KWL Chart: Animal Defense Mechanisms

Guiding question: How do animals’ bodies and behaviors help them survive?

<table>
<thead>
<tr>
<th>I THINK I KNOW …</th>
<th>I WANT to know …</th>
<th>I LEARNED …</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information</td>
<td>Y/N</td>
<td>Information</td>
</tr>
</tbody>
</table>


Source: *Venom* pages 16–17 and 19–20

**Directions:** Listen as *Venom* is read aloud. Use the table below to record your notes.

<table>
<thead>
<tr>
<th>Examples of How Bees and Wasps Protect Themselves</th>
<th>How This Helps Bees and Wasps Survive</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Venom</em> pages 16–17</td>
<td></td>
</tr>
<tr>
<td><strong>Venom</strong> pages 19–20</td>
<td></td>
</tr>
<tr>
<td><strong>Other Facts about Bees and Wasps</strong></td>
<td></td>
</tr>
</tbody>
</table>

Explain what this section of *Venom* was about?
Source: “Award-Winning Survival Skills: How Animals Elude Predators”

**Directions:**
Look at the visual on page 2 of “Award-Winning Survival Skills: How Animals Elude Prey.”
In the first column of the graphic organizer below, record three details you see in the visual.
In the second column of the graphic organizer, record the inferences you make based on these details.

**NOTE: Do NOT complete the right-hand column of the graphic organizer yet!**
Read the article.

In the right-hand column of the graphic organizer, record details from the text that support your inferences in the middle column.

<table>
<thead>
<tr>
<th>Details from the Visual (explicit information)</th>
<th>My Inferences (what I infer about this animal)</th>
<th>Details in the Text That Support My Inferences (confirmed with explicit information)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Source:** *Venom* pages 26–27

**Directions:** Listen as *Venom* is read aloud. Use the table below to record your notes.

<table>
<thead>
<tr>
<th>Examples of How Ants Protect Themselves</th>
<th>How This Helps Ants Survive</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Venom</em> pages 26–27</td>
<td></td>
</tr>
</tbody>
</table>

Other Facts about Ants

Explain in your own words what this section of *Venom* was about:
Source: “Award-Winning Survival Skills”

### Best Action Hero—The spiny pufferfish

<table>
<thead>
<tr>
<th>Main Idea:</th>
<th>Supporting Details:</th>
</tr>
</thead>
</table>

### Best Special Effect—The three-banded armadillo

<table>
<thead>
<tr>
<th>Main Idea:</th>
<th>Supporting Details:</th>
</tr>
</thead>
</table>
Best Impersonator—The mimic octopus

<table>
<thead>
<tr>
<th>Main Idea:</th>
<th>Supporting Details:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Source: *Venom* pages 74–75

**Directions:** Listen as *Venom* is read aloud. Use the table below to record your notes.

<table>
<thead>
<tr>
<th>Examples of How Pufferfish Protect Themselves</th>
<th>How This Helps Pufferfish Survive</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Venom</em> pages 74–75</td>
<td></td>
</tr>
</tbody>
</table>

Other Facts about Pufferfish

**Explain in your own words what this section of *Venom* was about:**

____________________________________________________________________

____________________________________________________________________

____________________________________________________________________

____________________________________________________________________

____________________________________________________________________

____________________________________________________________________
Animal Defenses Research Journal:
Examining Visuals

Source: *Animal Behaviors: Animal Defenses*

1. Look at the visual in your group’s section of *Animal Behaviors: Animal Defenses*.
   - Group 1—page 59
   - Group 2—page 78
   - Group 3—page 92

2. In the first column of the graphic organizer below, record three details you see in the visual.

3. In the second column of the graphic organizer, record the inferences you make based on these details.

**NOTE: Do NOT complete the right-hand column of the graphic organizer yet!**

1. Read your group’s assigned pages.
   - Group 1—“Bad Smells, Bad Tastes, and Powerful Poisons” (page 55–top of 56, stopping at “Poisonous Prey”; pages 58–60)
   - Group 2—“Venomous Stings and Bites” (page 73; “How Venom Works” box on page 76; “Stinging Tentacles” pages 77–78)
   - Group 3—“Mimicry” (pages 91–94)

2. In the right-hand column of the graphic organizer, record details from your section of the text that support your inferences in the middle column.

<table>
<thead>
<tr>
<th>Details from the Visual (explicit information)</th>
<th>My Inferences (what I infer about this animal)</th>
<th>Details in the Text That Support My Inferences (confirmed with explicit information)</th>
</tr>
</thead>
</table>
Reread the text and identify the main idea for each section of the text.

| “Avoiding Danger” pages 7–9, stopping at “Self-Defense”; last two paragraphs on page 21; and “Escape Artists” first two paragraphs on page 22 |
|---|---|
| **Main Idea:** | **Supporting Details:** |
| | |

<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Main Idea:</strong></td>
<td><strong>Supporting Details:</strong></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### “Venomous Stings and Bites” page 73; “How Venom Works” box on page 76; “Stinging Tentacles” pages 77–78

<table>
<thead>
<tr>
<th>Main Idea:</th>
<th>Supporting Details:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### “Mimicry” pages 91–94

<table>
<thead>
<tr>
<th>Supporting Details:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>
**Question:** How do animals’ bodies help them survive?

