Practice in Science Writing

Connections

Have you ever . . .

- Voted on an issue involving science?
- Explained a new scientific study to a friend?
- Given a relative advice about how to deal with an illness or injury?

Developing the ability to comprehend and write about scientific subjects will benefit you in your life, your career, and your academic progress. From choosing a water filter to finding out information on health problems, you deal with science every day. Many careers and areas of study also deal with scientific topics. Health care deals with biology, physiology, and pharmaceutical research. Law enforcement deals with sociology, psychology, and public policy studies.

You will need to read and respond to scientific texts. You will also need to understand and design scientific experiments. When you write about scientific topics, you will show:

- Your ability to apply scientific knowledge to new situations.
- Your ability to comprehend new scientific information.
- Your existing knowledge of fundamental scientific concepts.

Learn It!

Responding to a Science Prompt

A science prompt will ask you to do a specific writing task, such as designing an experiment, evaluating an experiment, describing scientific knowledge, or applying a scientific principle.

Respond to the following scientific passage and prompt.

What Makes You Different from Everybody Else?

All humans are basically the same; that is, we are all members of the same species. Yet we are each also unique, with different traits that allow us to stand out as individuals. Some people are short, others tall. There are a variety of eye, skin, and hair colors. These physical similarities and differences are due to similarities and differences in our genetic instructions. Our own set of genetic instructions, our "genes," determines our particular traits, inherited from our parents.

Genes come in the form of DNA (deoxyribonucleic acid), a long, thread-like molecule that carries within its coil all of our genetic information. A genome is all of a living organism's DNA. It is the complete set of genetic instructions for building, running, and maintaining that organism. Virtually every single cell in the body carries a complete copy of all the DNA that makes up the genome.

All living things, from bacteria to plants to animals, have genomes, and every species has its own genome. Simple organisms, such as bacteria, have small genomes with several hundred to several thousand genes in them. By contrast, humans have a relatively large genome with about 30,000 genes. In any two humans, 99.9% of their DNA is identical. However, the entire set of genetic instructions is so large that the 0.1% variation allows for millions of possible differences. This tiny fraction of DNA where variations occur leads to the enormous diversity that makes each of us unique. Yet, the same variation that causes differences in our appearance also leads to differences in our likelihood of getting any particular disease. Knowledge about the effects of DNA variation between individuals can lead to better understanding of diseases and to advances in medicine.

Source: National Human Genome Research Institute, adapted from "From the Blueprint to You: A Brief Guide to Genetics," available at http://www.genome.gov/Pages/Education/Modules/BluePrintToYou/BlueprintCover02.pdf

The passage explains DNA variations in humans. When animals are bred, breeders choose to mate animals with particular traits so that their offspring inherit the desired traits. Explain the role of DNA variation in breeding. Take approximately 10 minutes for this task.

Plan: Identify the Task (1 minute)

Identify the task in the text and the prompt:

- Do you need to design an experiment?
- Do you need to apply information in the text to a new situation?
- Do you need to describe scientific knowledge?

1. Identify the task from the prompt and passage.

The task is to apply information in the text to a new situation. The text gives you information about variations in DNA, specifically human DNA. The prompt asks you to apply that information to animal breeding.

Plan: Outline Central Idea and Details (2 minutes)

Identify a central idea immediately. Make a brief outline of details and a conclusion to support your central idea.

2. Outline the central idea and details.

Central Idea:
Detail:
Detail:
Detail:
Detail:
Conclusion:

You might write the following outline:

Central Idea: DNA variation creates the variation in traits that allows breeders to choose animals to breed.
Detail: Most of the DNA of any species is the same and will be inherited from any parents of that species.
Detail: When breeders choose animals with specific traits, those traits are controlled by DNA.
Detail: The DNA variation in the parents is inherited by the children.
Detail: Because the children inherit the DNA variation, they also inherit the trait.
Conclusion: Without DNA variation within a species, breeding would not be possible.

