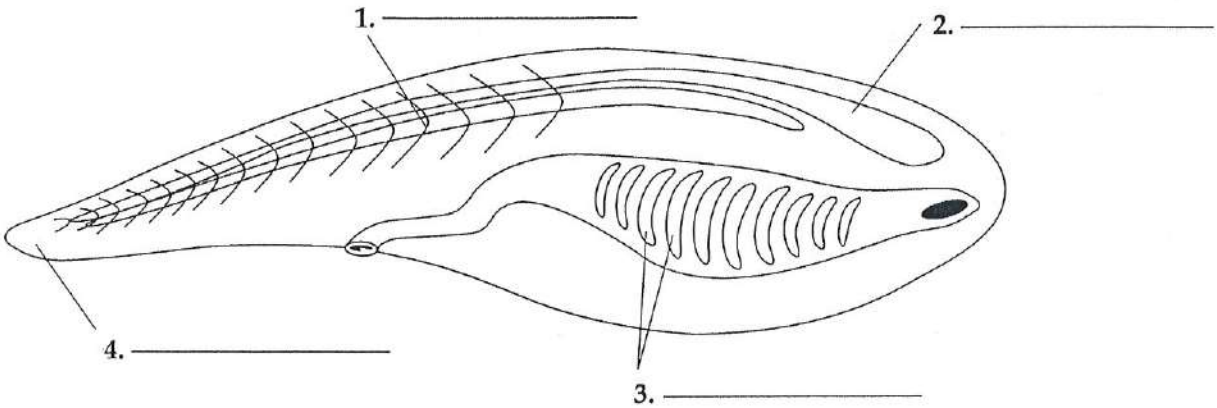
Ecology of Amphibians (page 789)

22. What are two ways in which amphibians protect themselves from predators?
    a. _____
    b. _____
23. Is the following sentence true or false? For the past several decades, the number of living species of amphibians has been increasing. _____

Name_____ Class_____ Date _____

Vocabulary Review

Labeling Diagrams *Use the following words to label the structures of the animal below:* nerve cord, notochord, pharyngeal pouches, *and* tail. *Then, complete the sentence.*



5. The animal diagrammed above is an example of a(an) _____.

Matching *In the space provided, write the letter of the definition that best matches each term.*

_____ 6. vertebrae
_____ 7. cartilage
_____ 8. atrium
_____ 9. ventricle
_____ 10. cerebrum
_____ 11. cerebellum
_____ 12. medulla oblongata
_____ 13. lateral line system
_____ 14. swim bladder
_____ 15. oviparous

a. part of the brain responsible for voluntary activities
b. part of the brain that controls many internal organs
c. chamber of the heart into which blood enters from the body
d. method of development in which eggs hatch outside the mother's body
e. receptors in fishes that sense motion and vibrations in water
f. tissue that is softer and more flexible than bone
g. individual segments that make up the backbone
h. part of the brain that coordinates body movements
i. the actual pumping portion of the heart
j. gas-filled organ in fishes that adjusts buoyancy

Completion *Fill in the blanks with terms from Chapter 30.*

16. In _____ animals, the eggs develop inside the mother's body, and the embryo uses the yolk for nourishment.
17. In _____ animals, the embryos develop inside the mother's body and obtain their nourishment from their mother, not the egg.
18. The muscular cavity at the end of the large intestine in amphibians is called the _____.
19. Transparent eyelids, called _____ membranes, protect an amphibian's eyes underwater and keep them moist in air.
20. Amphibians hear through _____ membranes, or eardrums.

Name_____ Class_____ Date _____

Summary

31–1 Reptiles

Reptiles are vertebrates that are adapted to live entirely on land. They have dry skin that is covered with protective scales. This helps hold water in their bodies. They have efficient lungs that get oxygen from air. Reptiles also have eggs with a shell and several membranes.

As the climate became drier at the end of the Carboniferous Period, amphibians began dying out. This opened up many new habitats for reptiles. The Mesozoic Era is often called the Age of Reptiles because of the diversity and large numbers of reptiles that lived. Dinosaurs were everywhere. The Age of Reptiles ended with a mass extinction at the end of the Cretaceous Period.

Reptiles are ectotherms. They control their body temperature by their behavior. To warm up, they bask in the sun. To cool down, they move into shade, go for a swim, or move to an underground burrow.

Reptiles eat a wide range of foods. They also have many different ways of eating.

Reptile lungs have more gas-exchange area than amphibian lungs. Reptiles also have muscles around their ribs. They are able to expand their chest to inhale and collapse it to exhale.

Reptiles have a double-loop circulatory system. One loop carries blood to and from the lungs. The other loop carries blood to and from the rest of the body. Most reptiles have a three-chambered heart with a partially separated ventricle. Crocodiles have two atria and two ventricles.

Reptiles get rid of liquid wastes as urine. The urine contains either ammonia or uric acid. Reptiles that live in water excrete ammonia. Reptiles that live on land convert ammonia to uric acid. Uric acid is less toxic and requires less water to dilute it.

The reptilian brain is similar to the amphibian brain. However, the cerebrum and cerebellum are larger. Reptiles have well-developed sense organs.

Reptiles have larger and stronger limbs than amphibians. Their legs are rotated further under the body than those of amphibians. In this position, the legs can carry more body weight.

