



Task: HEALTHY WATERS



Part 1: Research Student Directions:

Your Assignment:

News flash! Your community is learning what it takes to keep the local waters healthy. You have been asked to explain the role of waste water treatment in maintaining the health of water sources such as rivers, lakes, or the ocean. You will explain what sewage is, where it goes, and how it is treated. Your essay will be shared with community members as part of the “Healthy Waters” campaign.

Steps you will be following:

To plan and compose your essay, you will do the following:

1. Watch two videos and read one article.
2. Answer three research questions about the sources.
3. Write your essay.

Directions for beginning:

You will now read two sources and watch two videos about the importance of maintaining healthy waters. Use the note taking tool provided because you may want to refer to your notes while writing your essay. You can refer to any of the sources as often as you like.

Source Information:

- Source #1:** Video: *Why is Clean Water Important?* (2:48)
King County Waste Water Treatment Division
<https://www.youtube.com/watch?v=FVNSidxtems>
- Source #2:** Video: *West Point Treatment Plant Tour* (5:08)
<https://www.youtube.com/watch?v=4uYk1AGYxcs>
- Source #3:** Article: Down the Drain
- Source #4:** Diagram: The H₂O Cycle





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Note Taking Tool

SOURCE	WHAT IS WASTEWATER?	HOW IS WASTEWATER TREATED?	HOW DOES WASTEWATER TREATMENT PROTECT THE HEALTH OF THE PUGET SOUND?
Source #1: Video <i>Why is Clean Water Important?</i>			
Source #2: Video <i>West Point Treatment Plant Tour</i>			
Source #3: Article: <i>Down the Drain</i>			
Source #3: Diagram of the Water Cycle			

Down The Drain



Why care about water?

Water is needed by all life on earth. People, plants, and animals all need water to live. We need water to drink, bathe, and grow food. We enjoy water all around us in the form of rivers, lakes, and Puget Sound.

How much water do we use?

Believe it or not, each person uses up to 100 gallons of water every day for drinking, cooking, bathing, flushing toilets, laundry, washing cars, and watering lawns. The water we use comes from groundwater. Groundwater is trapped in rock and sand layers and underground lakes and rivers called aquifers. We use wells to pump groundwater to the surface.

What is wastewater?

All the water we use in our homes that goes down the drain is wastewater. This includes water from baths, showers, sinks, dishwashers, washing machines, and toilets.

Where does our wastewater go?

Wastewater from homes goes one of two places:

If your home has a septic tank, the wastewater is piped into a large tank buried in your yard. Inside the tank, solid material sinks to the bottom and the liquid flows out into an underground layer of rocks called a drainfield. Water in the drainfield slowly filters through the soil to be cleaned naturally.

If your home connects to a sewer system, the wastewater flows into a series of pipes under the street. The sewer pipes carry the wastewater from homes and businesses to a treatment plant for cleaning.



Why must the wastewater be cleaned?

By the time the wastewater reaches the treatment plant, this dirty water is somewhat green in color. It usually looks and smells pretty bad. Most of it (about 99.5%) is water. A very small amount (about 0.5%) is actual waste. Wastewater contains pollutants like bacteria, soaps, and chemicals. If the water was not cleaned or treated it could pollute our groundwater, lakes, rivers, and Puget Sound and make people very sick. Polluted water is also harmful to wildlife and the environment.



The 123's of Wastewater Treatment



What does “treatment” mean?

The process of cleaning wastewater is called treatment. In nature, water is slowly cleaned as it is absorbed by plants, filtered down through the soil, and cleaned by microscopic bugs called bacteria. Nature’s way of cleaning water takes months or even years.

Because we create so much wastewater every day, we need a faster way to clean it. A wastewater treatment plant can clean water in less than one day.

What happens to wastewater at the Plant?

Wastewater goes through many stages of cleaning at the Budd Inlet Treatment Plant:

Primary Treatment: Screening & Sinking

Step 1: Taking Out the Trash

Wastewater flows through a metal screen with many holes. The holes are big enough to let water through, but small enough to screen out trash like rags and sticks.

