Classification

Name _______________

Mrs. Benedict
Honors Biology
Learning Objectives
Classification

- Compare and contrast the domains/kingdoms with respect to: cell type, cell structures, number of cells mode of nutrition and example organisms. (18-3)
- Use and create dichotomous keys (18-2)
- Compare and contrast invertebrates and vertebrates; identify which are more abundant. (26-1)
- Describe the following trends in animal evolution and discuss advantages of each (26-1)
  - Cell specialization
  - Internal body organization (protostome vs. deuterostome development)
  - Bilateral body symmetry (vs. radial symmetry)
  - Cephalization
  - Body cavity formation (coelom)
- Identify (memorize) the derived characters and evolutionary relationships presented in the cladogram of animal evolution on p747 and described on pages 748-749. (29-1)
- Compare and contrast an open circulatory system with a closed circulatory system and provide examples of organisms in each category. (29-2)
- Compare and contrast the terms hydrostatic skeleton, endoskeleton and exoskeleton, and provide examples of organisms with each. (29-2)
- Describe how the major invertebrate phyla carry out their life functions. (29-2)
- Identify which chordate groups have amniotic eggs, which groups are oviparous and which are viviparous. (33-3)
- Compare and contrast ectothermy with endothermy and provide examples of chordates in each category. (33-2)
- Compare and contrast the circulatory systems of fishes, reptiles, birds and mammals. (33-3)

Classification Vocabulary

<table>
<thead>
<tr>
<th>Term</th>
<th>Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acoelomate</td>
<td>Endothermy</td>
</tr>
<tr>
<td>Amniotic Egg</td>
<td>Eubacteria</td>
</tr>
<tr>
<td>Animalia</td>
<td>Eukaryote</td>
</tr>
<tr>
<td>Archaeabacteria</td>
<td>Exoskeleton</td>
</tr>
<tr>
<td>Bilateral Symmetry</td>
<td>Family</td>
</tr>
<tr>
<td>Blastopore</td>
<td>Fungi</td>
</tr>
<tr>
<td>Cell Specialization</td>
<td>Gastrovascular Cavity</td>
</tr>
<tr>
<td>Cephalization</td>
<td>Genus</td>
</tr>
<tr>
<td>Chordate</td>
<td>Hydrostatic Skeleton</td>
</tr>
<tr>
<td>Cladogram</td>
<td>Invertebrate</td>
</tr>
<tr>
<td>Class</td>
<td>Kingdom</td>
</tr>
<tr>
<td>Closed circulatory system</td>
<td>Notochord</td>
</tr>
<tr>
<td>Coelom</td>
<td>Open circulatory system</td>
</tr>
<tr>
<td>Coelomate</td>
<td>Order</td>
</tr>
<tr>
<td>Derived Characteristics</td>
<td>Oviparous</td>
</tr>
<tr>
<td>Deuterostome</td>
<td>Phylum</td>
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<tr>
<td>Dichotomous Key</td>
<td>Plantae</td>
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<tr>
<td>Digestive Tract</td>
<td>Prokaryote</td>
</tr>
<tr>
<td>Domain</td>
<td>Protista</td>
</tr>
<tr>
<td>Ectothermy</td>
<td>Protostome</td>
</tr>
<tr>
<td>Endoskeleton</td>
<td>Pseudocoelomate</td>
</tr>
<tr>
<td>Radial Symmetry</td>
<td>Vertebrate</td>
</tr>
<tr>
<td>Species</td>
<td>Viviparous</td>
</tr>
<tr>
<td>Taxonomy</td>
<td></td>
</tr>
</tbody>
</table>
Why Classify?

- To group organisms in a logical manner.
- Taxonomy

- Binomial nomenclature:

Example:

**The Linnaean System of Classification**

Mnemonic Device
Modern Evolutionary Classification

Mnemonic Device

- Scientists now group organisms into categories that represent lines of evolutionary descent,
- Cladograms

Cladogram Construction
Classification of Living Things

Kingdoms & Domains
Animal Kingdom
Increasing Complexity of Animals

- Protostome:
- Deuterostome:

- Body Symmetry
- Cephalization -

- A body cavity ( )

Circulatory System in Animals

Closed Circulatory System -
  - Annelids, some mollusks, and chordates rely on closed circulatory system.

