

Activity One

Questions to Explore

Episode Title: Any and all episodes

Activity Subject: Body plans and parts, animal behaviors, diversity, evolution, science careers, science process

Grade Level: Across all episodes K-12; episode-by-episode 6-12

Learning Objectives: Students examine pre-selected questions while viewing *The Shape of Life* episodes; questions cover most of the categories included in the accompanying "Video Time Code Index."

Assessment: Students participate in discussions and provide verbal or written responses to questions.

Time: One hour to view each episode, with discussion time to follow

Group Size: Entire class, groups of two to four students, or individuals

Materials and Preparation

Review suggested discussion questions before viewing each episode of *The Shape of Life*. Decide what you and your students would be interested in focusing on during the episode and in discussions to follow.

Procedure

- 1) Review suggested discussion questions before viewing *The Shape of Life*. Decide with your students what questions they would be interested in exploring.
- 2) As a class, view each or selected episodes of *The Shape of Life*. Draw attention to details that will prepare your students for post-viewing discussions.
- 3) Enjoy talking with your students about what you viewed together in *The Shape of Life* and the questions you have selected for further exploration.
- 4) Based on your discussions, assign follow-up research using the Web and/or print resources to adequately answer each selected question.

QUESTIONS TO EXPLORE Across All Episodes

Basic Questions

for pre-viewing preparation and post-viewing assessment

- 1) What is the name of the animal group featured in the episode?
- 2) How are the animals of this group alike? Different?
- 3) What special features or adaptations do the animals in the episode have to help them survive in their habitats?
- 4) How do the animals move?
- 5) How do the animals get food?
- 6) How do the animals breathe?
- 7) Does the episode mention any animals that lived long ago? If so, how are they different from animals that live today?
- 8) What kinds of scientists are featured in the episode?
- 9) What questions did the scientists in the episode investigate?

10) What do you like most about the animals in the episode? Why?

11) What is your favorite animal featured in the episode? Why?

Advanced Questions

for use in addition to the questions above

- 1) In what ways could you group the animals in the episode? In several episodes?
- 2) What animal behaviors did you observe in the episode?
- 3) What senses do the animals in the episode have? How do they use their senses?
- 4) Explain how the scientists use observations and experiments to learn more about animals. Describe any tools the scientists use to help them in their research.
- 5) Do scientists ever arrive at different conclusions? Explain.
- 6) How did the scientists benefit from working in a team?

QUESTIONS TO EXPLORE
Episode-by-Episode

Episode 1: “Origins” (Sponges)

Basic Questions

for pre-viewing preparation and post-viewing assessment

- 1) What was the first animal group? What is the evidence for this conclusion?
- 2) How long ago did the first animal appear on Earth?
- 3) How are scientists currently defining the group called “animal”?
- 4) Should protozoans be considered animals? Why or why not?
- 5) What does “multicellular” mean? What is meant by “specialized” cells?
- 6) What do sponges eat?

Advanced Questions

for use in addition to the questions above

- 1) What do you think the first animal looked like?
- 2) How do you think that first animal differed from today’s representatives?
- 3) Why do you think there would even have been a first animal?
- 4) What do you think “evolution” means?
- 5) What were the little organisms that were flying along the sponge tunnels? Learn more about them by first exploring what “plankton” means.
- 6) How have relationships between animal groups been determined in the past? How is molecular and genetic research influencing our classification of animals into related groups?

Episode 2: “Life on the Move” (Cnidarians)

Basic Questions

for pre-viewing preparation and post-viewing assessment

- 1) In what way are cnidarians more complex than sponges? What characteristics did they add?
- 2) What do these additions allow cnidarians to do?
- 3) Name and describe the two different versions of the cnidarian body plan.
- 4) Draw a moon jelly’s life cycle.
- 5) What are nematocysts? What do they do?
- 6) If the pulsing of a jellyfish isn’t only for locomotion, what else does it do?

Advanced Questions

for use in addition to the questions above

- 1) How do animals without brains perform and control their activities?
- 2) What kind of a skeleton does an anemone have, and how does it work? How is it different from the human skeleton?
- 3) What is “symmetry”? What kind of symmetry do cnidarians have? How is it different from the symmetry of your own body?

Episode 3: “The First Hunter” (Flatworms)

Basic Questions

for pre-viewing preparation and post-viewing assessment

- 1) How can paleontologists find fossils of flatworms if flatworms don’t have bones?

- 2) In what ways are flatworms more complex than cnidarians?
- 3) What is it about the flatworm body plan that makes it a good hunter? What are the advantages of having a bilaterally symmetrical body? What are the advantages of stereo senses?
- 4) What are cilia? How does a flatworm use them?
- 5) Name four kinds of habitats where different types of flatworms live.
- 6) Where is the mouth of the flatworm?
- 7) What is a mutation?
- 8) Name the special genes that control whole sets of other genes.

Advanced Questions

for use in addition to the questions above

- 1) What do we call an animal that produces both sperm and eggs? What are the advantages and disadvantages of such a design?
- 2) What were some special adaptations developed by parasitic flatworms? Use the tapeworm as an example.
- 3) How do genes control development and the formation of a body plan?
- 4) Flatworms aren’t the only kind of worm. There are roundworms, ribbon worms, arrow worms, acorn worms and segmented worms. Can you name others? What do you think the term ‘worm’ actually means? What other living organisms or parts of living organisms are shaped like worms? What do you think the benefits of having a worm-like body might be?