**Preparation:** Look back in your Animal Defenses research journal and texts about animal defense mechanisms to find evidence to help you answer the Science Talk question.

<table>
<thead>
<tr>
<th>When I read or see that (evidence) ...</th>
<th>It makes me think that animals’ bodies help them survive by ...</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Example) most spiders are venomous (<em>Venom</em> page 8)</td>
<td>(Example) I think that the venom paralyzes or kills the spider’s prey and enemies.</td>
</tr>
</tbody>
</table>
My Science Talk Notes: Ideas and Questions

My teacher’s feedback:

My goals for the next Science Talk:
**Guiding question:** How do millipedes’ bodies and behaviors help them survive?

<table>
<thead>
<tr>
<th>I THINK I KNOW …</th>
<th>I WANT to know …</th>
<th>I LEARNED …</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information</td>
<td>Y/N</td>
<td>Information</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Source</td>
</tr>
</tbody>
</table>
Source: *Venom* page 15

Directions: Listen as *Venom* is read aloud. Use the table below to record your notes.

<table>
<thead>
<tr>
<th>Examples of How Millipedes Protect Themselves</th>
<th>How This Helps Millipedes Survive</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Venom</em> page 15</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Other Facts about Centipedes and Millipedes

Explain in your own words what this section of *Venom* was about:
Reread the text and identify the main idea for each section of the text.

<table>
<thead>
<tr>
<th>Main Idea:</th>
<th>Supporting Details:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Explicit information from text</td>
</tr>
</tbody>
</table>

Reading and Writing Like a Researcher:
Summarize page 15 of Venom. Use details from the text to support your explanation.
Source: ________________________________________________

**Directions:** Listen as the text is read aloud. Use the table below to record your notes.

<table>
<thead>
<tr>
<th>Examples of How Millipedes Protect Themselves</th>
<th>How This Helps Millipedes Survive</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Other Interesting Things:**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
</table>
**Focus question:** How do animals use poison to survive?

<table>
<thead>
<tr>
<th>1. What is the gist of this section of the text?</th>
<th>What does the word “<strong>predator</strong>” mean?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>What does the word “<strong>prey</strong>” mean?</td>
</tr>
<tr>
<td></td>
<td>Who is usually poisonous, the predator or the prey?</td>
</tr>
</tbody>
</table>

2. Read Paragraph 1 aloud to a partner. Then use the glossary in the back of *Animal Behavior: Animal Defenses* to answer the questions on the right.

<table>
<thead>
<tr>
<th>3. Now, reread the first paragraph on page 56 silently. Then use details from the text to answer the questions on the right.</th>
<th>What is a poisonous animal? How is a poisonous animal different from a venomous animal?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>What is the purpose of this paragraph? What sentence in the text makes you think so?</td>
</tr>
</tbody>
</table>
4. Take turns reading the second and third paragraphs on page 56 to your partner. Then, working together, use details from the text to answer the questions on the right.

The text says, “If the bird swallows the monarch, it regrets it.” What do you think “regret” means?

Why would the bird regret it?

5. Look carefully at the following quote: “Scientists have found that the mere sight of a monarch can cause these ‘educated’ birds to gag and retch, as if they were about to be sick.” (page 56) Together, use this quote to answer the questions on the right.

What do you think “retch” means? What words in the text make you think so?

Why is the word educated in quotation marks?

What does an “educated bird” know?

How does poison help the monarch to survive?
6. Reread the focus question. Using evidence from the text, write one way animals use poison to survive in the box on the right. Write the answer to this question with your red pencil.

| One way animals use poison to survive is _____________________
| ________________________________________________________________________
| I think this because ____________________________________________________________________
| ________________________________________________________________________
| ________________________________________________________________________

7. Listen as your teacher reads the fourth paragraph on page 56 aloud. Your teacher will help you to choose the right strategy to use in answering the questions on the right.

| What familiar word do you recognize in “entrap”? |
| What do you think “entrap” means? |
| What do you think “oozes” means? What words in the text make you think so? |
| What do you think “affect” means? What words in the text make you think so? How is this different from the meaning of the word “effect”? Use a dictionary to help you figure out the difference. |
| What is the purpose of this paragraph? What sentence in the text makes you think so? |
8. Using evidence from the text, sketch what the pill millipede does when attacked by a predator.

9. Reread the focusing question. Using evidence from the text, write another way animals use poison to survive in the box on the right. Write the answer to this question with your red pencil.

Another way animals use poison to survive is ____________________________

_________________________________________________

I think this because ____________________________

_________________________________________________

______________________________

STOP HERE: Continue with the questions below in Lesson 12.

10. Reread the fifth paragraph on page 56 (continued on page 57) silently. Then use details from the text to answer the question on the right.

What is the purpose of this paragraph?

What sentence in the text makes you think so?
11. Read the second paragraph on page 57 to a partner. Look carefully at the following quote and use it to answer the questions on the right:

“Poison dart frogs (also called poison arrow frogs), which live in Central and South America, excrete a poisonous, foul-tasting fluid from their skin when threatened.” (page 57)

What is another name for “poison dart frogs”? How do you know?

What do you think “toxic” means? What words in the text make you think so?

