

# High School: Zoology I (Invertebrate)

Adopted 2018

## High School - Zoology I (Invertebrate)

### 1. Evolution Z00.1

1A. Students will develop a model of evolutionary change over time. Z00.1A

1. Develop and use dichotomous keys to distinguish animals from protists, plants, and fungi. Z00.1A.1
2. Describe how the fossil record documents the history of life on earth. Z00.1A.2
3. Recognize that the classification of living organisms is based on their evolutionary history and/or similarities in fossils and living organisms. Z00.1A.3
4. Construct cladograms or phylogenetic trees to show the evolutionary branches of an ancestral species and its descendants. Z00.1A.4
5. Design models to illustrate the interaction between changing environments and genetic variation in natural selection leading to adaptations in populations and differential success of populations. Z00.1A.5
6. Enrichment: Use an engineering design process to -develop an artificial habitat to meet the requirements of a population that has been impacted by human activity. Z00.1A.6

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## 2. Phyla Porifera and Cnidaria Z00.2

- 2A. Students will understand the structure and function of phylum Porifera and phylum Cnidaria and how each adapts to their environments. Z00.2A
1. Differentiate among asymmetry, radial symmetry, and bilateral symmetry in an animal's body plan. Z00.2A.1
  2. Identify the anatomy and physiology of a sponge, including how specialized cells within sponges work cooperatively without forming tissues to capture and digest food. Z00.2A.2
  3. Describe the importance of phylum Porifera in aquatic habitats. Z00.2A.3
  4. Create a model, either physical or digital, illustrating the anatomy of a sponge, tracing the flow of water. Z00.2A.4
  5. Enrichment: Use an engineering design process to determine the quantity of water that may be absorbed per unit in a natural sponge versus a synthetic sponge. Z00.2A.5
  6. Contrast the polyp lifestyle of most Cnidarians with the medusa lifestyle of jellyfish, including how both utilize a single body opening. Z00.2A.6
  7. Describe how nematocysts (stinging cells) of Cnidarians are used for capturing food and for defense. Z00.2A.7
  8. Enrichment: Utilize an engineering design process to create a simulated nematocyst, including possible biomimicry use. Z00.2A.8
  9. Describe the ecological importance of and human impacts on coral reefs. Z00.2A.9
  10. Create a digital or physical model illustrating the anatomy of a cnidarian, citing similarities and differences between polyps and medusas. Z00.2A.10

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### 3. Phylum Mollusca Z00.3

- 3A. Students will understand the structure and function of phylum Mollusca, and how they adapt to their environments. Z00.3A
1. Considering the diversity of mollusks, explain how they all share a common body plan (i.e., mantle, visceral mass, and foot). Z00.3A.1
  2. Describe why mollusks are classified as eucoelomates. Z00.3A.2
  3. Explain how the mantle is used in forming the shell. Z00.3A.3
  4. Describe how the radula is used in feeding. Z00.3A.4
  5. Develop a dichotomous key to contrast characteristics of gastropods, bivalves, and cephalopods. Z00.3A.5
  6. Examine how the unique characteristics of cephalopods lead to survival. Z00.3A.6
  7. Create a model comparing the anatomy of gastropods, bivalves, and cephalopods. Z00.3A.7
  8. Enrichment: Use an engineering design process to model the jet propulsion utilized by cephalopods in mechanical design of fluid systems (e.g., improving hydraulic systems). Z00.3A.8

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### 4. Phyla Platyhelminthes, Nematoda, and Annelida Z00.4

- 4A. Students will describe the evolution of structure and function of phylum Platyhelminthes, phylum Nematoda, and phylum Annelida. Z00.4A
1. Define and describe the closed circulatory system of an annelid. Z00.4A.1
  2. Differentiate between parasitic and free living. Z00.4A.2
  3. Compare and contrast the characteristics and lifestyles of flatworms, roundworms, and segmented worms. Z00.4A.3
  4. Create a model comparing acoelomate, pseudocoelomate, and eucoelomate body plans of Platyhelminthes, Nematoda, and Annelida. Z00.4A.4
  5. Describe the evolutionary importance of the segmented body plans of annelids. Z00.4A.5
  6. Dissect representative taxa, and compare their internal and external anatomy and complexity. Z00.4A.6
  7. Enrichment: Design, conduct, and communicate results of an experiment demonstrating the importance of flatworms, roundworms, and annelids for human use (e.g., the earthworm in agriculture and the leech in medicine). Z00.4A.7
  8. Enrichment: Use an engineering design process to design and construct a system to utilize flatworms, roundworms, or annelids to meet a human need. Z00.4A.8

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## 5. Phylum Arthropoda Z00.5

- 5A. Students will understand the basic structure and function of phylum Arthropoda, and how they demonstrate the characteristics of living things. Z00.5A
1. Describe the evolutionary advantages of segmented bodies, hard exoskeletons, and jointed appendages to arthropods and how they contribute to arthropods being the largest phyla in species diversity and the most geographically diverse. Z00.5A.1
  2. Explain how the exoskeleton is used in locomotion, protection, and development. Z00.5A.2
  3. Enrichment: Use an engineering design process to develop a biomimicry of an arthropod's exoskeleton to meet a human need. Z00.5A.3
  4. Identify organisms and characteristics of chelicerates, crustaceans, and insects. Z00.5A.4
  5. Describe the importance of toxins for arachnids, such as spiders and scorpions. Z00.5A.5
  6. Describe the importance of chela for decapods, such as lobsters and crabs. Z00.5A.6
  7. Differentiate between complete and incomplete metamorphosis in insects' life cycles. Z00.5A.7
  8. Explain the importance of eusociality in insects, such as ants, bees, and termites. Z00.5A.8
  9. Dissect representative taxa, and compare their internal and external anatomy and complexity. Z00.5A.9

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## 6. Phylum Echinodermata Z00.6

- 6A. Students will understand the structure and function of phylum Echinodermata, and how they demonstrate the characteristics of living things. Z00.6A
1. Recognize that the echinoderms have spines on their skin that are extensions of plates that form from the endoskeleton. Z00.6A.1
  2. Explain how the starfish inverts its stomach for external digestion of food. Z00.6A.2
  3. Describe sea urchins' and sea cucumbers' defense structures and behaviors. Z00.6A.3
  4. Describe the sexual and asexual reproduction of starfish. Z00.6A.4
  5. Describe how the water vascular system is used for locomotion, feeding, and gas exchange. Z00.6A.5
  6. Research, analyze, and communicate implications of applying the regeneration of starfish to human medicine. Z00.6A.6
  7. Dissect representative taxa and compare their internal and external anatomy and complexity. Z00.6A.7
  8. Enrichment: Use an engineering design process to model the water vascular system in hydraulic systems to meet a societal need. Z00.6A.8