Open Circulatory System -

  -- Arthropods and some mollusks rely on an open circulatory system.
Skeletons

- Hydrostatic Skeleton-
- Exoskeleton-
- Endoskeleton-
<table>
<thead>
<tr>
<th></th>
<th>Feeding</th>
<th>Respiration</th>
<th>Circulation</th>
<th>Excretion</th>
<th>Response</th>
<th>Movement</th>
<th>Reproduction</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sponges</strong></td>
<td></td>
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<tr>
<td><strong>Cnidarians</strong></td>
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<td></td>
</tr>
<tr>
<td><strong>Flatworms</strong></td>
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<td></td>
</tr>
<tr>
<td><strong>Roundworms</strong></td>
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<td></td>
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<td></td>
</tr>
<tr>
<td><strong>Mollusks</strong></td>
<td></td>
<td></td>
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</tr>
<tr>
<td><strong>Annelids</strong></td>
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<td></td>
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<td></td>
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<tr>
<td><strong>Arthropods</strong></td>
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<td></td>
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<tr>
<td><strong>Echinoderms</strong></td>
<td></td>
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<td></td>
</tr>
<tr>
<td><strong>Chordates</strong></td>
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</tr>
</tbody>
</table>
Chordates

Chordate Eggs

- Almost all vertebrate reproduce sexually.
- Development of chordates is:
  1. oviparous-
  2. ovoviviparous
  3. viviparous
Chordate Body Temperature

- Ectothermy-

- Endothermy-

Chordate Circulation
Why Classify? (page 447)

1. Why do biologists use a classification system to study the diversity of life?

2. The science of classifying organisms and assigning them universally accepted names is known as ________________.

3. Is the following sentence true or false?

   In a good system of classification, organisms placed into a particular group are less similar to each other than they are to organisms in other groups.

Assigning Scientific Names (page 448)

4. Why is it confusing to refer to organisms by common names?

5. Circle the letter of each sentence that is true about early efforts at naming organisms.
   a. Names were usually in English.
   b. Names often described detailed physical characteristics of a species.
   c. Names could be very long.
   d. It was difficult to standardize the names.

6. The two-word naming system developed by Linnaeus is called ________________.

7. Circle the letter of each sentence that is true about binomial nomenclature.
   a. The system is no longer in use today.
   b. Each species is assigned a two-part scientific name.
   c. The scientific name is always written in italics.
   d. The second part of the scientific name is capitalized.

8. What is the genus of the grizzly bear, Ursus arctos?

Linnaeus’s System of Classification (pages 449–450)

9. The largest taxonomic category in Linnaeus’s system of classification is the ________________, and the smallest is the ________________.
10. Fill in the name of each missing taxonomic category in the chart below.

Grizzly bear | Black bear | Giant panda | Red fox | Abert squirrel | Coral snake | Sea star

KINGDOM Animalia

Chordata

Mammalia

Carnivora

Ursidae

Ursus

SPECIES Ursus arctos
Section 18–2 Modern Evolutionary Classification (pages 451–455)
Introduction (page 451)

1. What traits did Linnaeus consider when classifying organisms?

Which Similarities Are Most Important? (page 451)

2. What problems are faced by taxonomists who rely on body-structure comparisons?

3. How can one explain similarities in body-structure without an ancestral relationship?

Evolutionary Classification (page 452)

4. Is the following sentence true or false?
   Darwin's theory of evolution changed the way biologists thought about classification.

5. How do biologists now group organisms into categories?

6. Is the following sentence true or false?
   Genera placed within a family should be less closely related to one another than to members of any other family.

7. The strategy of grouping organisms together based on their evolutionary history is called ________________.

Classification Using Cladograms (page 453)

8. Circle the letter of each sentence that is true about cladistic analysis.
   a. It considers only traits that are evolutionary innovations.
   b. It considers all traits that can be measured.
   c. It considers only similarities in body structure.
   d. It is a method of evolutionary classification.