The dash “-” in this quote is called a hyphen. Authors sometimes use a hyphen to join two or more words together to make a new word, called a “compound word.” What two words are joined together with a hyphen in this quote?

CHALLENGE QUESTION: What part of speech is the compound word “foul-tasting” in this sentence?:

The foul-tasting fluid helps the frog survive in two ways. What are they?

12. Think back to the focus question. Using evidence from the text, write one way animals use poison to survive in the box on the right.

Write the answer to this question with your red pencil.

Another way animals use poison to survive is ___________________________

________________________________________

I think this because _____________________________________________

________________________________________

________________________________________
<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>13.</strong> Examine the photo and caption on page 57. Use details from the text to answer the questions on the right.</td>
<td><strong>Read the caption and look carefully at the photo. What single word in the caption best describes what the photo is meant to show us?</strong>  &lt;br&gt;What defense mechanism does the poison dart frog use to help it survive?  &lt;br&gt;What do you think “excrete” means? What words in the text make you think so?  &lt;br&gt;What do poison dart frogs excrete? Use exact words from the text.</td>
</tr>
</tbody>
</table>
## Pulling it all together ...

### WORD MEANING

15. Reread this note-catcher, noticing the words in bold print. Turn and talk with a partner about three ways you might figure out the meaning of an unknown word. Then, follow the directions on the right.

Add the definitions for “predator” and “prey” to the glossary of your Animal Defenses research journal.

Choose three words in bold print on this note-catcher in addition to “predator” and “prey.” Add the definitions of these words to the glossary of your Animal Defenses research journal.

### SENTENCE MEANING

16. Look back at the answers you wrote in red.

What do you notice about sentences that tell the purpose of a paragraph? Hint: You may need to look for these sentences in the text to see a pattern.

### THE BIG IDEA

17. Use the evidence you recorded on this sheet, as well as additional evidence from the text, to answer the question below in a well-written paragraph.

THINK: Based on your observations about the paragraphs in this text, what will be important to consider when writing the first sentence of your own paragraph?

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**Synthesize!** Explain how animals use poison to survive (remember to use key words from the focus question in your response):
**Question:** Which millipede defense mechanism is most important? Why?

**Preparation:** Look back in your Animal Defenses research journal and texts about animal defense mechanisms to find evidence to help you answer the Science Talk question.

<table>
<thead>
<tr>
<th>When I read or see that (evidence) ...</th>
<th>It makes me think that the most important millipede defense mechanism is ... because ...</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Example) most spiders are venomous (<em>Venom</em> page 8)</td>
<td>(Example) I think that the venom paralyzes or kills the spider’s prey and enemies.</td>
</tr>
</tbody>
</table>
My Science Talk Notes: Ideas and Questions

Now that I have heard everyone’s reasons and their evidence, the millipede defense mechanism I think is most important is

because

My teacher’s feedback:

My goals for the next Science Talk:
<table>
<thead>
<tr>
<th>Word/Phrase</th>
<th>Definition</th>
<th>Vocabulary strategy I used to learn this word:</th>
<th>Sketch/Diagram</th>
</tr>
</thead>
<tbody>
<tr>
<td>defenses/defense mechanisms</td>
<td>how animals protect themselves or their kind</td>
<td>inferred from the text</td>
<td></td>
</tr>
<tr>
<td>entrap</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>extract</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>frantically</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>habitat</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>injecting</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Glossary

<table>
<thead>
<tr>
<th>Word/Phrase</th>
<th>Definition</th>
<th>Vocabulary strategy I used to learn this word:</th>
<th>Sketch/Diagram</th>
</tr>
</thead>
<tbody>
<tr>
<td>mimicry</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>predator</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>prey</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>poisonous</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>quickly</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>seize</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>survive</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Word/Phrase</td>
<td>Definition</td>
<td>Vocabulary strategy I used to learn this word:</td>
<td>Sketch/Diagram</td>
</tr>
<tr>
<td>------------</td>
<td>------------</td>
<td>------------------------------------------------</td>
<td>----------------</td>
</tr>
<tr>
<td>threaten</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>unpleasant</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>venom</td>
<td>poison that is injected with fangs, stingers, or spines</td>
<td>defined in the text</td>
<td></td>
</tr>
<tr>
<td>warning</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
It’s a dog-eat-dog world out there—not to mention a snake-eat-lizard world. To survive and reproduce, every creature must avoid becoming another predator’s meal. But how to elude a hungry hunter who’s bigger or faster than you?

Animals use some positively award-worthy strategies called defenses. “An animal’s defenses are all that stand between being alive and being eaten,” says biologist Tom Tregenza at the University of Leeds in the UK. The newly discovered mimic octopus, for example, fools marauders by impersonating an entire cast of less tempting prey. The flexible three-banded armadillo rolls itself up into a ball as impenetrable as an armored truck.

How did such an audacious array of animal defenses evolve in the first place? “In any large population there will be some variation,” says biologist Ralph Turtingan at the Florida Institute of Technology. Members of a species develop slightly different traits (physical characteristics); one armadillo might possess more flexible armor than another. If an individual is lucky enough to possess a trait that saves it from being devoured, the animal may live long enough to reproduce and pass the trait on to its offspring. “Eventually that trait will become dominant in future generations,” Turtingan says. The theory is called natural selection.