Reptiles have internal fertilization. Most are oviparous, laying eggs that develop outside the mother's body. The embryos are covered with membranes and a protective shell. This amniotic egg keeps the embryo from drying out. Some snakes and lizards are ovoviviparous, and the young are born alive.

Four groups of reptiles survive today. Lizards and snakes (order Squamata) have legs, clawed toes, external ears, and movable eyelids. Snakes are lizards that have lost their legs during their evolution.

Crocodilians (order Crocodilia) have long, broad snouts and a squat appearance. They are fierce carnivores that live only in tropical climates. Crocodilians include alligators, crocodiles, caimans, and gavials.

Turtles and tortoises (order Testudines) have backbones fused to a shell, which provides protection. Turtles usually live in water. Tortoises usually live on land. Instead of teeth, these reptiles have horny ridges on their jaws.

The tuatara (order Sphenodonta) is found only on a few islands near New Zealand. They look somewhat like lizards, but do not have external ears and have primitive scales. They also have a "third eye," which is part of a sense organ on the top of the brain.

Name_____ Class_____ Date _____

31–2 Birds

Birds are reptilelike animals that have a constant internal body temperature. They have two legs that are covered with scales. Their front legs are modified into wings. Birds are covered with feathers. Feathers help birds fly and keep them warm. Birds have different kinds of feathers.

Paleontologists agree that birds evolved from extinct reptiles. Some think that birds evolved directly from dinosaurs. Others think that birds and dinosaurs evolved from an earlier common ancestor.

Birds have many adaptations that enable them to fly. Birds are endotherms. They produce their own body heat. Their high metabolic rate produces heat. Feathers help conserve this heat.

Birds need to eat large amounts of food to maintain their high metabolic rate. Birds have bills adapted to the type of food they eat. Some birds have digestive organs called a crop and a gizzard. The crop is located at the end of the esophagus. Food is stored and moistened in the crop. The gizzard is part of the stomach. It grinds and crushes food so that it is easier to digest.

Birds have a very efficient respiratory system. A system of air sacs and breathing tubes ensures that air flows into the air sacs and out through the lungs in one direction. The lungs are constantly exposed to oxygen-rich air. This helps birds maintain their high metabolic rate.

Birds have a four-chambered heart and two circulatory loops. A bird's heart has two separate ventricles. Oxygen-rich blood and oxygen-poor blood are completely separated.

Birds have an excretory system similar to that of reptiles. Nitrogenous wastes are converted to uric acid and sent to the cloaca. The cloaca reabsorbs most of the water from the wastes before they are expelled.

Birds have a well-developed brain and sense organs. The cerebrum and cerebellum are large in relation to body size. These adaptations enable birds to respond quickly to stimuli and coordinate the movements for flight. Birds have well-developed sight and hearing but do not sense smells or tastes very well.

The bodies, wings, legs, and feet of birds are adapted to many different habitats and lifestyles. Some of these adaptations, like air spaces in bones, help birds fly. All birds, however, do not fly.

Birds have internal fertilization. They lay amniotic eggs that have a hard shell. Most birds keep their eggs warm until they hatch. One or both parents may care for the offspring.

Name_____ Class_____ Date _____

Section 31–1 Reptiles (pages 797–805)

Key Concepts

- What are the characteristics of reptiles?
- How are reptiles adapted to life on land?
- What are the four living orders of reptiles?

What Is a Reptile? (page 797)

1. List three characteristics shared by all reptiles.

   a. _____

   b. _____

   c. _____

2. What is the disadvantage of reptilian scaly skin? _____

   _____

   _____

Evolution of Reptiles (pages 798–799)

3. Circle the letter of each sentence that is true about the evolution of reptiles.

   a. Reptiles evolved rapidly in the warm, humid climate of the Carboniferous Period.

   b. Mammal-like reptiles dominated many land habitats until near the end of the Triassic Period.

   c. All dinosaurs were enormous.

   d. Some dinosaurs may have had feathers.

4. Is the following sentence true or false? The extinction of dinosaurs opened up new niches on land and in the sea, providing opportunities for other kinds of organisms to evolve.

   _____

Form and Function in Reptiles (pages 800–802)

5. How do ectotherms control their body temperature? _____

   _____

   _____

6. Is the following sentence true or false? All reptiles are herbivores. _____

7. Circle the letter of each adaptation reptiles have for respiration.

   a. lungs
   c. strong rib muscles

   b. moist skin
   d. gill slits

8. Circle the letter of each sentence that is true about circulation in reptiles.

   a. Reptiles have a double-loop circulatory system.

   b. All reptile hearts have only one atrium.

   c. Most reptiles have one ventricle with partial internal walls.

   d. Crocodiles have the least developed heart of living reptiles.