Draft: Expand the Central Idea and Details (5 minutes)

Expand on the central idea, details, and conclusion in your outline. Add transitions and additional information to clarify your ideas and create fluid writing.

? **3.** Draft your response.

You might write:

> DNA variation is the difference in DNA molecules from one individual to the next in a species. Because DNA controls inherited traits, DNA variation creates the varied traits that allow breeders to select animals to breed. Most of the DNA of any species is the same and will be inherited from any parents of that species. This portion of the DNA does not affect selective breeding. When breeders choose animals with specific traits, the DNA variation controlling those traits in the parents is inherited by the children, so the trait is also inherited. Without DNA variation within a species, breeding for specific traits would not be possible.

Evaluate and Submit (2 minutes)

In a timed response, evaluate your work as you plan and write. Be sure that your response answers the prompt and has good content. Take a few minutes after you draft to review, revise, and edit your work. When you are satisfied with your response, submit your work.

Understanding Science Experiments

Understanding science experiments is crucial to developing science writing content.

Make a **hypothesis**, a proposed idea.	A black car's interior will heat quickly in the sun, because black absorbs the most light.
Identify an **independent variable** that you will change.	The color of the car is the independent variable.
Identify a **dependent variable** that you expect to change.	The heat inside the car is the dependent variable.
Identify a **control group** to verify how your variable is affecting results.	The control group can be blue cars and white cars.
Identify **constants** that remain the same so they don't affect results.	Constants would be the year and model of car, amount of sun, time in the sun, and type of pavement.
Include multiple trials.	You might plan to have 10 white cars, 10 black cars, and 10 blue cars.
Measure the dependent variable.	You might plan to put a thermometer in each car and record the temperature every 10 minutes.
Evaluate the data.	Did the black car heat more and faster than the other cars, as expected? Is there anything unexpected? What do you conclude about the hypothesis?
Plan next steps.	Based on the results, what new hypothesis can you make? What other experiments would you perform?

Practice It!

Use the following passage and prompt for exercises 1 and 2.

A large number of trees in a forest have died because of a beetle infestation. The owners of a nearby apple orchard are concerned that the beetles might infest their trees as well. A local scientist hypothesizes that the beetle infestations will not affect the orchard, since she believes the beetles will only infest specific types of trees.

Design a controlled experiment to test whether the beetles will attack the apple orchard. Include descriptions of data collection and how the scientist can determine whether her hypothesis is correct. Take approximately 10 minutes for this task.

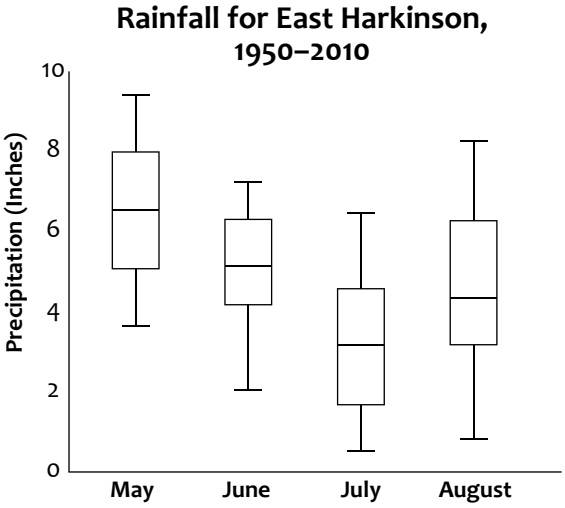
1. Complete the graphic organizer to outline your response.

Central Idea:
Detail:
Detail:
Detail:
Detail:
Conclusion:

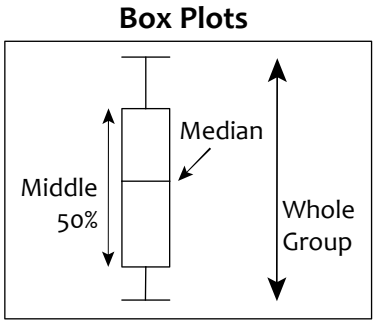
2. Draft and evaluate a response to the prompt based on the graphic organizer. Use a computer or write your response on a separate sheet of paper.