In a nutshell, life forms best suited to their environment survive over the long haul.

To learn more about some of nature’s award-winning defenses, read on...

by Lea Winerman
The three-banded armadillo (Tolypeutes tricinctus) and southern three-banded armadillo (Tolypeutes matacus) live in South America. Their body shields consist of bony plates and a layer of horn or keratin, fibrous proteins that make up tissues such as hair and nails; the plates themselves are formed by ossified or hardened skin. On their shells, three hinged bands give them the flexibility to roll themselves up. Since the shoulder and haunch plates aren’t attached on the sides to the armadillos’ skin, there’s plenty of room inside to fit a head, legs, and tail. (The shells are also good insulators—they trap heat to help keep the creature active in winter.)

When threatened, armadillos curl up and leave only a tiny peephole from which to peer out at their predator. If touched, they snap totally shut. However, some fierce jaguars have been known to use their savage teeth and claws to crack open a tasty armadillo! Even the most dazzling special effects have their limits.

**BEST IMPERSONATOR**

The mimic octopus

Do you know an undiscovered superstar—a natural talent who can mimic others on demand? For years, divers in murky waters off Indonesia snapped photos of an octopus—an eight-armed invertebrate (no backbone)—that seemed to impersonate a cast of marine animals through mimicy, or looking like another species. When a group of scientists got hold of the images, they high-tailed it...
to Indonesia last year to identify the extraordinary 60-centimeter (24-inch) long copy-cat—which they dubbed the mimic octopus.

Many animals mimic other creatures to turn off predators. The harmless milk snake, for example, resembles the poisonous coral snake with its bright red, yellow, and black bands. "But this octopus is the only animal we've found so far that can mimic more than one animal," says biologist Tom Tregenza at the University of Leeds. The octopus can ape at least three critters—the flatfish, lionfish, and sea snake. Tregenza's team claims to mimic the flatfish, the lumpy octopus speeds up, yanks in all eight arms, alters shape and color, and ripples its body in a wave.

Why imitate a slew of creatures? One clue: While many octopuses live and hide in reefs or rocks, the mimic octopus slinks along seafloor mud in plain sight. "There's nowhere to hide," Tregenza says. Besides, adds team scientist Roger Hanlon, "an octopus is a soft, juicy hunk of protein that everything else out there wants to eat." Flatfish are far more populous and less likely to attract attention.

How does this superstar perform its tricks? It features a flexible body that twists into multiple forms and skin cells called chromatophores, which contain various colored pigments. Muscles around each chromatophore constrict or expand the cell—when constricted, skin color lightens, when expanded color darkens. The octopus alters color patterns by constricting and expanding thousands of chromatophores at the same time. Next stop, Warner Brothers?

**BEST ACTOR IN A DEATH SCENE**

The opossum

Ever watch an actor croak—only to catch him breathing afterward? He should take lessons from the opossum, America's only marsupial (mammal that carries its young in a pouch). Many predators won't touch carrion, or dead animals. When threatened by wild dogs or coyotes, the slow-running opossum either heads for the nearest tree to climb or else "plays possum"—fakes death. It falls over, lies still on its side, eyes and mouth half open. Drool trickles from its mouth, its tongue lolling to one side. Most persuasive of all, it expels a green putrid-smelling substance from its anal glands. "Basically, it makes a big stinking mess," says University of Idaho biology professor Steven Austad. The opossum can remain in this state long enough for any predator to exit the scene. Now that's an Oscar-winning performance.
Ordinarily, the meek spiny pufferfish (*Diodon holocanthus*) drifts slowly in its native coral-reef habitats around the world. Its round body and small fins make it a sluggish swimmer—and perfect prey. But just try to eat it, and get ready to be BLOWN AWAY! When threatened, the puffer inflates to three times its normal size. "It just swallows water until its stomach is completely full," says biologist and pufferfish expert Ralph Turgingan at the Florida Institute of Technology. How does the fish change shape? Its skin and stomach are super-stretchable. Also, it lacks a rib cage—no bones to impede an expanding stomach. Dare to swallow an uninflated puffer! "Sharks have actually died from a pufferfish inflating in their esophagus," says Turgingan. Other predators who've witnessed Superman in action stay clear of the Big Puffer!

**PRIZE FACT**

When this pufferfish inflates in self-defense, its skin projects razor-sharp spines that cover the body—making it look pretty snappeting.

**BEST ACTION HERO**

The spiny pufferfish

**IT'S YOUR CHOICE**

Choose the correct answer(s) to these questions:

1. Which process might cause animal defenses to change over time?
   A. kin selection  B. behavioral modification  C. morphogenesis  D. natural selection

2. Which of the following would most likely explain why the mimic octopus impersonates several animals?
   A. The mimic octopus is a slow swimmer.  B. It lives in plain sight of other prey.  C. It has small eyes, which make it a poor hunter.  D. Mimicry is part of its mating process.