Name_____ Class_____ Date _____

9. What is the advantage of uric acid to terrestrial reptiles? _____

_____

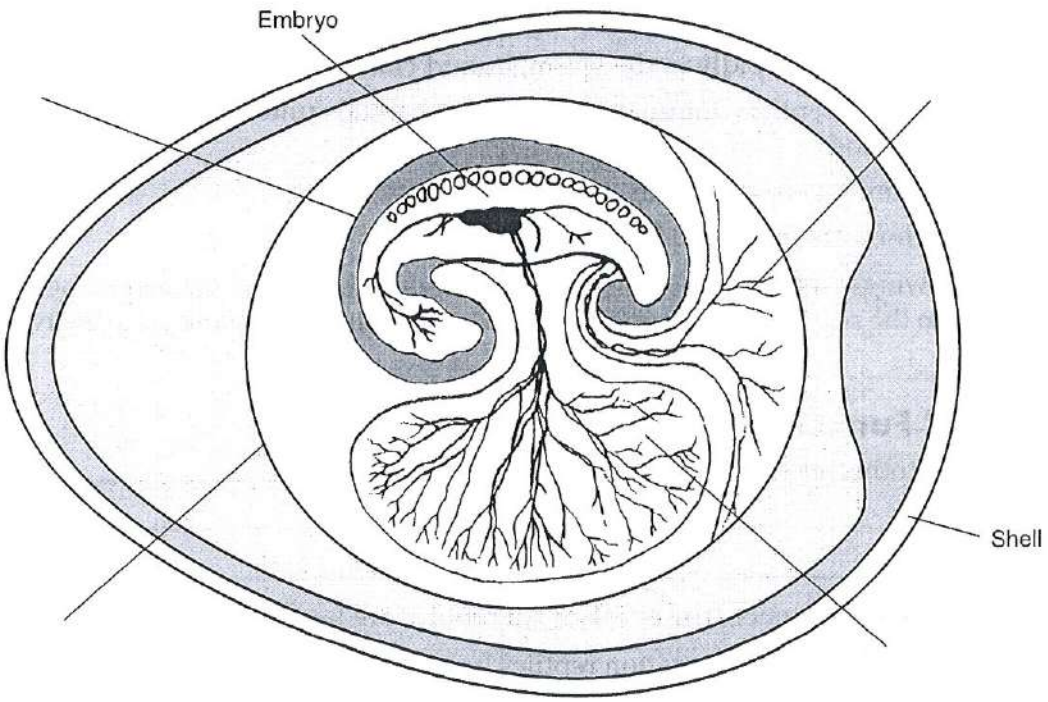
_____

10. Circle the letter of each sentence that is true about response in reptiles.
    a. The reptilian cerebrum is smaller than that of amphibians.
    b. Reptiles that are active during the day tend to have complex eyes.
    c. Reptiles do not have ears.
    d. Snakes sense vibrations in the ground through bones in their skulls.
11. Explain why reptiles are able to carry more body weight than amphibians.

_____

_____

12. All reptiles reproduce by _____ fertilization in which the male deposits sperm inside the body of the female.
13. In the diagram below, label the four membranes in the amniotic egg that surround the developing embryo.



Groups of Reptiles (pages 803–805)

14. What are the four living orders of reptiles?

_____

_____

Name_____ Class_____ Date _____

15. Is the following sentence true or false? Both snakes and lizards have scaly skin and clawed toes. _____

16. Circle the letter of each characteristic of crocodilians.

    a. long snout
    b. long legs
    c. herbivore
    d. protective of young

17. Members of the order Testudines that live on land are referred to as _____.

18. How do most turtles and tortoises protect themselves? _____

_____

19. Circle the letter of each characteristic of turtles and tortoises.

    a. teeth
    b. strong jaws
    c. strong limbs
    d. long, broad snout

20. Describe how tuataras differ from lizards. _____

_____

_____

Ecology of Reptiles (page 805)

21. Circle the letter of each sentence that is true about the ecology of reptiles.

    a. Reptiles are in no danger of disappearing.
    b. Reptilian habitats have been expanding.
    c. Humans hunt reptiles for food, to sell as pets, and for their skins.
    d. Conservation programs are in place to help reptiles survive.

Reading Skill Practice

Flowcharts can help you to order the steps in a process or the stages in a series of events. Construct a flowchart that shows the stages in the evolution of reptiles, beginning at the end of the Carboniferous Period and ending with the extinction of dinosaurs at the end of the Cretaceous Period. See Appendix A in your textbook for more information about flowcharts. Do your work on a separate sheet of paper.

Name_____ Class_____ Date _____

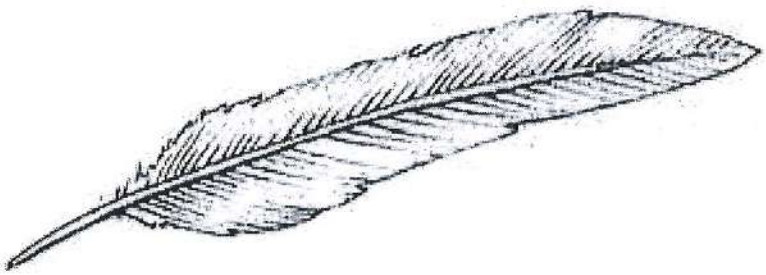
Section 31–2 Birds (pages 806–814)

Key Concepts

- What characteristics do birds have in common?
- How are birds adapted for flight?

What Is a Bird? (page 806)

1. Circle the letter of each characteristic of birds.
   a. feathers
   b. four legs
   c. wings
   d. scales
2. The single most important characteristic that separates birds from all other living animals is _____.
3. List two functions of feathers.
   a. _____
   b. _____
4. Identify each type of feather diagrammed below.



_____

_____

Evolution of Birds (page 807)

5. In what ways is the early bird *Archaeopteryx* different from modern birds?

_____

_____

6. Is the following sentence true or false? Scientists know for certain that birds evolved directly from dinosaurs. _____

Name_____ Class_____ Date _____

Form, Function, and Flight (pages 808–812)

7. What adaptations do birds have that enable them to fly? _____

_____

_____

_____

8. For what two things do birds require energy?

a. _____

b. _____

9. Is the following sentence true or false? Birds have a low metabolic rate compared to reptiles. _____

Match the type of bird bill with the type of food it is adapted to eat.