Step 2: Goodbye Grit

Next, the wastewater flows through a grit chamber where sand and other heavy stuff sinks to the bottom.

Step 3: Sink or Skim?

The wastewater is slowed down as it moves through the primary clarifiers so the tiny particles left in the cloudy water can either float to the top (scum) or sink to the bottom (sludge). This leaves the water in between much cleaner. The scum is skimmed off, the sludge is pumped out, and the cleaner water in the middle is ready for secondary treatment.

Secondary Treatment: Helpful Bugs at Work

During secondary treatment, nitrogen and other pollutants are removed from the wastewater using bacteria that are naturally present in the wastewater flow.

Step 4: Mixing Things Up

Secondary treatment begins in the aeration basin. This basin is like a cafeteria for an army of hungry bacteria that eat the waste and break down pollutants in wastewater. These hardworking bugs need oxygen to breathe so plenty of air is added in a process called aeration. This bubbly, buggy mixture is called mixed liquor.

Step 5: It’s a Gas!

The mixed liquor flows into the anoxic basins. Back in the aeration basin the bugs were given oxygen – but not in the anoxic basins. Anoxic means “no air.” The bugs are forced to get their oxygen from nitrogen compounds in the mixed liquor. As the bugs use the oxygen, the nitrogen is released as a harmless gas that is part of the air we breathe.

Step 6: Settling Things Down

Mixed liquor from the second anoxic basin flows into the secondary clarifier. The bugs, fat and heavy from eating, sink to the bottom of the clarifier leaving cleaner, clearer water at the top. The clean water flows out of the top of the clarifier. The bugs at the bottom are pumped back to the anoxic basin to continue their cleanup work.

Step 7: Bye Bye Bacteria

The last part of the treatment process is called disinfection. During this stage, the water flows through special channels filled with bright ultra-violet (UV) lights that stop disease-carrying bacteria from multiplying.

Step 8: Let It Flow!

By the time the cleaned water or final effluent leaves the Plant, it has been disinfected and almost all of the solid particles and pollutants have been removed. Most of the final effluent is released into Budd Inlet. The rest is sent to LOTT’s Budd Inlet Reclaimed Water Plant for even more cleaning. This extra cleaning is called Tertiary Treatment.



Class A Reclaimed Water is a valuable resource for our communities.



Tertiary Treatment: Ready for Reuse

At the Budd Inlet Reclaimed Water Plant, the final effluent moves through a sand filter for additional cleaning. After the water is filtered and disinfected with chlorine, this reclaimed water is clean, safe, and ready to be used again for almost everything but drinking. Each day, LOTT's Budd Inlet Reclaimed Water Plant in Downtown Olympia makes up to one million gallons of **Class A Reclaimed Water** – the highest rating for reclaimed water in the state of Washington.

LOTT also makes Class A Reclaimed Water in Lacey at the Martin Way Reclaimed Water Plant. From there, the reclaimed water travels through a **purple pipeline** to the Hawks Prairie Reclaimed Water Ponds. In the future, LOTT will produce reclaimed water for use in all three cities: Lacey, Olympia, and Tumwater. The water can be used for things like flushing, washing, and irrigation (watering grass, trees, and shrubs). Reclaimed water is sometimes used to recharge or “add water to” ground- water, lakes, streams, or wetlands.