3. Pufferfish belong to the same family—dioctociidae—as perch-like fish and burrfish. Which defining feature do family members share?
   A. large fins  B. bright coloring  C. spiny skin  D. small teeth

*ANSWERS IN TEACHER'S EDITION*
**MOST OUTRAGEOUS PERFORMANCE**

**The tortoise beetle**

Do you cheer for revolting onscreen characters? The *larvae* (immature form) of the tortoise beetle species *Hemiptera cymae* may nab the Oscar for nature's most disgusting defense-maker. The palm-tree-dwelling bugs, which live in Florida and southern Georgia, cover themselves with an elaborately woven thatch of their own feces. They extrude strands of feces from an "anal turret," which swivels to show out the strands in all directions. The feces are dry, odorless, and chemically inert (inactive). Still, most predators won't go near the stuff.

"People react with 'yuck,' and my guess is so do predators," says expert Thomas Eisner, a Cornell University ecologist (scientist who studies the environment). "There's a rule in nature: You don't mess with feces, because it can carry parasites and microbial diseases."

Unfortunately, no protection works 100 percent of the time. "If you look hard enough at the defense of any animal, somebody manages to crash through it," Eisner says. The adult carabid beetle chomps right through the fecal shield to reach tempting larvae underneath. "If an animal like the tortoise beetle is rejected by a lot of predators, it's an incredibly desirable resource to a hunter, because no one else is competing to eat the animal," says Eisner. "If you can crash through its defense, as the carabid beetle does, you've got it made."

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**HANDS-ON SCIENCE**

**MASTER OF DISGUISE**

Some animals escape predators by camouflage—concealing themselves by blending into their immediate physical environment. Follow this experiment to find out how they do it.

- **You Need:**
  1. Small rock
  2. Large photograph of any natural landscape (cut out one from a magazine)
  3. Construction paper
  4. Leaves
  5. Flower petals
  6. Colored pencils or markers
  7. Tape
  8. Glue
  9. Scissors
  10. Writing paper
  11. Pencil or pen

- **To Do:**
  1. Study the natural features of the photograph you selected. What would a species need to camouflage itself in the environment?
  2. **Goal:** You have to hide your species (a small rock) in the photograph.
  3. **Rule:** You can select only three of these items to construct your species’ (rock’s) disguise: construction paper, leaves, flower petals, colored pencils or markers.

(For example: 1 sheet of brown construction paper, 1 blue marker, and 1 maple leaf)

- Use a pair of scissors, tape, and/or glue to dress your species’ appearance.
- Place species on the photograph. Observe, evaluate, and record how your species fits in the environment. What features allow it to either blend in or stand out in the habitat you chose?
- Then take your species and place it on the photographs selected by your classmates. Observe, evaluate, and record how your species fits in or stands out in different environments.

- **Conclusions:**
  - In what environment would your species be most or least fit for survival? Why?
  - Discuss.

- **Take It Further:**
  - Research and report on the area depicted in your photograph. What types of species live there? What kinds of defenses do they possess?
Hanging by a Thread

By Sharon T. Pochron, Ph.D.
Photos by Ignacio Castellanos, Ph.D.
Art by Linda Weller

Caterpillars have a trick to get out of danger.

How do they know when to use it?

A wasp crept toward a caterpillar on a leaf. Dr. Ignacio Castellanos of Mexico watched. He knew the wasp was a caterpillar predator, which meant it ate caterpillars. He wondered what the caterpillar would do. Would it do anything?

As the predator walked closer to the caterpillar, the caterpillar spun a silk thread and jumped. It hung from the leaf by its thread. The wasp did not know where the caterpillar went. The caterpillar was safe!

Knowing Without Seeing

Caterpillars cannot see, hear, or smell very well. Castellanos wondered how the caterpillar knew the predator was approaching. He and Dr. Pedro Barbosa of Maryland wanted to find out. They thought that maybe the caterpillar could feel the leaf wiggle, or vibrate.

Wasps and stinkbugs eat caterpillars. When these insects walk on a leaf to eat a caterpillar, the leaf wiggles. But the wind, falling sticks, and insects that do not eat caterpillars might also wiggle the leaf. Could caterpillars tell the difference between something safe and something
Caterpillars Are Wiggle-Wise

The scientists put caterpillars on leaves and used another machine to make the leaves vibrate. When the leaves shook the way a predator would shake them, caterpillars behaved as if a real predator were on the leaf. They spun threads and hung.

When the leaves shook as if the wind were blowing or rain were falling, caterpillars did nothing. When the leaves shook as if insects that do not eat caterpillars were walking on the leaves, the caterpillars ignored the shaking.

The scientists also found that caterpillars could tell the difference between kinds of predators. Both stinkbugs and wasps have to be very close to a caterpillar to see it, but stinkbugs must be even closer.

So when stinkbugs were on the leaf, caterpillars could hang from short threads and not be noticed. When wasps were on the leaf, caterpillars spun longer threads to hang farther down—and out of sight.

So now we know that caterpillars can tell dangerous wiggles from other kinds of wiggles. People might have to pay attention to what’s in front of their nose, but caterpillars have to pay attention to what vibrates under their feet.
Mid-Unit 1 Assessment: Reading about Caterpillars, Answering Questions, and Determining the Main Idea

Learning Targets Assessed:
I can determine the main idea using specific details from the text. (RI.4.2)
I can interpret information presented through charts or graphs. I can explain how that information helps me understand the text around it. (RI.4.7)
I can determine the meaning of academic words or phrases in an informational text. (RI.4.4)
I can determine the meaning of content words or phrases in an informational text. (RI.4.4)

Part 1: Use the text to answer the questions below.