Bird Bill	Food
_____ 10. Short and fine	a. Flower nectar
_____ 11. Short and thick	b. Seeds
_____ 12. Strong and hooked	c. Insects
_____ 13. Long and thin	d. Animal prey

14. What is the main function of the crop? _____

_____

15. Why might a bird swallow gravel or small stones? _____

_____

_____

16. What is an advantage of the one-way airflow through a bird's lungs? _____

_____

_____

17. What type of circulatory system do birds have? _____

_____

18. Circle the letter of the form of nitrogenous waste excreted by birds.

a. ammonia

b. urea

c. uric acid

d. nitrate

Name_____ Class_____ Date _____

19. Circle the letter of each sentence that is true about response in birds.
    a. Birds have brains that quickly interpret and respond to signals.
    b. The cerebrum controls behaviors, such as nest building.
    c. The cerebellum in birds is much like that in reptiles.
    d. Birds can sense tastes and smells quite well.
20. What are two ways in which the skeleton of a flying bird is strengthened for flight?
    a. _____
    b. _____
21. How are the amniotic eggs of birds different from the eggs of reptiles? _____
    _____
    _____
22. Is the following sentence true or false? Bird parents do not ever care for their offspring.
    _____

Groups of Birds (pages 812–813)

Match the bird group with its characteristics. Use Figure 31–19 as a guide.

Bird Groups	Characteristics
_____ 23. Birds of prey	a. Largest order of birds, which includes songbirds
_____ 24. Ostriches and their relatives	b. Fierce predators with hooked bills, large wingspans, and sharp talons
_____ 25. Parrots	c. Flightless birds that move by running
_____ 26. Perching birds	d. Adapted to wading in aquatic habitats
_____ 27. Herons and their relatives	e. Colorful, noisy birds that use their feet to hold up food
_____ 28. Cavity-nesting birds	f. Birds found in all types of aquatic ecosystems; have four toes connected by a web
_____ 29. Pelicans and their relatives	g. Multicolored birds that live in holes made in trees, mounds, or underground tunnels

Name_____ Class_____ Date _____

Ecology of Birds (page 814)

30. Circle the letter of each way in which birds interact with natural ecosystems.
    a. pollinate flowers
    b. disperse seeds
    c. control insects
    d. produce toxic wastes
31. Is the following sentence true or false? Some species of migrating birds use stars and other celestial bodies as guides. _____
32. Is the following sentence true or false? Birds are not affected by changes in the environment. _____

Reading Skill Practice

By looking at illustrations in textbooks, you can help yourself remember better what you have read. Look carefully at Figure 31–14 on page 809 in your textbook. What important information does the illustration communicate? Do your work on a separate sheet of paper.

Name_____ Class_____ Date _____

Vocabulary Review

Matching *In the space provided, write the letter of the definition that best matches each term.*

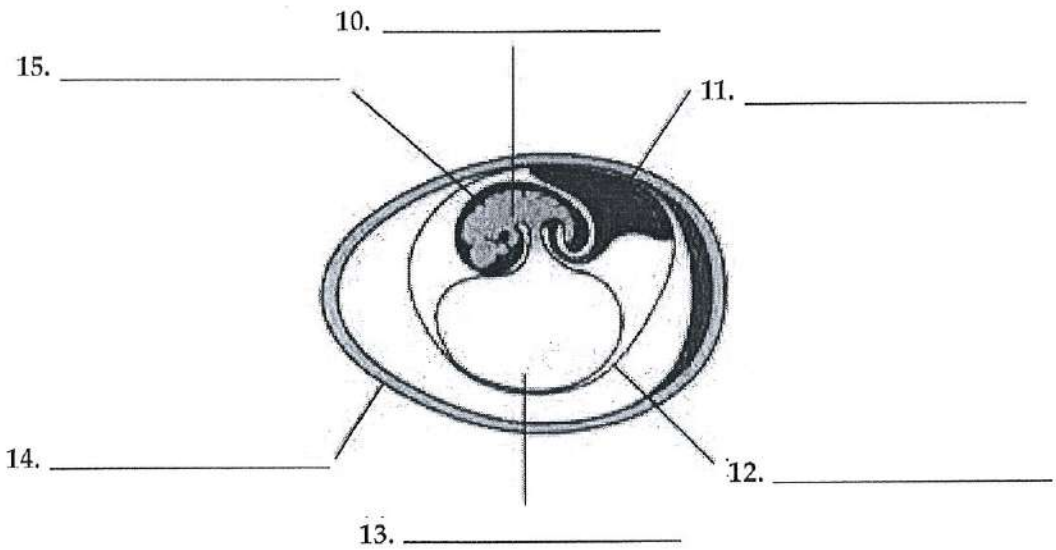
_____ 1. ectotherms
_____ 2. endotherms
_____ 3. carapace
_____ 4. plastron
_____ 5. crop
_____ 6. gizzard

a. digestive structure that grinds and crushes food
b. animals that can generate their own body heat
c. animals that rely on behavior to control body temperature
d. ventral part of a turtle shell
e. dorsal part of a turtle shell
f. digestive structure that stores and moistens food

Completion *Fill in the blanks with terms from Chapter 31.*

7. One of the most important adaptations to life on land is the _____, which protects the growing embryo and keeps it from drying out.
8. An outer covering of _____ helps birds fly and keeps them warm.
9. In birds, _____ direct air through the lungs in an efficient, one-way flow.