Use the following passage and prompt for exercises 3 and 4.

The box and whisker plot shows rainfall for the months of May through August in the town of East Harkinson. This year, East Harkinson received 4.26 inches of rain in May, 2.12 inches in June, 0.18 inches in July, and 3.14 inches in August.



Based on the box and whisker plot, how would you characterize this year's rainfall for the town of East Harkinson? How does it compare to past years? Take approximately 10 minutes for this task.



3. Complete the graphic organizer to outline your response.

Central Idea:
Detail:
Detail:
Detail:
Detail:
Conclusion:

4. Draft and evaluate a response to the prompt based on the graphic organizer. Use a computer or write your response on a separate sheet of paper.

Use the following passage and prompt for exercises 5 and 6.

Clem bought a pack of generic batteries. He put one in his remote control and another in his hand-held mixer. A few weeks later, the remote and the mixer both died. Clem hypothesized that the generic batteries are a poor brand and don't last. He bought three more packs of batteries: one pack of the generic brand and one pack each of two major name brand batteries. How could Clem test his hypothesis?

Design a controlled experiment to test Clem's hypothesis about the generic brand's longevity. Include descriptions of data collection and how Clem can determine whether his hypothesis is correct. Take approximately 10 minutes for this task.

5. Complete the graphic organizer to outline your response.

Central Idea:
Detail:
Detail:
Detail:
Detail:
Conclusion:

6. Draft and evaluate a response to the prompt based on the graphic organizer. Use a computer or write your response on a separate sheet of paper.

Use the following passage and prompt for exercises 7 and 8.

A scientist hypothesized that increased runoff of Chemical A into Briar Lake had increased the presence of Bacteria B. The scientist performed a study to measure the amount of the chemical and the bacteria in Briar Lake and nearby Carson Lake, which lacks chemical runoff. The study had the following results.

Location	Chemical A	Bacteria B
Briar Lake—Site 1	1.02 mg per 100 mL	402 per 100 mL
Briar Lake—Site 2	2.59 mg per 100 mL	395 per 100 mL
Carson Lake—Site 1	0.12 mg per 100 mL	87 per 100 mL
Carson Lake—Site 2	0.01 mg per 100 mL	89 per 100 mL

The passage describes the results of a study. Describe your conclusions based on the results. Is the hypothesis correct or incorrect? What next steps would you take based on this study? Take approximately 10 minutes for this task.

7. Complete the graphic organizer to outline your response.

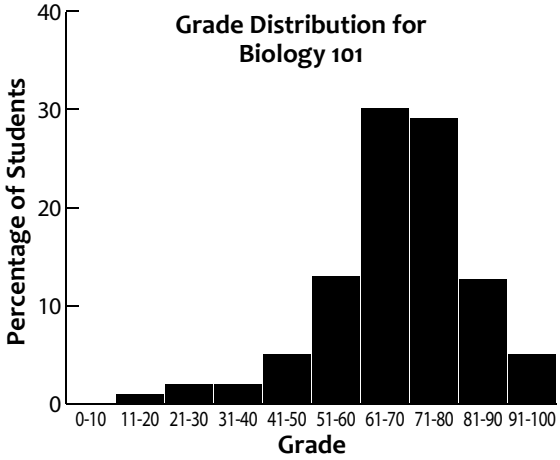
Central Idea:
Detail:
Detail:
Detail:
Detail:
Conclusion:

8. Draft and evaluate a response to the prompt based on the graphic organizer. Use a computer or write your response on a separate sheet of paper.

Check Your Skills

Use the following passage for exercise 1.