9. Characteristics that appear in recent parts of a lineage, but not in its older members, are called ____________.

10. A diagram that shows the evolutionary relationships among a group of organisms is called a(an)______________.

11. Is the following sentence true or false?
   Derived characters are used to construct a cladogram.
**Similarities in DNA and RNA (page 454)**

12. Is the following sentence true or false? Some organisms do not have DNA or RNA.

13. How do similarities in genes show that humans and yeasts share a common ancestry?

**Molecular Clocks (page 455)**

14. Any change in the DNA sequence of a species is known as a ________________.

15. What is the ultimate source of variation for any species?

16. Why are only neutral mutations useful for molecular clocks?

17. Is the following sentence true or false?

   The degree of dissimilarity in DNA sequences is an indication of how long ago two species shared a common ancestor.
Section 18–3 Kingdoms and Domains (pages 457–461)

The Tree of Life Evolves (pages 457–458)
1. Complete the concept map.

![The Six-Kingdom System diagram]

2. A more inclusive category than any other, including the kingdom, is the ________________.

3. Complete the chart below.

<table>
<thead>
<tr>
<th>CLASSIFICATION OF LIVING THINGS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domain</td>
</tr>
<tr>
<td>--------</td>
</tr>
<tr>
<td>Eubacteria</td>
</tr>
<tr>
<td>Archaea</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>
Domain Bacteria (page 459)

4. Circle the letter of each sentence that is true about members of the domain Bacteria.
   a. They are multicellular.
   b. They are prokaryotes.
   c. They have rigid cell walls.
   d. The cell walls contain peptidoglycans.

5. Is the following sentence true or false?
   All members of the domain Bacteria are parasites.

Domain Archaea (page 459)

6. Circle the letter of each sentence that is true about members of the domain Archaea.
   a. They are unicellular.
   b. They are eukaryotes.
   c. They lack cell walls.
   d. They lack cell membranes.

7. Is the following sentence true or false?
   Many members of the domain Archaea can survive only in the absence of oxygen.

Domain Eukarya (pages 460–461)

8. Circle the letter of each sentence that is true about all the members of the domain Eukarya.
   a. They have a nucleus.
   b. They are multicellular.
   c. They are heterotrophs.
   d. They have cell walls and chloroplasts.

9. What is the difference between an organism that is prokaryote compared to an organism that is a eukaryote?

Match each kingdom with the description that applies to members of that kingdom.

<table>
<thead>
<tr>
<th>Kingdom</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>10. Protista</td>
<td>a. They have cell walls of chitin.</td>
</tr>
<tr>
<td>11. Fungi</td>
<td>b. They have no cell walls or chloroplasts.</td>
</tr>
<tr>
<td>12. Plantae</td>
<td>c. They include slime molds and giant kelp.</td>
</tr>
<tr>
<td>13. Animalia</td>
<td>d. They include mosses and ferns.</td>
</tr>
</tbody>
</table>
What Is an Animal? (page 657)
1. Is the following sentence true or false?
The cells that make up animal bodies are eukaryotic.

2. What characteristics do all animals share?

What Animals Do to Survive (pages 658–659)
3. What are seven essential functions that animals carry out?
   a. ___________________
   b. ___________________
   c. ___________________
   d. ___________________
   e. ___________________
   f. ___________________
   g. ___________________

4. Define each essential function.

5. What is a filter feeder?

6. What does an animal do when it respires?

7. What does the excretory system of most animals do?

8. Animals respond to events in their environment using specialized cells called __________.

9. What does it mean that an animal is motile?

10. Circle the letter of the process that helps a species maintain genetic diversity.
   a. asexual reproduction   c. response
   b. movement             d. sexual reproduction

11. What does asexual reproduction allow animals to do?

Trends in Animal Evolution (pages 660–663)
12. What are four characteristics that complex animals tend to have?
   a.
   b.
   c.
   d.
13. How have the cells of animals changed as animals have evolved?