1. Look at the diagram on the first page of “Hanging by a Thread.”
2. In the first column of the graphic organizer below, record three details you see in the diagram.
3. In the second column of the graphic organizer, record the inferences you make based on these details.

**NOTE: Do NOT complete the right-hand column of the graphic organizer yet!**
**NOTE: Do NOT complete the right-hand column of the graphic organizer yet!**

<table>
<thead>
<tr>
<th>Details from the Diagram (explicit information)</th>
<th>My Inferences (what I infer about caterpillars)</th>
<th>Details in the Text That Support My Inferences (confirmed with explicit information)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.)</td>
<td>1.)</td>
<td>1.)</td>
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<tr>
<td>2.)</td>
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<td>2.)</td>
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<tr>
<td>3.)</td>
<td>3.)</td>
<td>3.)</td>
</tr>
</tbody>
</table>
**Part 2**

**Directions**
1. Read “Hanging by a Thread” for the gist.
2. In the right-hand column of the graphic organizer above, record details from the text that support your inferences in the middle column.
3. Reread the text to answer the following questions.

1. According to “Hanging by a Thread,” how do caterpillars know to spin a thread and jump off a leaf?
   
   a. Caterpillars see the leaf wiggle from the predator moving.
   
   b. Caterpillars hear the leaf wiggle from the predator moving.
   
   c. Caterpillars smell their predators on the leaf.
   
   d. Caterpillars feel the leaf wiggle from the predator moving.

2. According to “Hanging by a Thread,” what best describes what Dr. Castellanos and Dr. Barbosa did to find out how caterpillars knew the predator was approaching?

   a. They observed wasps approach caterpillars.
   
   b. They recorded leaves vibrating.
   
   c. They put caterpillars on leaves and used a machine to make the leaves vibrate in different ways.
   
   d. They observed stinkbugs approach caterpillars.

3. Which line from the text is the best evidence to support the answer to Question 2?

   a. “So when stinkbugs were on the leaf, caterpillars could hang from short threads and not be noticed.”
   
   b. “When the leaves shook the way a predator would shake them, caterpillars behaved as if a real predator were on the leaf.”
   
   c. “First, they needed to know how to make the leaf vibrate.”
   
   d. “He knew the wasp was a caterpillar predator, which meant it ate caterpillars.”
4. In the section “Knowing without Seeing,” the text says, “The scientists wanted to make the leaf vibrate and watch what the caterpillar did.” Which word is a synonym for the word vibrate?

a. shake  
b. hang  
c. dangerous  
d. be still

5. Which line from the text is the best evidence to support the answer to Question 4?

a. “It hung from the leaf by its thread.”  
b. “When these insects walk on a leaf to eat a caterpillar, the leaf wiggles.”  
c. “Could caterpillars tell the difference between something safe and something dangerous?”  
d. “They used a special machine to record vibrations.”
Mid-Unit 1 Assessment: Reading about Caterpillars, Answering Questions, and Determining the Main Idea

Part 3: Reread the text and determine the main idea for each section of the text. Identify two details that support the main idea for each section.

<table>
<thead>
<tr>
<th>Opening</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Main Idea:</strong></td>
</tr>
<tr>
<td><strong>Supporting Details:</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Knowing without Seeing</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Main Idea:</strong></td>
</tr>
<tr>
<td><strong>Supporting Details:</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Caterpillars Are Wiggle-Wise</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Main Idea:</strong></td>
</tr>
<tr>
<td><strong>Supporting Details:</strong></td>
</tr>
</tbody>
</table>
Learning target: I can determine the main idea using specific details from the text.

1. The target in my own words is:

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

2. How am I doing? Circle one.

I need more help to learn this  I understand some of this  I am on my way!

3. The evidence to support my self-assessment is:

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________
Learning target: I can interpret information presented through charts or graphs. I can explain how that information helps me understand the text around it.

1. The target in my own words is:

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

2. How am I doing? Circle one.

I need more help to learn this  I understand some of this  I am on my way!

3. The evidence to support my self-assessment is:

________________________________________________________________________

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________________________________________________________________________
Learning target: I can determine the meaning of unfamiliar words in an informational text.

1. The target in my own words is:

_________________________________________________________________________
_________________________________________________________________________
_________________________________________________________________________
_________________________________________________________________________

2. How am I doing? Circle one.

I need more help to learn this

I understand some of this

I am on my way!

