

CHAPTER 5

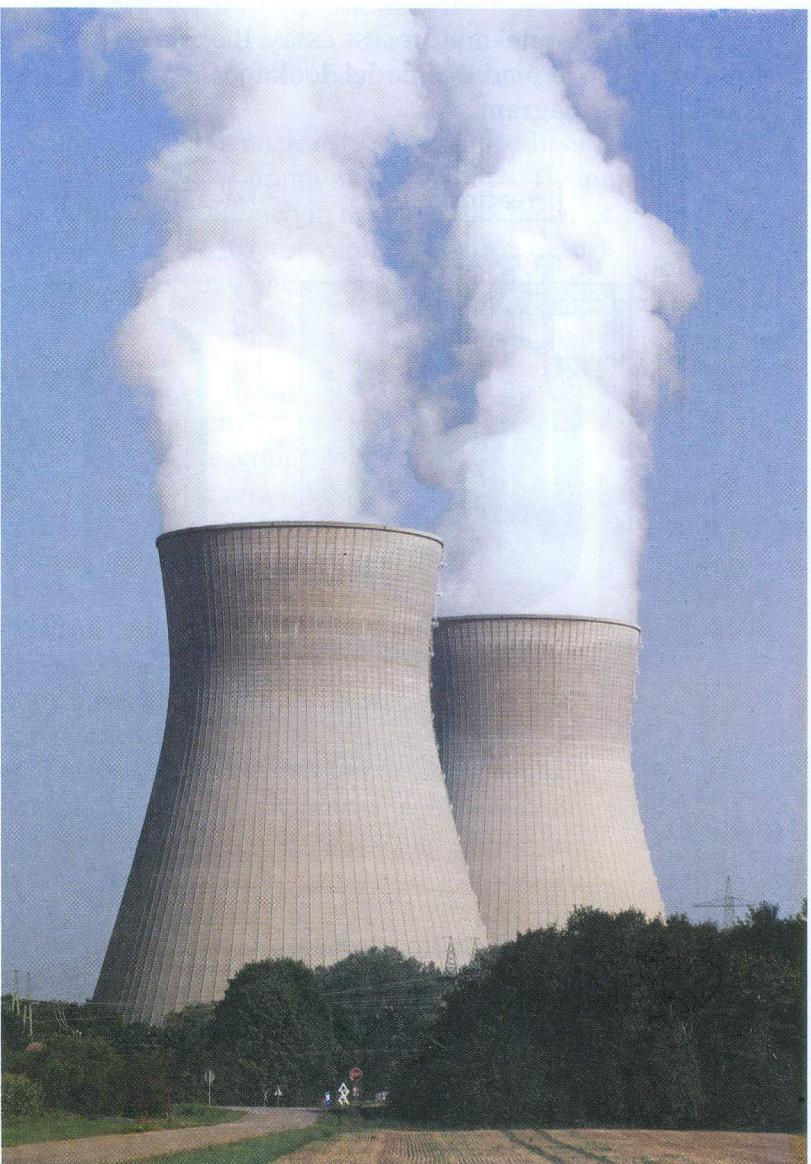
OBJECTIVES

To write academic texts, you need to master certain skills.

In this chapter, you will learn to:

- Analyze a process essay
- Organize steps in a process
- Construct a thesis statement for a process essay
- Use transition signals to show chronological order
- Write, revise, and edit a process essay about earth science

PROCESS ESSAYS



Nuclear power is a controversial source of energy.