14. Groups of specialized cells form ____________, which form organs, which form ______________.

15. Circle the letter of what a zygote forms after it undergoes a series of divisions.
   a. blastopore b. protostome c. blastula d. deuterostome

16. What is a protostome?
17. What is a deuterostome?

18. Is the following sentence true or false?
   Most invertebrates are deuterostomes.

19. Complete the table about germ layers.

<table>
<thead>
<tr>
<th>Germ Layer</th>
<th>Location</th>
<th>Develops Into These Body Structures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Innermost layer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Middle layer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outermost layer</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

20. Complete the table about body symmetry.

21. A body that is constructed of many repeated and similar parts, or segments, exhibits ______________.

22. What is cephalization?

23. What is a body cavity?

24. Why is having a body cavity important?
Section 29–1 Invertebrate Evolution (pages 745–750)

Invertebrate Phylogeny (page 747)

1. To which group of invertebrates are chordates most closely related to?

2. Number the features below according to the sequence in which they evolved. Number the feature that evolved first 1.
   a. Deuterostome development __________
   b. Tissues __________
   c. Coelom __________
   d. Protostome development __________

Evolutionary Trends (pages 748–750)

3. Circle the letter of each animal group that has organ systems.
   a. flatworms
   b. cnidarians
   c. mollusks
   d. arthropods

4. What body plan and lifestyle characterizes invertebrates that have evolved cephalization?

5. What is a coelom?

6. Label each of the cross sections according to whether it represents an acoelomate, a pseudocoelomate, or a coelomate.

7. Most complex animal phyla have a true coelom that is lined completely with __________.

8. What is the difference in early development between a protostome and a deuterostome? In

9. Which groups of invertebrates are protostomes?
Section 29–2 Form and Function in Invertebrates (pages 751–758)

Feeding and Digestion (pages 751–752)
1. How is the digestion of food different in simple animals compared to that in more complex animals?

2. More-complex animals digest food in a tube called a(an) ____________________.

Respiration (pages 752–753)
3. Why do respiratory organs have large surface areas?

4. Why are respiratory surfaces kept moist?

Circulation (page 754)
5. How do the smallest and thinnest animals meet the requirement of supplying oxygen and nutrients to cells and removing metabolic wastes?

6. Complex animals move fluid through their bodies using one or more ______________.

7. Closed circulatory systems are characteristic of what kinds of animals?

Excretion (pages 754–755)
8. What does the excretory system of most animals do?

9. How do aquatic invertebrates rid their bodies of ammonia?

10. Circle the letter of each way that terrestrial invertebrates eliminate nitrogenous wastes from their bodies.
   a. Ammonia diffuses from body tissues into the surrounding water.
   b. They convert ammonia into urea.
   c. They convert ammonia into uric acid.
   d. They form a thick paste that leaves the body through the rectum.

Response (page 756)
11. Number the following groups of invertebrates according to how centralized their nervous system is. Number the group with the simplest nervous system 1.
   a. Flatworms ________
   b. Cnidarians __________
   c. Arthropods __________

12. Is the following sentence true or false?
The more complex an animal’s nervous system, the more developed its sense organs are.
Movement and Support (pages 756–757)

13. What are the three main kinds of skeletal systems among invertebrates?
   
   a. _______________________
   
   b. _______________________
   
   c. _______________________

14. What invertebrates have endoskeletons?

Sexual and Asexual Reproduction (pages 757–758)

15. What is the difference between external and internal fertilization?

16. Circle the letter of each sentence that is true about invertebrate reproduction.
   
   a. Most invertebrates reproduce sexually in one part of their life cycle.
   
   b. Asexual reproduction maintains genetic diversity in a population.
   
   c. Asexual reproduction includes budding and division in two.
   
   d. Most invertebrates have separate sexes.
Section 33–1 Chordate Evolution (pages 849–852)
Chordate Origins (page 849)

1. A flexible, supporting structure found only in chordates is a(an) ___________________.

Chordate Diversity (pages 851–852)

2. Is the following sentence true or false?
The chordate species alive today are a small fraction of the total number of chordate species that have existed over time.

