

## Chapter 32: An Overview of Animal Diversity

*32.1 Describe key characteristics of animals and their life cycles.*

*32.2 Identify key milestones in the evolutionary history of animals.*

*32.3 Differentiate between different types of animal "body plans."*

*32.4 Describe current views of the animal phylogenetic tree.*

In this chapter you will be introduced to the vocabulary of development and symmetry. Many of these terms are widely used in biology, so it will be useful to become familiar with them.

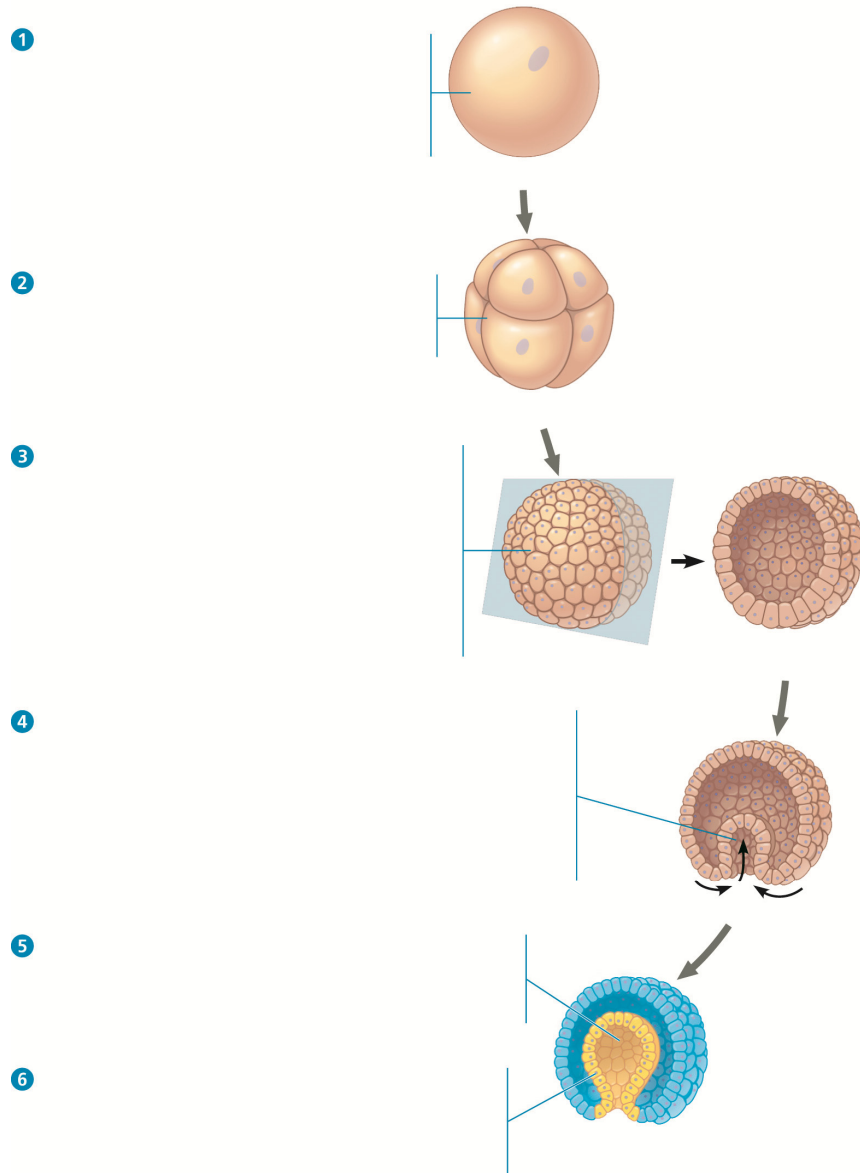
**Study Tip:** The opening Figure 32.1 in your text not only shows what makes animals efficient consumers, but also shows what is unique about animals. Orient to the chapter by going through the figure point by point. What are the five key characteristics of animals described here?

*Concept 32.1 Animals are multicellular, heterotrophic eukaryotes with tissues that develop from embryonic layers*

*LO 32.1: Describe key characteristics of animals and their life cycles.*

1. Like the fungi, animals are multicellular heterotrophs. How do fungi and animals differ in the way they feed?
2. What two types of specialized cells do only animals have?
3. Most animals reproduce \_\_\_\_\_, and the \_\_\_\_\_ stage dominates the life cycle.

4. An overview of animal development provides a background that will make a wide range of information more understandable. Animal development requires its own vocabulary to describe the stages that are seen in all developing embryos. To become familiar with the stages, label each stage in this figure and describe its key features.



- a. What is a *zygote*?
- b. What is a *blastula*?
- c. Explain how *gastrulation* leads to the formation of embryonic tissues.

5. What is a *larva*?
  - a. What happens to a larva during *metamorphosis*?
  
6. All eukaryotes have sets of regulatory genes containing common sets of DNA sequences called *homeoboxes*. What are the unique homeobox genes of animals called?

**Concept 32.3** *Animals can be characterized by body plans*

**LO 32.3:** *Differentiate between different types of animal "body plans."*

7. Sponges lack symmetry, but two types of symmetry are seen in all other animal groups. Using Figure 32.8 in your text, name and describe the two types of symmetry with words and a sketch.