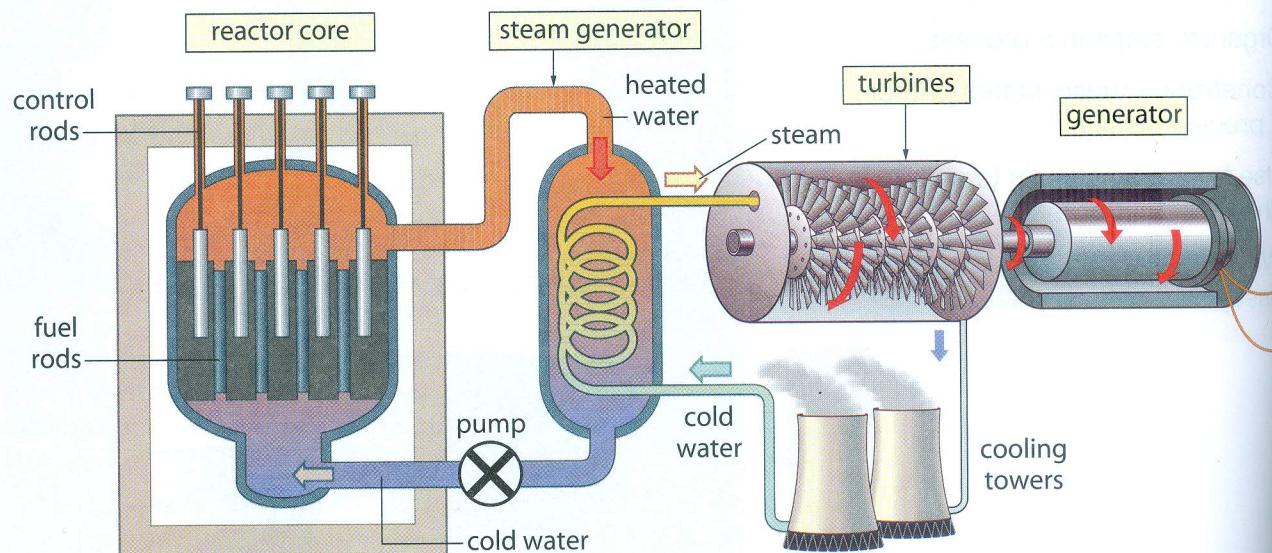
INTRODUCTION

In this chapter, you will learn about writing a **process essay**. This type of essay is written to explain processes and procedures, such as how something works or how to do something. In fact, a process essay is sometimes called a “how to” essay.

The information in a process essay is almost always presented in chronological order, or time sequence. For example, you would use chronological order to explain how to take a photograph, how to perform a chemistry experiment, or how to set up an accounting system. You would also use chronological order to explain processes such as how a snowflake forms, or how a piece of equipment operates. At the end of this chapter, you will write a process essay about a topic related to earth science.

ANALYZING THE MODEL

The writing model is a process essay. It explains two processes involving nuclear energy. As you read the model, look for the two processes. Before you read the model, look at this diagram.



Read the model. Then answer the questions.

Writing Model

Japan's Nuclear Crisis

- 1 Nuclear power is often used to generate electricity for twenty-first century needs. It is produced for this purpose by commercial nuclear reactors in nuclear power plants. In general, these reactors are reliable and efficient. Still, dangerous accidents or other serious problems can occur, so nuclear reactors must be built to withstand everything from hurricanes to terrorist attacks. Unfortunately, these safety measures are not always adequate. Shortly after an earthquake hit Japan on March 11, 2011, a chain of events led to explosions at the Fukushima Daiichi nuclear plant. To understand how the accident at Fukushima happened, it is necessary to understand how a nuclear reactor is constructed and operates.
- 2 A nuclear reactor produces energy through a nuclear reaction called fission, or the splitting of atoms. Reactors generally use uranium atoms for the fission process. First, small pieces of uranium are combined in metal tubes known as fuel rods. Many bundles of fuel rods form the reactor's core. As fission occurs, the uranium atoms in the fuel rods are split, and energy in the form of heat is generated.
- 3 However, too much heat can be dangerous. To regulate the heat generated by a reactor, fuel rods are interspersed with control rods. These are made of materials such as boron, which slow nuclear reactions. When the control rods are pushed into the reactor core, fission slows, and the reactor cools. When the control rods are pulled out, fission speeds up, and the reactor produces more heat.
- 4 The heat from the reactor is then channeled to a container of water called a steam generator. In a steam generator, heat is used to boil water and produce steam. Next, the steam turns a turbine, which powers a generator that creates electricity. Finally, the water is recirculated through the system with electric pumps to cool the reactor core. This cooling process is important because, if the fuel rods get too hot, the fuel can melt. A “meltdown” can destroy the walls of the reactor. It can allow nuclear radiation to escape and poison the surrounding area.
- 5 When the earthquake hit the Fukushima Daiichi nuclear power plant in Japan, there were many systems in place to prevent this kind of disaster. First, the reactor's control rods were fully inserted into the reactor core. This procedure automatically shut down the reactor. The shutdown helped to cool the reactor core, but of course it also made the nuclear power plant stop producing power. With no power, the electric pumps in the cooling system could not function. As a result, the core soon heated up again.