13. List the six living chordate groups in order from largest in number to smallest in number. See Figure 33–4 on page 852.
   a. ______________________
   b. ______________________
   c. ______________________
   d. ______________________
   e. ______________________
   f. ______________________

Section 33–2 Controlling Body Temperature (pages 854–856)
Body Temperature and Homeostasis (pages 854–855)

1. Circle the letter of each sentence that is true about body temperature.
   a. Essential life functions in animals can be carried out most efficiently at any temperature.
   b. If muscles are too cold, they may contract slowly.
   c. If an animal gets too hot, its muscles will work more efficiently.
   d. The control of body temperature is important for maintaining homeostasis.

2. List three features that vertebrates need in order to control their body temperature.
   a. ______________________
   b. ______________________
   c. ______________________
Match each description with the method of controlling body heat. Methods may be used more than once.

Method
a. Ectotherm
b. Endotherm

description
3. An animal whose body temperature is controlled from within
4. Examples include reptiles, fishes, and amphibians
5. Warm up by basking in the sun
6. High metabolic rates that generate a significant amount of heat
7. An animal whose body temperature is mainly determined by the temperature of its environment
8. Have feathers, body fat, or hair for insulation
9. Easily lose heat to the environment
10. Low metabolic rate
11. Cools off by panting or sweating

Comparing Ectotherms and Endotherms (page 856)
12. Name one advantage and one disadvantage of endothermy.

Advantage:

Disadvantage:

12. Is the following sentence true or false?
   Ectothermy is a more energy-efficient way to live in cold environments.

Evolution of Temperature Control (page 856)
14. Circle the letter of each sentence that is true about the evolution of temperature control.
   a. The first land vertebrates were ectotherms.
   b. Scientists know when endothermy evolved.
   c. Some biologists hypothesize that dinosaurs were endotherms.
   d. Evidence suggests that endothermy evolved more than once.
1. Complete the flowchart that describes the path of water as it moves through a fish. See Figure 33-9 on page 859.

Water flows in through the fish's ____________, where muscles pump the water across the _____________.

As water passes over the gill filaments, ____________ molecules diffuse into blood in the capillaries. At the same time, ____________ diffuses from blood into water.

Water and carbon dioxide are pumped out through the _____________.

2. Why do mammals need large amounts of oxygen?

3. Why are the lungs of birds most efficient?

Circulation (pages 860–861)

4. Is the following sentence true or false?
   Chordates that use gills for respiration have a single-loop circulatory system.

5. Identify where the blood is carried in each loop of a double-loop circulatory system.

First loop:

Second loop:

6. Is the following sentence true or false?
   In a double-loop system, oxygen-poor blood from the heart is carried to the body.

7. In vertebrates with gills, the heart consists of ____________ chambers.

8. What is the advantage of the reptilian heart over the amphibian heart?

9. Why is a four-chambered heart sometimes described as a double pump?
Excretion (page 861)
10. In nonvertebrate chordates and fishes, play an important role in excretion. However, most vertebrates rely on ________________.

11. How do vertebrate kidneys help maintain homeostasis?

Reproduction (page 864)
12. Is the following sentence true or false?
   Vertebrate evolution shows a general trend from internal to external fertilization.

13. Circle the letter of development in which the eggs develop internally and the embryos receive nutrients from the yolk surrounding them.
   a. oviparous          c. viviparous
   b. ovoviviparous      d. asexual
Cladogram Worksheet

Convert the following data table into a venn diagram, and then into a cladogram:

<table>
<thead>
<tr>
<th>Characters</th>
<th>Sponge</th>
<th>Jellyfish</th>
<th>Flatworm</th>
<th>Earthworm</th>
<th>Snail</th>
<th>Fruitfly</th>
<th>Starfish</th>
<th>Human</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cells with flagella</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Symmetry</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>(X)</td>
<td>X</td>
</tr>
<tr>
<td>Bilateral symmetry</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>(X)</td>
<td>X</td>
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<tr>
<td>Mesoderm</td>
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<td>X</td>
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<td>X</td>
<td>X</td>
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<td></td>
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<tr>
<td>Head develops first</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>Anus develops first</td>
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<td></td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
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<tr>
<td>Segmented body</td>
<td></td>
<td>X</td>
<td>X</td>
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<tr>
<td>Calcified Shell</td>
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<td>X</td>
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<td></td>
</tr>
<tr>
<td>Chitinous Exoskeleton</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
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<tr>
<td>Water-vascular system</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Vertebrae</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