The biology department at a local university is evaluating their undergraduate general education coursework. The histogram shows the distributions of student grades in Biology 101. The department wants to raise grades without reducing the educational value or standards of the course. The department decides that identifying effective new teaching methods is the best course.



One teacher proposes that group work will improve grades. He proposes that students should spend 30% of class time working together in groups on specific biology projects aligned to the curriculum. Another teacher proposes that replacing lectures with Socratic questioning will be effective. She proposes that teachers should spend 30% of class time using Socratic questioning.

The department hypothesizes that either method will increase student performance compared to current teaching methods.

1. Design a controlled experiment that the department can use to test this hypothesis. Include descriptions of data collection and how the department can determine whether the hypothesis is correct.

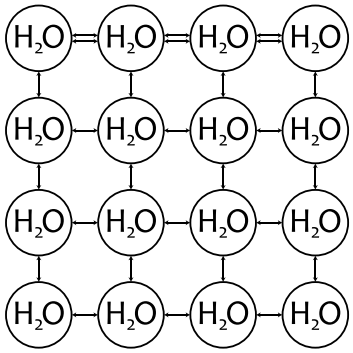
Take approximately 10 minutes for this task. Write your response below or type your response on a computer.

Use the questions on page 329 to evaluate your response.

Use the following passage for exercise 2.

What causes surface tension on water? The answer is the force that binds water molecules together. Inside the water, a molecule binds to other molecules on every side. On the surface of the water, however, the water molecules are not completely surrounded. Because there are no water molecules above them, the water molecules at the surface bind more strongly to the molecules beside them. This creates a strong barrier of tightly bound molecules at the surface of the water. Sometimes people think of surface tension as a "film" at the surface of the water, but the surface of the water is not made of a different substance than any other part of the water. The molecules are simply more tightly bound together.

Water's Surface



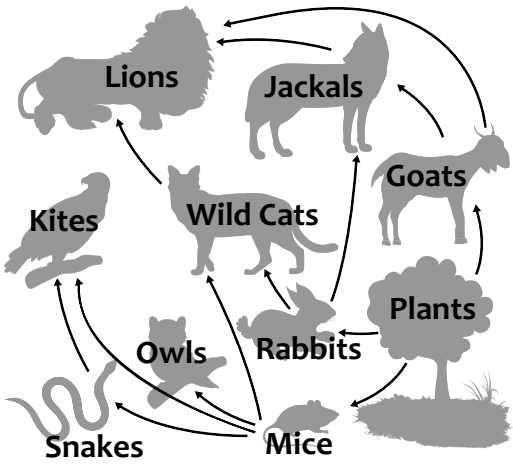
2. The passage explains surface tension on water. Based on the passage, explain how surface tension helps water striders and other small, light insects move and stand on the water's surface.

Take approximately 10 minutes for this task. Write your response below or type your response on a computer.

Use the questions on page 329 to evaluate your response.

Use the following passage for exercise 3.

A food web is a diagram that shows the food relationships of animals and plants in an ecosystem. In an ecosystem, organisms are affected by the presence or absence of their food source. In turn, those food-source organisms are affected by the presence or absence of their food sources. This diagram shows a simplified food web for a land ecosystem. In this diagram, lions are top-level predators. They prey on wild cats, jackals, and goats. Therefore, the lions depend on wild cats, jackals, and goats. A lack of prey would impact the lion population. Similarly, the wild cats, jackals, and goats depend on their food sources: mice, rabbits, and plants.



3. Based on the passage and diagram, what would happen to this ecosystem if a deadly disease wiped out most of the mouse population?

Take approximately 10 minutes for this task. Write your response below or type your response on a computer.

Remember the Concept

To respond to science prompts:

- **Plan:** Identify the task.
- **Plan:** Outline central ideas and details.
- **Draft:** Expand the central ideas and details.
- **Evaluate:** Check for strong content and clear communication.

Use the questions on page 329 to evaluate your response.