This episode discusses sexual reproduction in terms that might not be appropriate for children and early teens.

Episode 4: “Explosion of Life” (Annelids)

Basic Questions

for pre-viewing preparation and post-viewing assessment

- 1) What complex body features were developed in annelids that their flatworm-like ancestors didn't have?
- 2) When did the majority of animal body plans appear?
- 3) In what way is the annelid digestive tract different from the digestive systems of cnidarians and flatworms?
- 4) How do earthworms move? How are the body segments involved in this action?
- 5) Name an annelid worm that sucks blood from other animals for its food.
- 6) What kind of annelid worm lives near hot-water vents in the deep sea?

Advanced Questions

for use in addition to the questions above

- 1) What reasons are offered to explain the rapid occurrence of body plan evolution known as the Cambrian Explosion?
- 2) How did the burrowing of worms contribute to keeping Earth from entering a major ice age?
- 3) What are the advantages of having a segmented body?

Episode 5: “The Conquerors” (Arthropods)

Basic Questions

for pre-viewing preparation and post-viewing assessment

- 1) Define these terms: exoskeleton, appendage, molting, terrestrial, detritus, and robotics.
- 2) What is special about arthropod appendages?
- 3) Where did the first arthropods live?
- 4) What features of the arthropod body plan allowed them to invade land?
- 5) What did the first arthropods on land eat?
- 6) See how many different uses of arthropod appendages you can list.
- 7) What arthropod structures are used to extract oxygen from water? What arthropod structures are used to extract oxygen from air?
- 8) What two major habitats of Earth were arthropods the first animals to explore?
- 9) What role might algal mats have played in the land invasion?

Advanced Questions

for use in addition to the questions above

- 1) What are the advantages and disadvantages of having an internal skeleton like ours as opposed to an external skeleton that is shed in order to grow?
- 2) What are the advantages and disadvantages of undergoing metamorphosis? What animals, besides arthropods, undergo metamorphosis?
- 3) What are the characteristics of animals that live in many different kinds of places?

4) Humans often think of insects as creepy-crawlies that are up to no good. Though some insects do sting or bite, others pollinate our crops. Make a two-column list of some of the good things and some of the bad things about insects with regard to their immediate impact on humans.

5) Insects are an enormously diverse group of organisms that often play key roles in their respective ecosystems. Write a few sentences describing three roles that insects play in the natural world to help maintain ecosystem services.

Episode 6: “Survival Game” (Molluscs)

Basic Questions

for pre-viewing preparation and post-viewing assessment

- 1) Name some different activities a mollusc can perform with its foot.
- 2) What do you call the skinlike tissue that produces the shells of molluscs?
- 3) What is a radula and how does a mollusc use it?
- 4) How do squid or octopuses move through the water?
- 5) Aside from the shell, what other mollusc defenses can you name?

Advanced Questions

for use in addition to the questions above

- 1) How does the mollusc build and repair its shell?
- 2) How does a chambered nautilus control its buoyancy? Compare the diversity of forms of molluscs to that of annelids. Describe which group you think covers the greatest range of body form, function, and behavior.

3) Make a list of molluscs you have known. In other words, make a list of molluscs you have encountered in your own experiences—in aquariums, at restaurants, in your garden, etc. For each one, answer the following questions:

- a) Where did you see it?
- b) What was it doing or what were you doing to it?
- c) Where is its natural habitat?
- d) What does it eat?
- e) What eats it?

Episode 7: “Ultimate Animal” (Echinoderms)

Basic Questions

for pre-viewing preparation and post-viewing assessment

- 1) Give the common names for the four major kinds of echinoderms.
- 2) How do sea stars walk and grab?
- 3) What term describes how an animal grows new replacements for lost body parts?
- 4) What is similar about echinoderms and cnidarians? In what way does echinoderm symmetry differ from that of cnidarians?
- 5) Describe how some sea stars feed on mussels.
- 6) What two kinds of structures are scattered between the spines of sea stars?
- 7) How could you investigate the activities of an animal that doesn't appear to move when you watch it?

Advanced Questions

for use in addition to the questions above

- 1) How does a water-vascular system work?
- 2) How can a sea star be so flexible and then suddenly become as rigid as a rock?
- 3) What are the advantages and disadvantages to eating with an extrusible stomach?
- 4) Are there benefits to being headless, brainless, and not bilaterally symmetrical? What are they?

Episode 8: “Bones, Brawn & Brains” (Chordates)

Basic Questions

for pre-viewing preparation and post-viewing assessment

- 1) What makes a chordate a chordate? Why are tunicates included in the same phylum as humans?
- 2) What is a tetrapod?
- 3) What are some major groups of vertebrate animals?
- 4) Most vertebrates have jaws. Why are jaws important?
- 5) What natural disaster wiped out half of the Earth's animals 65 million years ago?

Advanced Questions

for use in addition to the questions above

- 1) What are the advantages of having an internal skeleton as compared to an external skeleton that is shed in order to grow?
- 2) What is the function of the notochord?
- 3) Why can't an ant get as big as an elephant?
- 4) What happened during evolution that led to the appearance of jaws and skulls in chordates?
- 5) How can you investigate growth in an extinct animal? How can you investigate rate of growth in an extinct animal?

See www.shapeoflife.org for links to additional print and electronic resources to explore.