(continued on next page)

- 6 Once the plant itself stopped producing power, it began to draw power from the nation's power grid¹ to run the pumps. Other power plants around the country, nuclear and nonnuclear, were still producing electricity. Unfortunately, the earthquake had also damaged the power grid. It, too, soon stopped providing power to the Fukushima Daiichi pumps. At this point, there was still one more safety system that could prevent meltdown: backup diesel generators. These machines use diesel fuel, instead of nuclear power, to make electricity. The diesel generators had started to make electricity to run the plant's cooling pumps when another disaster occurred. Fukushima Daiichi was hit with a tsunami, or giant wave, caused by the earthquake. The tsunami flooded the generators. This left only batteries to operate the pumps. They lasted for just a few hours before they ran out of power.
- 7 After the batteries died, the pumps failed once and for all. They could no longer circulate water to cool the reactor. As a result, the water started boiling away, exposing the tops of the fuel rods. Then the metal tubes holding the uranium fuel overheated and split. The cracks allowed the remaining water to enter the tubes and interact with the fuel. This interaction began generating hydrogen gas. The hydrogen accumulated so quickly that it exploded inside the reactor building. To prevent disaster, operators decided to destroy the reactor in a flood of seawater mixed with boron. The seawater reduced the reactor's temperature while the boron stopped the process of nuclear fission. A meltdown was prevented.
- 8 As these events show, nuclear power is a resource with great potential, but in some circumstances it still can have serious risks. Prior to the earthquake and tsunami, Japan had planned to increase its use of nuclear power. It is now unlikely that a large increase can happen. It is also unclear how much of the country's nuclear infrastructure² will be rebuilt, and it is still unknown whether the Japanese people are open to continued reliance on nuclear fuel.

Sources:

1. Brain, Marshall and Robert Lamb. "How Nuclear Power Works."
2. "Explaining Nuclear Energy for Kids." *The Washington Post*.
3. "Japan to Scrap Nuclear Energy in Favor of Renewables." *The Guardian*.
4. Timmer, John. "Understanding Japan's Nuclear Crisis."
5. "Uranium." *Energy Kids*. U.S. Energy Information Administration.

¹ **power grid:** the system for carrying electrical power around the country

² **infrastructure:** the basic systems and structures that a country or organization needs in order to work properly, for example roads, railways, and banks

Questions about the Model

1. What is the thesis statement? How does it indicate that at least part of this essay will use chronological organization?
2. What two processes are explained?
3. Which paragraphs explain the first process? Which paragraphs explain the second process?
4. What kind of introduction does this essay have—"funnel" or attention-getting?
5. What kind of conclusion does it have? Does it summarize the main points or paraphrase the thesis or is it a different kind? Does it give a final comment?



Noticing Vocabulary: Word Parts and Word Families

In Chapters 1 and 4, you learned about word families and suffixes. You also learned that words in a word family often have similar meanings but are different parts of speech.

Words in the same word family are related because they share the same basic part, called a **base word** or **word root**. Base words—for example the verb *act*—can stand alone as words. (*Act* is the base of words like *action* and *actor*.) Word roots, however, cannot stand alone. For example, the root *struct*—the root of the word *structure*—is not a word.

Prefixes, like roots and suffixes, are word parts. Prefixes can be added to the beginning of a word's base or root to modify its meaning. For example, the prefixes *con* and *de* can be added to the root *struct* to create *construct* and *destruct*. *Construct* and *destruct* have different but related meanings.

Notice the words *reactor* and *constructed* in the model. These two words have both a prefix and a suffix added to the base or root. Understanding how words in word families are built from word parts can help you expand and enrich the vocabulary you use in your writing.

PRACTICE 1 Recognizing Word Parts

- A Find words in the model that use one or more of the word parts in this chart. Write at least ten words.

| PREFIX | BASE OR ROOT | SUFFIX |
|--------|--------------|--------|
| auto | act | ic |
| con | mat | ing |
| ex | pose | ly |
| re | source | or |
| | struct | |

- B Now write a definition of each word. Use a dictionary as needed. Notice how the meanings of the words in a word family are related.

ORGANIZATION

Like other essays, a process essay includes an introduction, a body, and a conclusion. What's different about a process essay is that it's usually organized into steps. You must discuss the steps in your process in the order in which they occur. Otherwise, readers will be confused.

