Built to Diversify

How arthropod body features support life in many habitats

ZOO.5.1 "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."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline one advantage of each of the three body features in the passage, then circle two habitats or food sources those advantages could help arthropods use.

One Body Plan, Many Possibilities

1 At low tide, a shore crab braces against waves while tiny isopods slip into damp cracks. Both are arthropods, members of the animal phylum with more described species than any other. Arthropods also live in deserts, forests, freshwater, and deep seas. Their success does not come from one perfect body plan. Instead, three inherited features can be modified across generations: a segmented body, a hard outer covering called an exoskeleton, and jointed appendages. Together, these features help different lineages survive in different places and use different resources, conditions that can promote the evolution of many species.

2 A segmented body is built from repeated sections. In a crab, sections are grouped into regions with different jobs, including feeding and movement. Because sections can become specialized, one lineage may handle food or move differently from another. A hard exoskeleton supports the body and shields soft tissues from injury and predators. On land, its outer layers can also reduce water loss, although an arthropod must shed the covering to grow. That trade-off matters: a shell offers protection, but molting leaves an animal vulnerable until its new covering hardens.

3 Joints let appendages bend without forcing the whole exoskeleton to flex. A crab's claws can grip prey, while its walking legs push against uneven ground. In other arthropods, modified appendages may swim, dig, sense the environment, or collect food. Variations in these tools help populations use different habitats and food sources. Over many generations, populations in different settings may diverge into separate species. Segmentation supplies parts that can specialize, the exoskeleton provides support and protection, and joints make those parts mobile. Their combined flexibility helps explain arthropods' enormous species diversity and wide geographic distribution, not a guarantee of survival everywhere.

2 ANSWER WITH EVIDENCE

Use the passage

1. How can a segmented body help two arthropod lineages use food in different ways?

2. Why can an exoskeleton help an arthropod live on land? What cost comes with that advantage?

3. How can jointed appendages help arthropods use different resources? Give two functions from the passage.

4. How do all three body features together help explain arthropods' many species and wide geographic range?

3 YOUR TURN

Your own words

Imagine an arthropod lineage living in a dark limestone cave. In 4 to 6 sentences, describe a useful role for each of its three body features, then explain how changes in those features across generations might help related populations use different cave food sources and become separate species.

Built to Diversify

PART 1 · READ AND MARK

Underline one advantage of each of the three body features in the passage, then circle two habitats or food sources those advantages could help arthropods use. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	How can a segmented body help two arthropod lineages use food in different ways?	**Segments can become specialized for different jobs, so lineages may develop different ways to handle food.**
2	Why can an exoskeleton help an arthropod live on land? What cost comes with that advantage?	**Its outer layers can reduce water loss, but the arthropod must molt to grow and is vulnerable until the new covering hardens.**
3	How can jointed appendages help arthropods use different resources? Give two functions from the passage.	**Jointed appendages can grip prey and dig, helping arthropods obtain or reach different food sources. Other listed functions are also acceptable.**
4	How do all three body features together help explain arthropods' many species and wide geographic range?	**Segments can specialize, exoskeletons provide support and protection, and joints make appendages mobile. Variations in these features help populations use different habitats and resources and may lead to new species over generations.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

In a dark limestone cave, my arthropod has body segments specialized for sensing and feeding. Its hard exoskeleton protects it when it squeezes past sharp rock. Jointed feelers detect nearby food, and jointed legs let it climb steep cave walls. Some populations might develop different feeding appendages that work better on fungi, while others feed on bat droppings. Over many generations, populations using these different foods could diverge into separate species within the cave.

Accept other accurate advantages and cave food sources. The response should connect each body feature to a useful function and explain how differences among populations could contribute to new species over generations.