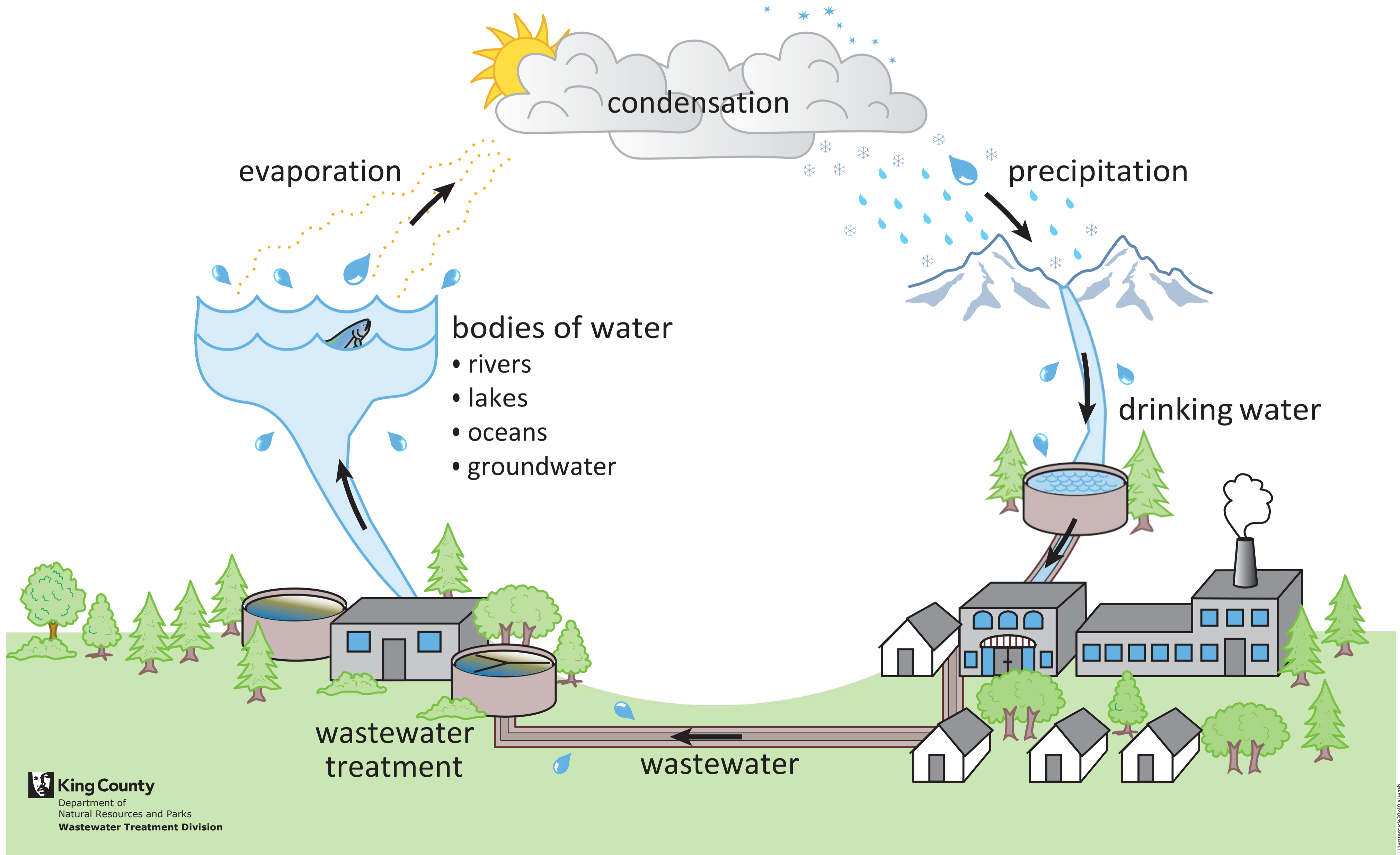
Solids Treatment: Recycling Times Two

Sludge, the semi-solid material that settles out during the treatment process, is sent to a special area in the Plant for treatment. Liquid is removed and the sludge is thickened before it is pumped into digesters. In the digesters, the sludge is heated and mixed for at least 15 days to reduce the amount of harmful bacteria. The sludge is then transferred to a centrifuge where it spins so fast that excess water is removed. The dewatered solids that are left behind are called biosolids.

Biosolids are nutrient-rich, making it good for use as fertilizer and compost. Biosolids from the Plant are trucked to other parts of the state and composted or used as fertilizer for non-food crops such as hay.

