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25.2 Animal Body Plans and Evolution

Lesson Objectives

- Discuss some trends in animal evolution.
- Explain the differences among the animal phyla.

Lesson Summary

Features of Body Plans Each animal phylum has a unique organization of body structures called its "body plan." The features of a body plan include

- levels of organization: cells, tissues, organs, organ systems
- body symmetry:
  - **radial symmetry:** body parts extend from a central point
  - **bilateral symmetry:** left and right sides are mirror images, with front and back ends
- differentiation of germ layers:
  - **endoderm**, the innermost layer
  - **mesoderm**, the middle layer
  - **ectoderm**, the outermost layer
- formation of a cavity, or fluid-filled space between the digestive tract and the body wall:
  - a true **coelom** (found in most complex animal phyla) develops in the mesoderm and is lined with tissue derived from the mesoderm
  - a **pseudocoelom** is only partially lined with mesoderm
  - Some invertebrates lack a body cavity and some have only a primitive, jellylike layer between the ectoderm and endoderm.
- patterns of embryological development
  - Sexually reproducing animals begin life as a **zygote**, or fertilized egg.
  - The zygote develops into a hollow ball of cells, the **blastula**.
  - The blastula folds in on itself and creates a tube that becomes the digestive tract; the tube has a single opening, the blastopore:
    - In **protostomes** (most invertebrates), the blastopore becomes the mouth.
    - In **deuterostomes** (chordates and echinoderms), the blastopore becomes the anus.
- segmentation: repeated parts, such as the segments of worms
- **cephalization**: the concentration of sense organs and nerves near the anterior (head) end
- limb formation: external appendages such as legs, flippers, and wings

The Cladogram of Animals The features of body plans provide the evidence needed to build a cladogram, or phylogenetic tree, of all animals. Animal phyla are usually defined by their adult body plans and patterns of embryological development.

- The characteristics of animals vary within each phylum.
- Each phylum may be thought of as an "evolutionary experiment." Phyla with successful body plans have survived.

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Features of Body Plans

1. Complete the table of main ideas and details about animal body plans. Use the boxes to list and summarize the features of animal body plans.

Features of Body Plans	
Main Idea: Feature of Body Plan	**Details: Important structures or patterns of development**
Levels of organization	
	None, radial, or bilateral
Germ layers	
Body cavity	
Patterns of embryological development	
	Repeated parts, such as the segments of worms
Cephalization	
Limb formation	

2. THINK VISUALLY Sketch two common objects that show the difference between radial symmetry and bilateral symmetry. Label your sketches and explain them.

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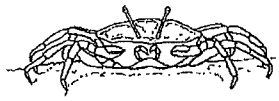
3. THINK VISUALLY Label each of these organisms with the kind of symmetry it exhibits.



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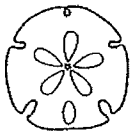

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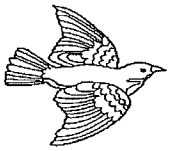

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4. THINK VISUALLY Draw three sketches that show the difference between acoelomate, pseudocoelomate, and coelomate animals. Label ectoderm, mesoderm, and endoderm in your sketches.

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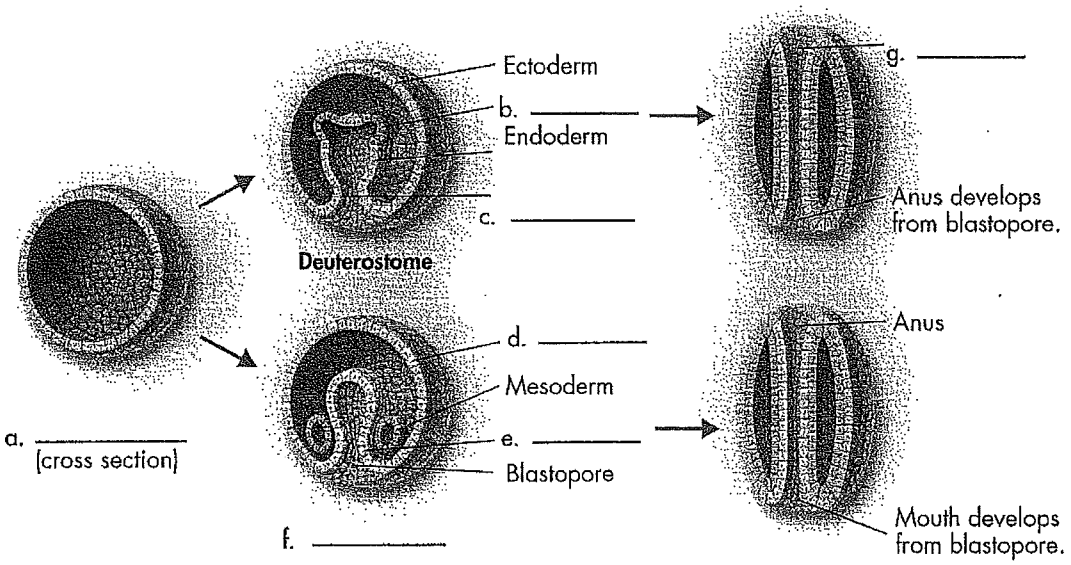
5. Label the diagram showing the difference between deuterostomes and protostomes. Label the following structures: blastula, blastopore, ectoderm, endoderm, mesoderm, mouth, protostome.



For Questions 6–14, complete each statement by writing the correct word or words.

6. Deuterostomes that show radial symmetry in their adult form are called _____.

7. _____ are bilaterally symmetrical animals with three germ layers and no coelom.

8. _____ are protostomes with a true coelom and cephalization without segmentation.

9. Members of the _____ phylum have no body symmetry.

10. Animals in the _____ phylum have specialized cells and tissues, but no organs.

11. Both _____ and _____ are segmented protostomes with bilateral symmetry.

12. In addition to echinoderms, _____ are also deuterostomes.

13. An important way in which the body plan of mollusks differs from that of arthropods is that mollusks lack _____.

14. Only members of the _____ phylum have a pseudocoelom.