Venn Diagram (Draw your cladogram on the back):
## Constructing a Cladogram for Plants

<table>
<thead>
<tr>
<th>Organisms</th>
<th>Derived Traits</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Vascular tissue</td>
<td>Seeds</td>
<td>Flowers</td>
<td></td>
</tr>
<tr>
<td>Mosses (out)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Pine trees</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Flowering plants</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Ferns</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

## Comparison of Traits in Different Organisms

<table>
<thead>
<tr>
<th></th>
<th>Goldfish</th>
<th>Lungfish</th>
<th>Lions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shoulder girdle</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Bony skeleton</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Humerus, ulna and radius bones</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Lungs</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Hair</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Derived Character</td>
<td>Shark</td>
<td>Bluegill</td>
<td>Human</td>
</tr>
<tr>
<td>-------------------</td>
<td>-------</td>
<td>----------</td>
<td>-------</td>
</tr>
<tr>
<td>Boney Skeleton</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Amniotic Egg</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hair</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Four Limbs</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Vertebrae</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Derived Character</th>
<th>Rabbit</th>
<th>Kangaroo</th>
<th>Finch</th>
<th>Snake</th>
<th>Platypus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amniotic Egg</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Placenta</td>
<td>X</td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>Hair</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Feathers</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scales</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Live Birth</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Traits</td>
<td>Lobster</td>
<td>Perch</td>
<td>Flounder</td>
<td>Spider</td>
<td>Lizard</td>
</tr>
<tr>
<td>-----------------</td>
<td>---------</td>
<td>-------</td>
<td>----------</td>
<td>--------</td>
<td>--------</td>
</tr>
<tr>
<td>Vertebral</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exoskeleton</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lung</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amniotic Egg</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spiny-rayed fins</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cephalization</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Traits</th>
<th>Toad</th>
<th>Lizard</th>
<th>Parrot</th>
<th>Crocodile</th>
<th>Manatee</th>
<th>Elephant</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 limbs</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Cardiac septum</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>See UV Light</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gizzard</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subdermal Fat Stores</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>
Chapter 18  Classification

Vocabulary Review

Hidden Word  Use the clues and the words below to write the correct vocabulary term in the blanks.

<table>
<thead>
<tr>
<th>cladogram</th>
<th>Eubacteria</th>
<th>genus</th>
<th>phylogeny</th>
</tr>
</thead>
<tbody>
<tr>
<td>domain</td>
<td>family</td>
<td>kingdom</td>
<td>taxonomy</td>
</tr>
</tbody>
</table>

Clues

1. kingdom that makes up the domain Bacteria
   __ __ __ __ __ __ __ __ __ __

2. largest and most inclusive taxon in Linnaeus’s system
   __ __ __ __ __ __ __

3. a group of closely related species __ __ __ __ __ __

4. science of classifying and naming living things
   __ __ __ __ __ __ __ __ __

5. newest and largest classification category __ __ __ __ __ __ __ __ __

6. group of genera that share many characteristics
   __ __ __ __ __ __

7. diagram that shows evolutionary relationships among a group of organisms __ __ __ __ __ __ __ __ __ __

8. the study of evolutionary relationships among organisms
   __ __ __ __ __ __ __ __ __ __

Write the circled letter in each term in the spaces provided to reveal a type of nomenclature studied in the chapter.

Hidden Word:  __ __ __ __ __ __ __ __

Write a description of this type of nomenclature.

Description:  ________________________________________________________________

__________________________________________________________

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Reviewing Key Concepts

Short Answer On the lines provided, answer the following questions.

1. As biologists classify the diversity of life, what two main tasks do they carry out?

2. On what two languages are scientific names based?

3. According to the system of binomial nomenclature, how should the scientific name of a species be written?

4. Which part of the name Homo erectus identifies the genus?

5. List in order from smallest to largest the seven categories in Linnaeus’s system of classification.

Reviewing Key Skills

6. Applying Concepts Give an example of an animal that has one scientific name but two or more common names. Name the common names.