It's usually a good idea to figure out what steps you want to include as soon as you decide on your topic. Then you'll be prepared to write your thesis statement and decide how many paragraphs to include in your essay's body. Here are three important points to remember in organizing a process essay:

- Write a thesis statement that names the process and indicates time order.
- Discuss the steps in your process in the order in which they occur.
- Use chronological order signal words and phrases to indicate the time sequence.

THESIS STATEMENTS FOR A PROCESS ESSAY

The thesis statement for a process essay indicates that chronological order will be used. Statements often use verbs like *plan*, *develop*, and *evolve* or expressions such as *the process of*, *the procedure for*, *five stages*, and *several steps*.

Follow these **steps** to make a beautiful ceramic vase for your home.

The field of genetic engineering has **developed** rapidly in the past ten years.

Heating water by solar radiation is a **simple process**.

Sometimes the thesis statement tells the number of steps in the process.

The process of heating water by solar radiation involves **three** main steps.

The thesis statement may even name the steps.

The main steps in the process of heating water by solar radiation are (1) trapping the sun's energy, (2) heating and storing the hot water, and (3) distributing the hot water to its points of use.

PRACTICE 2

Creating Thesis Statements for Process Essays

Check (✓) the thesis statements that suggest the essay will describe a process or a procedure. Then, in the checked statements, circle the words that indicate chronological order.

- 1. A child learns to handle responsibility in a series of small steps.
- 2. Both heredity¹ and environment contribute to a person's intelligence.
- 3. There are two main reasons that governments should provide free higher education for their citizens.
- 4. The procedure for submitting expense reports has recently changed.
- 5. The tensions that led to last year's student riots had been developing for several years.
- 6. Some cultures have very direct interaction styles, while other cultures are more indirect.
- 7. Two of the busiest travel days in the United States are the Wednesday before and the Sunday after Thanksgiving.
- 8. Cultures celebrate the end of winter and the arrival of spring in different ways.
- 9. The preparation of the poisonous puffer fish for eating is a delicate process that is not for amateur chefs.
- 10. The life cycle of the monarch butterfly is an interesting phenomenon.

TRY IT OUT!

Choose five topics that you think would be interesting for a process essay. Write thesis statements for the five topics you choose on a separate sheet of paper. Remember to use words that suggest time order.

TOPICS

- How to take a good photograph
- How to research a topic for an essay
- How diamonds are processed from a diamond mine to a diamond ring
- How to perform a particular chemistry or physics experiment
- How to transplant a tree
- How a hybrid automobile works
- How to overcome a fear
- How to celebrate a special occasion (such as a favorite holiday, a birthday, a wedding, an anniversary)

¹heredity: the process by which mental and physical qualities are passed from a parent to a child before the child is born

BODY PARAGRAPHS IN A PROCESS ESSAY

You discuss the steps in the process or procedure that you are writing about in your body paragraphs. You may want to discuss each step in a separate body paragraph, or you may want to group the steps. If you need to include a lot of information about a step, adding details that will help your readers understand how to do it or how it is done, you can present that step in a separate paragraph. On the other hand, you can discuss several steps in a single paragraph if doing so helps clarify the process.

To write about how to make a ceramic vase, you might divide the body into four paragraphs.

- I. Introductory paragraph
- II. Body
 - A. Shaping the vase
 - B. First (bisque) firing
 - C. Glazing
 - D. Second firing
- III. Concluding paragraph

In the paragraph on “shaping the vase,” you might include details in time order such as placing the clay on the pottery wheel, shaping the form of the vase, hollowing out the center of the vase, and creating the rim of the vase.

PRACTICE 3

Identifying and Organizing Steps

- A** Choose the topic that interests you most. Then list five or more steps you might include to describe the process. Write the steps on a separate sheet of paper.
 - Achieving a high grade in a class
 - Setting up a wireless network of computers and printers
 - Helping someone who is having a heart attack
 - Organizing a community garden
- B** Look at the steps you listed in Part A and put them in chronological order. Decide which steps will require a separate paragraph and which can be grouped together.
- C** Choose one of the steps you listed. On the same paper, write a list of details you will include to explain the step.

Writing Tip

Make sure you use the right verb form for the type of process essay you are writing.

- Use the imperative form to tell how to do something
First, place the clay on the pottery wheel.
- Use the simple present to say how something works.
A GPS system receives signals from a satellite.
- Use the simple past to tell how something happened.
The earthquake damaged the power grid.