Labeling Diagrams *Use the following words to label the amniotic egg:* allantois, amnion, chorion, embryo, shell, *and* yolk sac.



Name_____ Class_____ Date _____

Summary

32–1 Introduction to the Mammals

All mammals have hair and mammary glands. In females, mammary glands produce milk to nourish the young. In addition to hair and mammary glands, all mammals breathe air, have four-chambered hearts, and can generate their body heat internally.

Mammals descended from ancient reptiles. Early mammals, which lived during the time of dinosaurs, were small and active only at night. When the dinosaurs became extinct, mammals evolved to fill many different niches.

Mammals have many different adaptations that allow them to live in diverse habitats. Like birds, mammals are endotherms. Their metabolism creates their body heat. They have body fat and fur or hair to prevent heat loss. Many have sweat glands to conserve body heat.

Mammals must eat a lot of food to maintain their high metabolic rate. Mammals have specialized teeth, jaws, and digestive systems for eating plants or animals or both.

All mammals use lungs to breathe. Well-developed muscles in the chest, including the diaphragm, help pull air into the lungs and push air out.

Mammals have a four-chambered heart and a double-loop circulatory system. One loop brings blood to and from the lungs, and the other loop brings blood to and from the rest of the body. Each side of the heart has an atrium and a ventricle. Oxygen-rich blood is completely separated from oxygen-poor blood.

Highly developed kidneys help control the amount of water in the body. This enables mammals to live in many different habitats. The kidneys filter nitrogenous wastes from the blood, forming urine.

Mammals have the most highly developed brains of any animals. Mammalian brains consist of a cerebrum, cerebellum, and medulla oblongata. The cerebrum contains a well-developed outer layer called the cerebral cortex. It is the center of thinking and other complex behaviors.

Mammals, like other vertebrates, have endocrine glands that are part of an endocrine system. Endocrine glands regulate body activities by releasing hormones that affect other organs and tissues.

Mammals have many different adaptations for movement. Variations in the structure of limb bones allow mammals to run, walk, climb, burrow, hop, fly, and swim.

Mammals reproduce by internal fertilization. All newborn mammals feed on the mother's milk. Most mammal parents care for their young for a certain amount of time after birth. The length of care varies among species.

32–2 Diversity of Mammals

The three groups of living mammals are the monotremes, marsupials, and placentals. They differ in their means of reproduction and development. Monotremes lay eggs. They also have a cloaca, similar to the cloaca of reptiles. When the soft-shelled monotreme eggs hatch, the young are nourished by the mother's milk.

Marsupials bear live young that complete their development in an external pouch. The young are born at a very early stage of development. They crawl across the mother's fur and attach to a nipple. They continue to drink milk until they are large enough to survive on their own.

Placental mammals are the most familiar. Placental mammals are named for the placenta—an internal structure that is formed when the embryo's tissues join with tissues from within the mother's body. Nutrients, oxygen, carbon dioxide, and wastes are passed between the embryo and mother through the placenta. After birth, most placental mammals care for their offspring.

32–3 Primates and Human Origins

All primates share several important adaptations. Many of these adaptations are useful for a life spent mainly in trees. These adaptations include binocular vision, a well-developed cerebrum, flexible fingers and toes, and arms that rotate in broad circles.

Very early in evolutionary history, primates split into several groups. Prosimians are small, nocturnal primates with large eyes adapted for seeing in the dark. Anthropoids include monkeys, apes, and humans.

Very early in their evolutionary history, anthropoids split into two major groups. One group evolved into the monkeys found today in Central and South America. This group is called the New World monkeys. All New World monkeys have a prehensile tale. A prehensile tail is a tail that can coil tightly around a branch to serve as a "fifth hand." The other group of anthropoids includes the Old World monkeys and the great apes. Old World monkeys do not have prehensile tails. Great apes, which are also called hominoids, include gorillas, chimpanzees, and humans.

The hominoid line gave rise to the branch that leads to modern humans. This group, called the hominids, evolved adaptations for upright walking, thumbs adapted for grasping, and larger brains.

Many recent fossil finds have changed the way paleontologists think about hominid evolution. Now researchers think that hominid evolution occurred in a series of complex adaptive radiations. This produced a large number of different species rather than one species that led directly to the next.

Researchers agree that our genus, *Homo*, first appeared in Africa. However, researchers do not agree when the first hominids began migrating from Africa. They are also not sure when and where *Homo sapiens* arose. The multiregional model suggests that modern humans evolved independently in several parts of the world. The out-of-Africa model proposes that modern humans arose in Africa and then migrated out.

About 500,000 years ago, two main groups of hominids are known to have existed. *Homo neanderthalensis* lived in Europe and western Asia. Fossil evidence suggests that they used stone tools and lived in organized groups. The other group is the first *Homo sapiens*. Researchers think that they lived side by side with Neanderthals.

According to one hypothesis, around 50,000–40,000 years ago, *H. sapiens* dramatically changed their way of life. They made more sophisticated tools. They produced cave paintings. They also began burying their dead with elaborate rituals. In other words, they began to behave more like modern humans. The Neanderthals disappeared about 30,000 years ago. It is not yet known why. Since then, *H. sapiens* has been the only hominid on Earth.