7. Applying Concepts How did binomial nomenclature avoid the problems of the first attempts at scientific naming?

8. Classifying Describe a classification system that you would use to group various pets. Start with the group with the most individuals, and end with the group with the fewest individuals.

9. Classifying Name the smallest taxon in Linnaeus’s system of classification that contains fishes, lions, eagles, snakes, and frogs.
In your textbook, read about how classification began and about biological classification.

For each item in Column A, write the letter of the matching item in Column B.

<table>
<thead>
<tr>
<th>Column A</th>
<th>Column B</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Grouping objects or information based on similarities</td>
<td>a. Aristotle</td>
</tr>
<tr>
<td>2. Naming system that gives each organism a two-word name</td>
<td>b. Linnaeus</td>
</tr>
<tr>
<td>3. Developed the first system of classification</td>
<td>c. genus</td>
</tr>
<tr>
<td>4. Branch of biology that groups and names organisms</td>
<td>d. classification</td>
</tr>
<tr>
<td>5. Designed a system of classifying organisms based on their physical</td>
<td>e. taxonomy</td>
</tr>
<tr>
<td>and structural similarities</td>
<td>f. binomial nomenclature</td>
</tr>
<tr>
<td>6. Consists of a group of similar species</td>
<td></td>
</tr>
</tbody>
</table>

Determine if the statement is true. If it is not, rewrite the italicized part to make it true.

7. The scientific name of a species consists of a family name and a descriptive name.

8. The scientific name of modern humans is *Homo sapiens*.

9. *Latin* is the language of scientific names.

10. The scientific names of organisms can be misleading.

11. Taxonomists try to identify the *evolutionary relationships* among organisms.

12. Besides comparing the structures of organisms, taxonomists also compare the organisms’ geographic distribution and *chemical makeup*.

13. Similarities between living species and extinct species *cannot* be used to determine their relationship to each other.

14. Because the bones of some dinosaurs have large internal spaces, some scientists think dinosaurs are more closely related to *amphibians* than to reptiles.

15. Classification can be useful in identifying the *characteristics* of an unknown organism.
In your textbook, read about how living things are classified.

Examine the table showing the classification of four organisms. Then answer the questions.

<table>
<thead>
<tr>
<th>Taxon</th>
<th>Green Frog</th>
<th>Mountain Lion</th>
<th>Domestic Dog</th>
<th>Human</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kingdom</td>
<td>Animalia</td>
<td>Animalia</td>
<td>Animalia</td>
<td>Animalia</td>
</tr>
<tr>
<td>Phylum</td>
<td>Chordata</td>
<td>Chordata</td>
<td>Chordata</td>
<td>Chordata</td>
</tr>
<tr>
<td>Class</td>
<td>Amphibia</td>
<td>Mammalia</td>
<td>Mammalia</td>
<td>Mammalia</td>
</tr>
<tr>
<td>Order</td>
<td>Anura</td>
<td>Carnivora</td>
<td>Carnivora</td>
<td>Primates</td>
</tr>
<tr>
<td>Family</td>
<td>Ranidae</td>
<td>Felidae</td>
<td>Canidae</td>
<td>Hominidae</td>
</tr>
<tr>
<td>Genus</td>
<td>Rana</td>
<td>Felis</td>
<td>Canis</td>
<td>Homo</td>
</tr>
<tr>
<td>Species</td>
<td>Rana clamitans</td>
<td>Felis concolor</td>
<td>Canis familiaris</td>
<td>Homo sapiens</td>
</tr>
</tbody>
</table>

16. Which taxon includes the most specific characteristics? _______________________________________

17. Which taxon includes the broadest characteristics? _________________________________________

18. Which taxon includes more species, an order or a family? __________________________________

19. Which taxon includes only organisms that can successfully interbreed? _______________________

20. If two organisms belong to the same family, what other taxonomic groups do the organisms have in common.
   ________________________________________________________________

   ________________________________________________________________

21. Which two organisms in the chart are most closely related? Explain.
   ________________________________________________________________

   ________________________________________________________________

22. To which taxa do all four organisms belong?

23. Which class does not include animals that have hair or fur? _______________________________

24. What is the order, family, and genus of a human?

25. Using the information in the chart, what can you conclude about the classification taxa of an organism with the scientific name *Rana temporaria*?