TRANSITION SIGNALS FOR CHRONOLOGICAL ORDER

Chronological order signal words are especially important in a process essay. You have to be very clear about the sequence of steps: Does one step happen before, after, or at the same time as another step? Chronological order signals include all time expressions.

| CHRONOLOGICAL ORDER SIGNAL WORDS AND PHRASES | EXAMPLES |
|--|--|
| first, first of all, second, third, etc. then, next, after that, soon, later, later on meanwhile, at the same time, now gradually, eventually finally, last, last of all | First, choose a destination for your camping trip. Meanwhile, have a supply of clean rags ready. Gradually increase your child's allowance. |
| SUBORDINATORS | EXAMPLES |
| after since as until as soon as when before while | After you have chosen a destination, make a list of equipment and supplies that you will need. Praise your child when he or she does something well. |
| OTHERS | EXAMPLES |
| the first (second, last, final) step on the third day later that morning for five minutes in 2012 several years ago a few weeks later in the next (past, last) 15 years | The last step is to decorate the cake. Continue stirring the soup for five minutes. In 2012, scientists announced a major discovery. My parents emigrated to the United States several years ago. |

blue

See Chapter 12, page 224, to learn more about Time Clauses.

PRACTICE 4

Identifying Chronological Order Signals

Reread the writing model on pages 103–104. Find and circle all chronological order signals, including time words, time phrases, and time clauses.

PRACTICE 5**Using Chronological Order Signals**

Read “How to Make a Model Volcano.” Complete the paragraph using chronological order signals from the box. Add commas where necessary.

after it erupts

after the outside of the
volcano is complete

finally

first

next

once the paint has dried

second

then

when the vinegar meets
the baking soda

How to Make a Model Volcano

When a volcano erupts, gas from under the earth bubbles up to the surface and forces hot lava above the ground. It is an impressive sight, and there is much that volcanoes can teach us about physics and earth science.



To learn more about how volcanoes work, you can follow a process to make a model volcano out of a few common household materials. _____ take a jar or a bottle and cover it with clay or paper-maché. _____ mold the covering into the shape of a volcano and decorate it so that it resembles a volcanic mountain. _____ use small twigs to create miniature trees and pebbles to mimic boulders. You can use any leftover material to make other small hills surrounding the volcano. _____ spray or paint it with shellac or waterproof varnish. This will enable you to clean the volcano more effectively _____.

_____ fill the bottle most of the way with warm water. _____ add red food coloring to mimic the color of lava and dishwashing soap to create bubbles. _____ add baking soda. Baking soda contains sodium bicarbonate, which supplies the carbon for the carbon dioxide gas that will make the volcano erupt. When you are ready for the eruption, pour some vinegar into the bottle. _____ a chemical reaction happens, and carbon dioxide is released. The carbon dioxide gas bubbles up and pushes the liquid out of the bottle, causing the eruption.





Applying Vocabulary: Using Word Parts and Word Families

Understanding how words are built from word parts can help you expand your vocabulary and use words correctly in context. Of course, if you are unsure of a word's meaning or spelling, you should check the word in the dictionary before using it in your writing.

PRACTICE 6

Using Word Parts and Word Families

- A** Combine the word parts to make at least five words. (Try not to repeat the words you wrote for Practice 1 on page 105.) Remember that word parts may slightly change in spelling when combined.

| PREFIX | BASE OR ROOT | SUFFIX |
|--------|--------------|--------|
| auto | act | ic |
| con | mat | ing |
| ex | pose | ly |
| re | source | or |
| | struct | |

1. _____
2. _____
3. _____
4. _____
5. _____

- B** Choose five words from Practice 1 on page 105 and Part A above. Use each word in a sentence that you might use to describe a process.

1. _____

2. _____

3. _____

4. _____

5. _____

WRITING ASSIGNMENT

Your assignment for this chapter is to write an essay on a topic related to earth science. Choose one of the topics from the list. Use the writing model on pages 103–104 to help you. To complete the assignment, follow the steps in the writing process.

TOPICS

- What to do in case of an earthquake (or hurricane or other natural disaster)
- How to perform a particular science laboratory experiment
- How to conserve energy in your daily life



Prewrite

STEP 1: Prewrite to get ideas.