Name_____ Class_____ Date _____

Section 32–1 Introduction to the Mammals

(pages 821–827)

Key Concepts

- What are the characteristics of mammals?
- When did mammals evolve?
- How do mammals maintain homeostasis?

Introduction (page 821)

1. List the two notable features of mammals.
   a. _____
   b. _____
2. Circle the letter of each characteristic of mammals.
   a. breathe air
   b. three-chambered heart
   c. ectotherm
   d. endotherm

Evolution of Mammals (page 821)

3. What three characteristics help scientists identify mammalian fossils?
   a. _____
   b. _____
   c. _____
4. The ancestors of mammals diverged from ancient _____ during the Permian Period.
5. Circle the letter of each sentence that is true about the evolution of mammals.
   a. The first true mammals were as large as dinosaurs.
   b. During the Cretaceous Period, mammals were probably nocturnal.
   c. After dinosaurs disappeared, mammals increased in size and filled many new niches.
   d. The Permian Period is usually called the Age of Mammals.

Form and Function in Mammals (pages 822–827)

6. List two ways in which mammals conserve body heat.
   a. _____
   b. _____

Name_____ Class_____ Date _____

7. Is the following sentence true or false? Mammals have a low rate of metabolism.

_____

8. Circle the letter of each way mammals are able to rid themselves of excess heat.
   a. fat c. sweat glands
   b. hair d. panting
9. The ability of mammals to regulate their body heat from within is an example of _____.
10. Is the following sentence true or false? Animals that are omnivores consume only meat. _____
11. As mammals evolved, the form and function of their _____ and _____ became adapted to eat foods other than insects.
12. Complete the table about the different kinds of teeth found in mammals.

TEETH ADAPTATIONS IN MAMMALS

Type	Description
Canines	
	Chisellike incisors used for cutting, gnawing, and grooming
Molars and premolars	

13. In which type of animal would you expect to find sharp canine teeth? _____
14. How are herbivores' molars adapted for their diet? _____

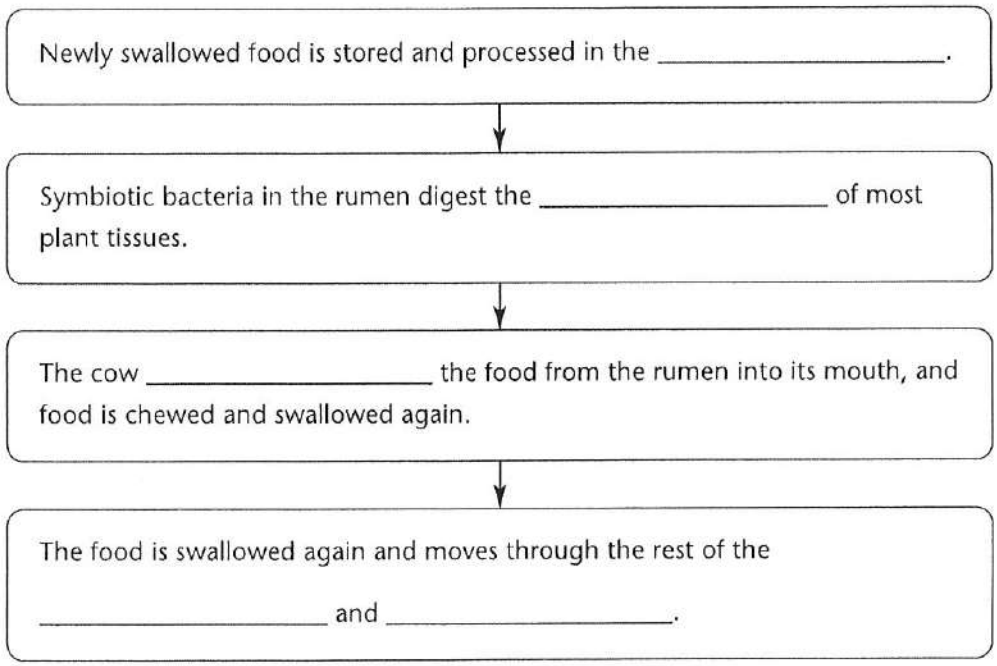
_____

_____

15. Is the following sentence true or false? Carnivores have a shorter intestine than herbivores. _____

Name_____ Class_____ Date _____

16. Complete the flowchart to show how cows digest their food.



17. How does the diaphragm work to help move air into and out of the lungs?

_____

_____

_____

_____

18. Is the following sentence true or false? Mammals have a four-chambered heart that pumps blood into two separate circuits around the body. _____

19. Where does the right side of the heart pump oxygen-poor blood? _____

20. After blood picks up oxygen in the lungs, where does it go? _____

_____

Name_____ Class_____ Date _____

21. How do mammalian kidneys help to maintain homeostasis? _____

_____

_____

_____

Match each part of the mammalian brain with its function.

Part of the brain	Function
_____ 22. medulla oblongata	a. Involved in thinking and learning
_____ 23. cerebral cortex	b. Controls muscular coordination
_____ 24. cerebrum	c. Regulates involuntary body functions
_____ 25. cerebellum	d. Part of the cerebrum that is the center of thinking and other complex behaviors

26. What are endocrine glands? _____

_____

_____

27. What body system helps to protect mammals from disease? _____

28. Is the following sentence true or false? Mammals have a rigid backbone, as well as rigid shoulder and pelvic girdles for extra stability. _____

29. Mammals reproduce by _____ fertilization.

30. Is the following sentence true or false? All mammals are viviparous, or live-bearing.

_____

31. What do young mammals learn from their parents? _____

_____

_____

Name_____ Class_____ Date _____

Section 32–2 Diversity of Mammals (pages 828–832)

Key Concepts

- How do the three groups of living mammals differ from one another?
- How did convergent evolution cause mammals on different continents to be similar in form and function?