3. The evidence to support my self-assessment is:

_________________________________________________________________________
_________________________________________________________________________
_________________________________________________________________________
_________________________________________________________________________
Prefix: letter groups added to the beginning of a word that change or add to the meaning  
Suffix: letter groups added to the end of a word that show the part of speech and/or add meaning

<table>
<thead>
<tr>
<th>Prefix</th>
<th>Meaning</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>dis-</td>
<td>not, opposite of</td>
<td>discover, dishonest</td>
</tr>
<tr>
<td>en-</td>
<td>cause to</td>
<td>enjoy, entrap</td>
</tr>
<tr>
<td>ex-</td>
<td>out</td>
<td>exit, excrete</td>
</tr>
<tr>
<td>in-, im-</td>
<td>not, opposite of</td>
<td>independent, impossible</td>
</tr>
<tr>
<td>in-, im-</td>
<td>in or into</td>
<td>inside, immigrate</td>
</tr>
<tr>
<td>inter-</td>
<td>between, among</td>
<td>international, interrupt</td>
</tr>
<tr>
<td>mid-</td>
<td>middle</td>
<td>midsemester, midnight</td>
</tr>
<tr>
<td>mis-</td>
<td>wrongly</td>
<td>mistake, misbehave</td>
</tr>
<tr>
<td>non-</td>
<td>not, opposite of</td>
<td>nonfiction, nonstop</td>
</tr>
<tr>
<td>over-</td>
<td>too much, above</td>
<td>overgrown, overdue</td>
</tr>
<tr>
<td>pre-</td>
<td>before</td>
<td>preschool, prepare</td>
</tr>
<tr>
<td>re-</td>
<td>again, back</td>
<td>return, redo, reflect</td>
</tr>
<tr>
<td>sub-</td>
<td>under, lower</td>
<td>submarine, submerge</td>
</tr>
<tr>
<td>super-</td>
<td>above, beyond</td>
<td>supermarket, superman</td>
</tr>
<tr>
<td>un-</td>
<td>not, opposite of</td>
<td>unhappy, uncomfortable</td>
</tr>
<tr>
<td>under-</td>
<td>too little, below</td>
<td>underfed, underground</td>
</tr>
<tr>
<td>Suffix</td>
<td>Meaning</td>
<td>Example</td>
</tr>
<tr>
<td>---------</td>
<td>---------------------</td>
<td>--------------------</td>
</tr>
<tr>
<td>-ed</td>
<td>past-tense verbs</td>
<td>jumped, smiled</td>
</tr>
<tr>
<td>-er</td>
<td>comparative</td>
<td>bigger, smarter</td>
</tr>
<tr>
<td>-er, -or</td>
<td>person connected with</td>
<td>teacher, doctor</td>
</tr>
<tr>
<td>-est</td>
<td>comparative</td>
<td>biggest, softest</td>
</tr>
<tr>
<td>-ful</td>
<td>full of</td>
<td>cheerful, careful</td>
</tr>
<tr>
<td>-ible, -able</td>
<td>can be done</td>
<td>likeable, comfortable</td>
</tr>
<tr>
<td>-ing</td>
<td>verb form</td>
<td>playing, singing</td>
</tr>
<tr>
<td>-ion, -tion, -ation, -ition</td>
<td>act, process</td>
<td>action, attention</td>
</tr>
<tr>
<td>-ity, -ty</td>
<td>state of</td>
<td>activity, honesty</td>
</tr>
<tr>
<td>-ive, -ative, -itive</td>
<td>adjective form of a noun</td>
<td>attentive, talkative</td>
</tr>
<tr>
<td>-less</td>
<td>without</td>
<td>helpless, careless</td>
</tr>
<tr>
<td>-ly</td>
<td>characteristic of</td>
<td>friendly, motherly</td>
</tr>
<tr>
<td>-ment</td>
<td>action or process</td>
<td>enjoyment, experiment</td>
</tr>
<tr>
<td>-ness</td>
<td>state of, condition of</td>
<td>happiness, darkness</td>
</tr>
<tr>
<td>-ous, -eous, -ious</td>
<td>having the qualities of</td>
<td>serious, poisonous</td>
</tr>
<tr>
<td>-s, -es</td>
<td>plurals</td>
<td>boys, millipedes</td>
</tr>
<tr>
<td>-y</td>
<td>characterized by</td>
<td>funny, rainy</td>
</tr>
</tbody>
</table>
Part 1:
How do animals’ bodies and behaviors help them survive? Use evidence from your research and from today’s Science Talk to support your answer.

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Part 2:
Which animal would you like to research and write about for the performance task? Rank the following four choices, using a 1 for the animal you are most interested in researching and a 4 for the animal you are least interested in researching.

________ Monarch butterfly
________ Three-banded armadillo
________ Mimic octopus
________ Gazelle
End of Unit 1 Assessment:
Answering Questions and Summarizing Texts about Animal Defense Mechanisms

Name: \\
Date: \\

Long-Term Learning Targets Assessed:
I can paraphrase portions of a text that is read aloud to me. (SL.4.2)
I can explain what a text says using specific details from the text. (RI.4.1)
I can make inferences using specific details from text. (RI.4.1)
I can determine the main idea using specific details from the text. (RI.4.2)
I can summarize informational or persuasive text. (RI.4.2)

Part 1: Listen to the narrator in the video. Complete the graphic organizer to paraphrase what you hear.

More Facts about Camouflage as an Animal Defense Mechanism

<table>
<thead>
<tr>
<th>Animals That Use Camouflage</th>
<th>Examples of How Camouflage Is Used</th>
<th>How This Helps Animals Survive</th>
</tr>
</thead>
<tbody>
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</tbody>
</table>
End of Unit 1 Assessment: 
Answering Questions and Summarizing Texts about Animal Defense Mechanisms

Explain in your own words what this video was about.
Part 2: Read “Hearing Sounds through the Ground” for the gist. Then reread the text and use it to answer the questions below.
Elephants talk to each other.
They trumpet, growl, moo, bellow, and squeal. Elephants rumble to each other, too.