- Use a prewriting strategy to generate ideas about your topic.
 - One technique you can use is called **freewriting**. Freewriting is a brainstorming technique in which you write down all of your ideas without stopping.
 - Write your topic at the top of your page.
 - Place your pen on the first line of your paper and begin writing.
 - Do not pick up your pen or stop writing, even if you are having trouble thinking of new ideas.
 - Sometimes, it may help to write the same idea several times until you think of a new one.
 - Do not worry about grammar, the quality of your ideas, or anything else—just write as much as you can on the topic of your essay!

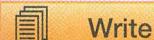
Omar did some freewriting to prepare for his essay about a science laboratory experiment. Here is the beginning of his freewriting.

In chem class we sometimes did lot of experiment and I like them although sometime it is hard but you try and you do it ok so I need to write about how to do this so it is first you are reading the lab manual to understand then maybe I should think of an experiment to describe an experiment to describe an experiment to describe oh ok I will do the one from last week where we had to decide what is acid and what is base, so first we had to get some materials



STEP 2: Organize your ideas.

- Choose one main idea from the prewriting that you think will be a strong focus for your essay. This should be your thesis statement. Remember to use a thesis statement that indicates a process essay.
- Look for related ideas in the freewriting from Step 1. If you find anything that is completely off topic, or repeated, cross it out. Then rewrite your ideas so that they are grouped with similar ideas. These groups will become your body paragraphs.
- Next, make an outline as you learned to do in Chapter 4. Put your thesis statement at the top. Then, for letters A, B, and C, write the sentences that will form the topic sentences of your body paragraphs.



STEP 3: Write the first draft.

- Using your list, begin writing your first draft. Remember to use chronological order transitions in your body paragraphs.
- Describe the steps in your process or procedure in your body paragraphs.
- Don't worry if you think of new ideas as you write. You can add or delete ideas later. Just be sure that your new ideas support your thesis.



STEP 4: Revise the draft.

- Review the content and organization of your draft. Do not try to correct errors in format, mechanics (capitalization, punctuation, and spelling), grammar, and sentence structure at this stage. You will do this in Step 5.
- Begin by reading over your essay to get a general overview. As you read, make sure that
 - your essay has a thesis statement that is appropriate for a process essay;
 - you have organized the steps in the process clearly;
 - you have used appropriate chronological order transition signals.
- Make notes in the margin about anything you want to improve.
- Ask a classmate to read and give you feedback on your first draft using the Chapter 5 Peer Review on page 329.
- Discuss your classmate's suggestions and decide which ones to take.



Proofread

STEP 5: Edit and proofread the draft.

- Make sure that you have identified all of the changes you want to make in content and organization. Then review your essay for errors in format, mechanics, grammar, and sentence structure. Use the Chapter 5 Writer's Self-Check on page 330 to help you.
- When you find an error, make a note on your paper using the correction symbols from Appendix D on pages 309–311.



Write

STEP 6: Write a new draft.

- In your new draft, include the changes you identified in Steps 4 and 5.
- Proofread your new draft again carefully. Make sure it is neat and error free.
- Hand in your essay to your teacher.

SELF-ASSESSMENT

In this chapter, you learned to:

- Analyze a process essay
- Organize steps in a process
- Construct a thesis statement for a process essay
- Use transition signals to show chronological order
- Write, revise, and edit a process essay about earth science

Which ones can you do well? Mark them

Which ones do you need to practice more? Mark them

EXPANSION



TIMED WRITING

In this expansion, you will write an essay in class. As you write, focus on using the techniques of process writing that you learned in this chapter. You will have 50 minutes. To complete the expansion in time, you will need to budget your time accordingly. Follow this procedure.

1. Read the writing prompt (or the prompt your teacher assigns) carefully. Choose one of the topics to write about. Make sure you understand the question or task. You may want to underline the key words in the prompt. (5 minutes)
2. Brainstorm to get ideas, choose a thesis and make a rough outline to organize your ideas. (10 minutes)

3. Write your essay. Be sure to include an introductory paragraph with your thesis, body paragraphs, and a concluding paragraph. (25 minutes)
4. Check your paragraph for errors. Correct any mistakes. (10 minutes)
5. Give your paper to your teacher.

Prompt: Write a process essay about one of these topics:

- How to cook a favorite food
- How to do a favorite hobby
- How to succeed in your major area or professional field
- How to accomplish an academic task (register for classes, apply for a scholarship, pass an exam, etc.)



WRITING FROM A DIAGRAM

Look at the diagram, which shows the process of generating energy from wind. Then write a paragraph that explains the process to someone who cannot see the diagram.