Introduction (page 828)

1. List the three groups of living mammals.

   a. _____ b. _____ c. _____

2. The three groups of mammals differ greatly in their means of _____ and development.

Monotremes and Marsupials (pages 828–829)

3. The mammals that lay eggs are _____. Those that bear live young at a very early stage of development are _____.
4. What two characteristics do monotremes share with reptiles?

   a. _____

   _____

   b. _____

   _____

5. How do monotremes differ from reptiles? _____

   _____

   _____

6. Circle the letter of each mammal that is a marsupial.

   a. koala
   b. echidna
   c. platypus
   d. kangaroo

7. Describe how marsupial embryos develop. _____

   _____

   _____

   _____

   _____

   _____

Placental Mammals (pages 829–831)

8. What is the placenta? _____

   _____

   _____

Name_____ Class_____ Date _____

9. What four substances are exchanged between the embryo and the mother through the placenta?

   a. _____ c. _____

   b. _____ d. _____

10. Is the following sentence true or false? After birth, most placental mammals care for their young and provide them with nourishment by nursing. _____

Match the main order of placental mammal with its description. Use Figure 32–12 on pages 830–831.

Order	Description
_____ 11. Insectivores	a. Hoofed mammals with an even number of digits on each foot
_____ 12. Sirenians	b. Herbivores with two pairs of incisors in the upper jaw and hind legs adapted for leaping
_____ 13. Chiropterans	c. Herbivores that live in rivers, bays, and warm coastal waters
_____ 14. Artiodactyls	d. The only mammals capable of true flight
_____ 15. Proboscideans	e. Insect eaters with long, narrow snouts and sharp claws
_____ 16. Lagomorphs	f. Mammals that have trunks

Biogeography of Mammals (page 832)

17. Is the following sentence true or false? During the Paleozoic Era, the continents were one large landmass. _____

18. What effect on the evolution of mammals was caused when the continents drifted apart? _____

_____

_____

_____

_____

Reading Skill Practice

A compare-and-contrast table is a useful tool for organizing similarities and differences. Make a table to compare the three groups of living mammals. Include information about the reproduction and development of each group. For more information about compare-and-contrast tables, look in Appendix A of your textbook. Do your work on a separate sheet of paper.

Name_____ Class_____ Date _____

Section 32–3 Primates and Human Origins

(pages 833–841)

Key Concepts

- What characteristics do all primates share?
- What are the major evolutionary groups of primates?
- What is the current scientific thinking about hominid evolution?

What Is a Primate? (pages 833–834)

1. What characteristic distinguished the first primates from other mammals? _____

_____

_____

2. List four adaptations that are shared by primates.

a. _____

b. _____

c. _____

d. _____

3. Circle the letter of each sentence that is true about primates.

a. Primates are well adapted to a life of running on the ground.

b. Many primates can hold objects firmly in their hands.

c. A well-developed cerebrum enables primates to display elaborate social behaviors.

d. Because primates have a flat face, both eyes point to the sides.

4. What is binocular vision? _____

_____

_____

_____

Evolution of Primates (pages 834–835)

5. Circle the letter of each characteristic of prosimians.

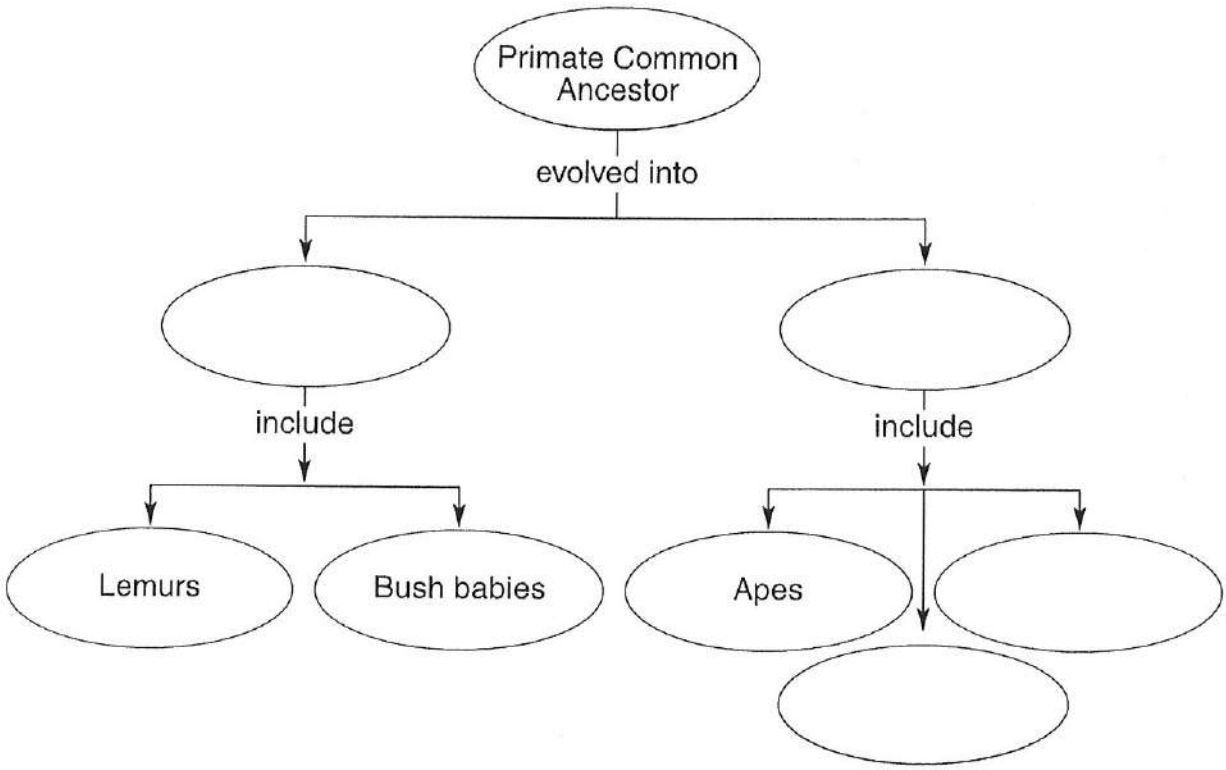
a. nocturnal b. diurnal c. small in size d. small eyes