Which type of symmetry will also include dorsal and ventral? \_\_\_\_\_

8. What is the symmetry of a jellyfish? \_\_\_\_\_ of a worm? \_\_\_\_\_ of a dog? \_\_\_\_\_
  
9. Many animals with radial symmetry are *sessile*. What does this mean?
  - a. How is *radial symmetry* an advantage to *sessile* or *planktonic* animals?
  
  - b. What are the advantages of *bilateral symmetry*?

10. The embryo becomes layered during gastrulation, and these *germ layers* form the various tissues and organs of the body. The names of the germ layers describe where they are found in the early embryo: *ectoderm*, *mesoderm*, *endoderm*. Each germ layer forms specific tissue types.
  - a. Where is the ectoderm and what does it give rise to?
  - b. Where is the endoderm and what does it give rise to?
  - c. Where is the mesoderm and what does it give rise to?
11. What is the difference between an organism being *diploblastic* or *triploblastic*?
12. What is the relationship between being triploblastic and having bilateral symmetry?
  - a. Return to the figure in question 4 and label the *archenteron*, *ectoderm*, *endoderm*, and *mesoderm*.
13. What is a *body cavity*?
  - a. What are two common functions of a body cavity?
14. A specific type of body cavity found in triploblastic animals is termed a *coelom*. How does a coelom function?
  - a. How is a *hemocoel* different from a coelom? (Figure 32.9 in your text will be helpful.)
  - b. What are *acoelomates*?
15. What are three functions of the body cavity?

### **Protostome and Deuterostome Development**

This concept is important to help you understand the major features that are used to organize animal groups. Begin by reading the explanation of *protostome* and *deuterostome* below. Referring to Figure 32.10 in the text will make visualizing the characteristics clearer.

*stom-* = mouth

*proto-* = first

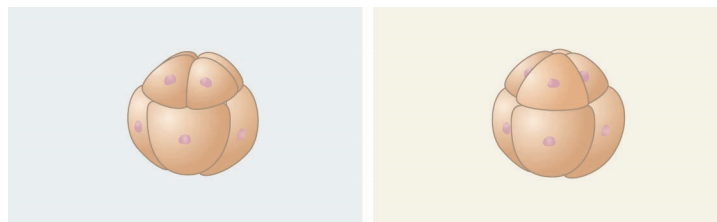
*deutero-* = second

With a *protostome*, the *blastopore* (which is the opening into the archenteron) becomes the mouth (*first mouth*), and a second opening in the body tube will form the anus.

With a *deuterostome*, the blastopore will be the anus, and a second opening becomes the mouth (*second mouth*).

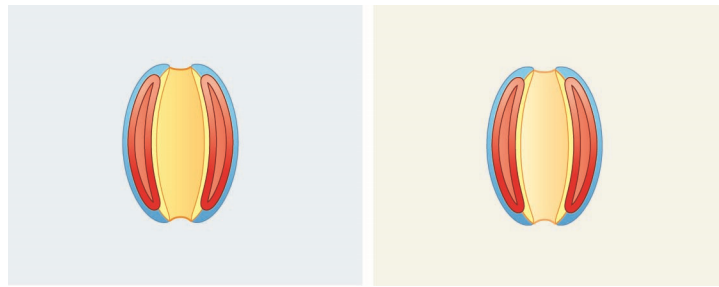
Whether an animal is a protostome or deuterostome can generally be determined by differences in cleavage, coelom formation, and fate of the blastopore. The following questions will explore each difference.

16. If each cell in the early embryo has the capacity to develop into a complete embryo, what is this type of cleavage called?
17. What type of cleavage is it if the developmental fate of each embryonic cell is rigidly “determined” very early?
18. Notice that most animals have *spiral* and \_\_\_\_\_ cleavage or *radial* and \_\_\_\_\_ cleavage.
19. Explain the connection of identical twins and embryonic stem cells to indeterminate cleavage and the human embryo.
20. Study the following figure. If the cells are lined up over each other in the eight-cell embryo, the cleavages are said to be *radial*. If the top layer is rotated relative to the lower layer, the cleavages are said to be *spiral*. Label the figure with *protostome* and *deuterostome*, *spiral* and *determinate cleavage*, and *radial* and *indeterminate* cleavage.



21. What is the difference between an archenteron and a digestive tube?
22. Describe the difference in development of the coelom in protostomes and deuterostomes.

23. Label *protostome*, *deuterostome*, *mouth*, *anus*, and *digestive tube* on the following figure.



24. What forms the mouth in a *protostome*?  
What forms the anus in a *deuterostome*?

**Concept 32.4** Views of animal phylogeny continue to be shaped by new molecular and morphological data

**LO 32.4:** Describe current views of the animal phylogenetic tree.

25. Figure 32.11 in your text was constructed using data from a wide range of sources that are listed in the opening paragraph of *The Diversification of Animals*. What are six categories of data used in constructing the phylogenetic tree in this figure?
26. Use the phylogenetic trees to answer these questions. *Which phylum or phyla ...*
- form(s) the clade of animals?
  - form(s) the basal taxon for animals?
  - include(s) animals with a backbone?
  - form(s) the clade Deuterostomia?
  - is the sister group of Nematoda?
  - are your closest relatives?

*Test Your Understanding*, p. 685

1. \_\_\_\_\_ 2. \_\_\_\_\_ 3. \_\_\_\_\_ 4. \_\_\_\_\_