   ________________________________________________________________

   ________________________________________________________________

   ________________________________________________________________
Defining Terms  On the lines provided, write a definition for each of the following terms.

1. cephalization
2. intracellular digestion
3. extracellular digestion
4. open circulatory system
5. closed circulatory system

Multiple Choice  On the lines provided, write the letter of the answer that best completes each sentence.

6. Invertebrates with mirror-image left and right sides have
   a. bilateral symmetry. c. unilateral symmetry.
   b. bifunctional symmetry. d. radial symmetry.

7. Invertebrates that have no coelom lack a
   a. heart. c. digestive tract.
   b. body cavity. d. mouth.

8. Blood stays within blood vessels in a(an)
   a. open circulatory system. c. nervous system.
   b. respiratory system. d. closed circulatory system.

9. The process of fertilization in which adults release eggs and sperm into surrounding water is called
   a. asexual reproduction. c. internal fertilization.
   b. asexual fertilization. d. external fertilization.

10. The process in which eggs are fertilized inside the body of a female animal is called
    a. internal fertilization. c. external fertilization.
    b. asexual fertilization. d. asexual reproduction.
Matching  On the lines provided, write the name of the invertebrate group or groups that exhibit the features described.

11. radial symmetry

12. cephalization

13. true coelom

14. protostome development

Completing Tables  In the spaces provided, fill in a description and give two examples of animals with the different types of skeletons.

<table>
<thead>
<tr>
<th>Description</th>
<th>Hydrostatic Skeleton</th>
<th>Exoskeleton</th>
<th>Endoskeleton</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>15.</td>
<td>16.</td>
<td>17.</td>
</tr>
<tr>
<td>Examples of animals with this type of skeleton</td>
<td>18.</td>
<td>19.</td>
<td>20.</td>
</tr>
</tbody>
</table>
Vocabulary Review

Completion  Fill in the blanks with terms from the box below.

bilateral  exoskeleton
ccephalization hydrostatic skeletons
closed intracellular digestion
ccoelom open
eendoskeleton radial

1. Echinoderms and cnidarians have ________________ symmetry—body parts that extend from the center part of the body.

2. Many invertebrates show ________________, a concentration of nerve cells and sense organs in the front of the body.

3. The bodies of worms, mollusks, and arthropods show ________________ symmetry, right and left sides that are mirror images of each other.

4. Most complex animals have a true ________________ that is lined completely with mesoderm.

5. In a(an) ________________ circulatory system, blood is only partially contained within a system of blood vessels.

6. A(An) ________________ is a structural support located inside the body.

7. Annelids and some cnidarians have ________________, or fluid-filled body cavities that support their muscles.

8. An external skeleton is called an ________________.

9. In a(an) ________________ circulatory system, a heart or heartlike organ pumps blood through a system of enclosed blood vessels.

10. The simplest animals digest their food inside cells in a process known as ________________.
Reviewing Key Concepts

Short Answer  On the lines provided, answer the following questions.

1. Explain the importance of controlling body temperature for an organism.

2. What are the three important features that all vertebrates incorporate into controlling body temperature?

Identification  On the lines provided, identify each description as a characteristic of an endotherm or an ectotherm.

3. includes most fishes, reptiles, and amphibians

4. has a high rate of resting metabolism

5. may sweat to get rid of excess body heat

6. is more energy efficient in environments with constant warm temperatures

7. can move around easily at night and during cool weather

8. requires a large amount of food

Reviewing Key Skills

9. Applying Concepts  Give examples of how an alligator would adjust to changes in environmental temperature.

10. Comparing and Contrasting  How are the temperature-regulating systems of birds and mammals similar? How are they different?
Acoelomate

Amniotic Egg

Animalia

Archaebacteria

Bilateral Symmetry

Blastopore

Cell Specialization

Cephalization

Chordate

Cladogram

Class

Closed circulatory system

Coelom
Protista

Protostome

Pseudocoelomate

Radial Symmetry

Species

Taxonomy

Vertebrate

Viviparous