Match the characteristics to the anthropoid group. Each anthropoid group may be used more than once.

Characteristic	Anthropoid Group
_____ 6. Found today in Central and South America	a. New World monkeys
_____ 7. Found today in Africa and Asia	b. Old World monkeys
_____ 8. Includes baboons and macaques	
_____ 9. Includes squirrel monkeys and spider monkeys	
_____ 10. Lack prehensile tails	
_____ 11. Long, prehensile tails and long, flexible arms	

Name_____ Class_____ Date _____

12. Complete the concept map to show the evolution of primates.



13. The anthropoid group that includes Old World monkeys also includes the great apes, or _____.

Hominid Evolution (pages 835–838)

14. What was the importance of bipedal locomotion that evolved in the hominid family?

_____

_____

15. The hominid hand evolved a(an) _____ thumb that enabled grasping objects and using tools.
16. Is the following sentence true or false? Hominids have a much larger brain than the other hominoids, such as chimpanzees. _____
17. Is the following sentence true or false? Only one fossil species exists that links humans with their nonhuman primate ancestors. _____
18. Circle the letter of each characteristic of the hominid genus *Australopithecus*.
    a. bipedal apes
    b. never lived in trees
    c. fruit eaters
    d. very large brains

Name_____ Class_____ Date _____

19. Is the following sentence true or false? Fossil evidence shows that hominids walked bipedally long before they had large brains. _____

20. Based on their teeth, what kind of diet did the known *Paranthropus* species probably eat?

_____

21. Is the following sentence true or false? Currently, researchers completely understand the evolution of the hominid species. _____

The Road to Modern Humans (pages 839–840)

22. *Homo habilis* was found with tools made of _____.

23. Describe the two hypotheses that explain how modern *Homo sapiens* might have evolved from earlier members of the genus *Homo*.

a. _____

_____

b. _____

_____

Modern *Homo sapiens* (page 841)

24. Circle the letter of each characteristic of Neanderthals.

a. stone tools

b. lived in social groups

c. gave rise to *H. sapiens*

d. made cave paintings

25. Is the following sentence true or false? Neanderthals and *Homo sapiens* lived side by side for around 50,000 years. _____

26. What fundamental changes did some populations of *H. sapiens* make to their way of life around 50,000–40,000 years ago? _____

_____

_____

Name_____ Class_____ Date _____

Vocabulary Review

Multiple Choice *In the space provided, write the letter of the answer that best completes each sentence.*

_____ 1. Mammals are characterized by hair and
   a. lungs.
   b. mammary glands.
   c. four-chambered hearts.
   d. prehensile tails.

_____ 2. The outer layer of the cerebrum that is the center of thinking is the
   a. cerebellum.
   b. medulla oblongata.
   c. cerebral cortex.
   d. subcutaneous fat.

_____ 3. Mammals that lay eggs are
   a. monotremes.
   b. placental mammals.
   c. marsupials.
   d. primates.

_____ 4. Small, nocturnal primates with large eyes adapted to seeing in the dark belong to the primate group called
   a. prosimians.
   b. hominoids.
   c. anthropoids.
   d. hominids.

_____ 5. Members of the primate group in which the only living members are humans are called
   a. prosimians.
   b. hominoids.
   c. anthropoids.
   d. hominids.

Completion *Fill in the blanks with terms from Chapter 32.*

6. The layer of fat located beneath the skin is called _____.
7. The _____ is a stomach chamber in which newly swallowed plant food is stored and processed.
8. A powerful muscle called the _____ pulls the bottom of the chest cavity downward, pulling air into the lungs.
9. Mammals bearing live young that complete their development in a pouch are called _____.
10. A structure called a(an) _____ forms when an embryo's tissues join with tissues from the mother's body.
11. The ability to merge visual images from both eyes is called _____.
12. Members of the primate group that includes monkeys, apes, and humans are called _____.
13. A tail that can coil tightly around a branch is called a(an) _____ tail.
14. The evolution of _____, or two-foot, locomotion freed the hands to use tools.
15. The hominid hand evolved a(an) _____ that enabled grasping objects and using tools.