In fact, the rumbling is so low that humans can’t hear it. But elephants can hear it, and the deep sounds go farther than the higher-pitched sounds that we can hear.

Elephants rumble to warn other elephants that something dangerous is near. When elephant herds hear this rumbling sound, they do things to keep their babies safe. They herd into a tight group to keep their babies close. The entire elephant family turns toward the source of rumbling. Then the elephants slowly leave, as if the rumbling were a warning.

An elephant’s rumbling feels strange to humans. It is such a deep, low sound that the ground actually shakes. A team of scientists led by Dr. Caitlin O’Connell-Rodwell of Stanford University wondered if the ground-shaking part of this sound was important to elephants.

The scientists thought it was possible that elephants might “listen” to the earth shaking beneath their feet.

To find out, the scientists studied wild elephants in Namibia, Africa. They used a machine to record the shaking that happens when elephants give their rumble call, the same machine scientists use to measure earthquakes.

Then the scientists used another machine to shake the ground exactly as if an elephant were rumbling—but without the sound. The scientists played the noiseless shaking to the elephants and watched what the elephants would do.

When the elephants felt the ground rumble, they clumped into a group, they all turned to face in the same direction, and then they left—even though they did not hear the rumble call with their ears.

No one knows how elephants use these earth-shaking sounds in everyday life. Do they rely on sounds through the ground when changing weather blocks their usual calls? Can these vibrations carry a message even farther than rumblings through the air?
Scientists have many more questions to answer as they work to learn how elephants talk to one another... and what they’re saying.
1. The third paragraph says, “Elephants rumble to warn other elephants that something dangerous is near. When elephant herds hear this rumbling sound, they do things to keep their babies safe. They clump into a tight group to keep their babies close. The entire elephant family turns toward the source of rumbling. Then the elephants slowly leave, as if the rumbling were a warning.”

What is the main idea of this paragraph?

a. Elephant rumbling keeps elephant babies safe.
b. Elephant rumbling increases the chances of survival for the entire elephant herd.
c. Rumbling is a signal of danger.
d. When elephants hear rumbling, they leave.

2. Which line from the text is the best evidence to support the answer to Question 1?

a. “Elephants rumble to warn other elephants that something dangerous is near.”
b. “They clump into a tight group to keep their babies close.”
c. “The entire elephant family turns toward the source of the rumbling.”
d. “Then the elephants slowly leave.”
3. Read the following sentence from Paragraph 5 of the text.

“The scientists played the noiseless shaking to the elephants and watched what the elephants would do.”

Which explanation is most appropriate for why scientists played noiseless shaking to the elephants?

a. To determine if elephants might “listen” to the rumbling
b. To see how elephants protect their babies
c. To warn the elephants of danger
d. To cause the elephants to move to a new location

4. Which line from the text best explains why scientists still have more questions about how elephants talk to one another?

a. “An elephant’s rumbling feels strange to humans.”
b. “The scientists thought it was possible that elephants ‘listen’ to the earth shaking beneath their feet.”
c. “When elephants felt the ground rumble, they clumped into a group ... even though they did not hear the rumble call with their ears.”
d. “No one knows how elephants use these earth-shaking sounds in everyday life.”

5. In the third paragraph, the text says, “The entire elephant family turns toward the source of rumbling.” What is the best definition of the word source as used in the context of this sentence?

a. thing from which something arises; origin
b. manufacturer
c. start of a stream or river
d. supplier of information
6. Select one sentence from the text that shows a similarity between elephants and humans. Record
the sentence below.


7. List one detail from the text that supports the conclusion that rumbling serves as an elephant
defense mechanism.


Part 3: Reread the text and determine the main idea of the text. Identify three details that support the main idea.

<table>
<thead>
<tr>
<th>Hearing Sounds through the Ground</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Main Idea:</strong></td>
</tr>
<tr>
<td></td>
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</tbody>
</table>
Part 4: Summarizing the Text: After thinking more closely about this text, summarize what you think this reading is mostly about. Use several specific details from the text in your summary.
Learning target: I can determine the main idea using specific details from the text

1. The target in my own words is:

2. How am I doing? Circle one.

I need more help to learn this  I understand some of this  I am on my way!

3. The evidence to support my self-assessment is:

________________________________________

________________________________________

________________________________________

________________________________________

________________________________________
**Learning target:** I can summarize a text using the main idea and supporting details found in the text.

1. The target in my own words is:

   ___________________________________________________________
   ___________________________________________________________
   ___________________________________________________________
   ___________________________________________________________

2. How am I doing? Circle one.

   - I need more help to learn this
   - I understand some of this
   - I am on my way!

3. The evidence to support my self-assessment is:

   ___________________________________________________________
   ___________________________________________________________
   ___________________________________________________________
   ___________________________________________________________
   ___________________________________________________________
   ___________________________________________________________
Learning target: I can paraphrase information presented in a text read aloud to me.

1. The target in my own words is:

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

2. How am I doing? Circle one.

I need more help to learn this  I understand some of this  I am on my way!

3. The evidence to support my self-assessment is:

________________________________________________________________________
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Learning Resources
CoSer 501
Educational Media

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