

Case Study1: Evolutionary Progression in Symmetry and Body Cavity

Read the scenario and answer the questions below:

A student examines four organisms. Organism A has a cellular level of organization. Organism B is radially symmetrical with a blind-sac body plan. Organism C is bilaterally symmetrical, acoelomate, and dorso-ventrally flattened. Organism D is bilaterally symmetrical and possesses a true body cavity (coelom).

Q1. Which of the following correctly identifies the organisms?

- A. A-Porifera, B-Cnidaria, C-Platyhelminthes, D-Annelida
- B. A-Cnidaria, B-Porifera, C-Platyhelminthes, D-Arthropoda
- C. A-Porifera, B-Ctenophora, C-Aschelminthes, D-Chordata
- D. A-Platyhelminthes, B-Cnidaria, C-Porifera, D-Annelida

Q2. Organism B (Cnidaria) and Organism C (Platyhelminthes) both exhibit a "blind-sac" body plan. What does this mean?

- A. They have a complete digestive system with two openings.
- B. They have a single opening that serves as both mouth and anus.
- C. They lack a digestive system entirely.
- D. They possess only intracellular digestion.

Q3. Organism D has a true coelom. Which of the following is the primary criterion for a "true coelom"?

- A. A body cavity filled with fluid but not lined by mesoderm.
- B. A body cavity partially lined by mesoderm.
- C. A body cavity completely lined by mesodermal epithelium.
- D. The absence of any internal body cavity.

Q4. If Organism D was found to have a metamerically segmented body, which phylum would it most likely belong to?

- A. Mollusca
- B. Echinodermata
- C. Annelida

D. Aschelminthes

Q5. Which of the following statements is true regarding the evolutionary trend observed from Organism A to D?

A. There is a transition from organ-system level to cellular level of organization.

B. Symmetry shifts from bilateral in all stages to radial in adults.

C. There is an increasing complexity in the body cavity and digestive system.

D. All these organisms are diploblastic.

Case Study2: Physiological Adaptations and Classification

Read the scenario and answer the questions below:

A researcher is studying three organisms: Organism X is a homeothermic vertebrate with a four-chambered heart and feathers. Organism Y is a poikilothermic vertebrate with a three-chambered heart and skin that is moist and lacks scales. Organism Z is a marine animal with a body divided into head, thorax, and abdomen, possessing jointed appendages and a chitinous exoskeleton.

Q1. Identify the classes to which Organisms X, Y, and Z belong, respectively.

A. Aves, Amphibia, Arthropoda

B. Mammalia, Reptilia, Insecta

C. Aves, Reptilia, Arthropoda

D. Reptilia, Amphibia, Crustacea

Q2. Organism X (Aves) exhibits homeothermy. What does this mean in a biological context?

A. The animal can change its body temperature to match the environment.

B. The animal can maintain a constant body temperature regardless of external conditions.

C. The animal's body temperature is always lower than the environment.

D. The animal is only active during the day.

Q3. Organism Y (Amphibian) undergoes "dual life." Which physiological trait allows for gas exchange on both land and in water?

A. The presence of lungs only.

B. The use of gills throughout the life cycle.

C. The ability to perform cutaneous respiration (breathing through moist skin).

D. The presence of a specialized swim bladder.

Q4. Organism Z belongs to the largest phylum. Which of the following is a key characteristic of this phylum?

A. Presence of a water vascular system.

B. Presence of an exoskeleton made of chitin and jointed appendages.

C. Absence of a coelom.

D. Presence of a dorsal hollow nerve cord.

Q5. Comparing Organism X and Organism Y, what is a significant difference in their circulatory systems?

A. X has a 3-chambered heart, Y has a 2-chambered heart.

B. X has a complete separation of oxygenated and deoxygenated blood; Y has partial mixing due to a 3-chambered heart.

C. Both have identical circulatory systems.

D. X is poikilothermic, and Y is homeothermic.

Q. No.	Correct Answer	Explanation
1	A	Porifera (cellular), Cnidaria (radial), Platyhelminthes (acoelomate), Annelida (coelomate).
2	B	Incomplete digestive systems have only one opening used for both ingestion and egestion.
3	C	A true coelom (eucoelom) must be lined by mesoderm on both sides (somatic and splanchnic).
4	C	Metameric segmentation is a hallmark feature of Phylum Annelida (and Arthropoda/Chordata).
5	C	Evolutionary biology in animals shows a trend toward greater complexity, moving from simple to complex systems.

Q. No.	Correct Answer	Explanation
1	A	X is a bird (Aves), Y is an amphibian, Z is an insect (Arthropoda).
2	B	Homeotherms (warm-blooded) regulate internal body temperature independently of external environments.
3	C	Amphibians use skin for respiration, which is highly effective in moist environments.
4	B	Phylum Arthropoda is defined by chitinous exoskeletons and jointed legs.
5	B	Birds (Aves) have a 4-chambered heart preventing mixing; amphibians have 3 chambers leading to some mixing of blood.