Biosolids aren't the only thing that is recycled from solids handling. In the digesters, methane gas is produced as the sludge breaks down. The gas is collected and used as energy to help heat buildings at the Treatment Plant and the sludge in the digesters!

The H₂O Cycle





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Research Questions

1. Explain what waste water is using information from two of the sources. Name your sources.
(Claim 4, Target 2)



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3. "It's important for all citizens to understand the role of wastewater treatment." Support this statement with information from two of the sources. Name your sources. **(Claim 4, Target 4)**



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Part 2: Field Investigation

Teachers are encouraged to arrange a field experience to a wastewater treatment plant so that students can see firsthand how wastewater is treated prior to entering our water ways. The plants typically have excellent outreach programs to local schools.

Discussion questions might include the following:

- How might the filtering systems used for wastewater treatment be replicated in the classroom?
- Why is wastewater treatment important to the health of our environment?
- How does a septic system treat waste?
- How is your wastewater at home treated?

In addition, teachers may want to consider one or more of the following resources for possible field investigations:

- *Healthy Forests, Healthy Waters* Tahoma Curriculum on PEI website for download
- Wastewater Treatment Brochures (City of Coeur d'Alene):
<https://www.cdavid.org/2687/departments/wastewater/wastewater-informational-brochures>

Other ideas for field investigations:



PART 3: Essay

Student Directions

You will now review your notes and sources, plan, draft, and revise your essay. You may use your notes and refer to the sources. You may also refer to the answers you wrote to questions at the end of Part 1, but you cannot change those answers. Now read your assignment and the information about how your essay will be scored. Then begin your work.

Your assignment:

You have been asked to explain the role of wastewater treatment in maintaining the health of your local waters. Your essay should include what wastewater is, how it is treated, and why this treatment is important. Be sure to use information from the sources and cite your sources in the essay.

How your essay will be scored:

The people scoring your essay will be assigning scores for

- 1. *Statement of Purpose / Focus***—how well you clearly state and maintain your controlling idea or main idea.
- 2. *Organization***—how well the ideas progress from the introduction to the conclusion using effective transitions and how well you stay on topic throughout the essay.
- 3. *Elaboration of Evidence***—how well you provide evidence from sources about your topic and elaborate with specific information.
- 4. *Language and Vocabulary***—how well you effectively express ideas using precise language that is appropriate for your audience and purpose.
- 5. *Conventions***—how well you follow the rules of usage, punctuation, capitalization, and spelling.

Now begin work on your essay.

Manage your time carefully so that you can:

- Plan your essay
- Write your essay
- Revise and edit for a final draft



Planning My Essay

Essay Components
Introduction: Capture the reader's attention
Statement of purpose or controlling idea:
What waste water is:
How waste water is treated:
Why waste water treatment is important to maintaining the health of our local waters:
Conclusion:

Informative / Explanatory Writing Rubric (Grades 6-11)

Scoring Version



Score	4	3	2	1
Statement of Purpose/Focus	<p>The response is fully sustained and consistently and purposefully focused:</p> <ul style="list-style-type: none"> consistent or main idea of a topic is clearly communicated, and the focus is strongly maintained for the purpose, audience, and task 	<p>The response is adequately sustained and generally focused:</p> <ul style="list-style-type: none"> controlling or main idea of the topic is clear, and the focus is mostly maintained for the purpose, audience, and task 	<p>The response is somewhat sustained and may have a minor drift in focus:</p> <ul style="list-style-type: none"> controlling or main idea of a topic may be somewhat unclear, and the focus may be insufficiently sustained for the purpose, audience, and task 	<p>The response may be related to the topic but may provide little or no focus:</p> <ul style="list-style-type: none"> controlling or main idea of the topic may be somewhat confusing or ambiguous; response may be too brief or the focus may drift from the purpose, audience, and task
Organization	<p>The response has a clear and effective organizational structure creating unity and completeness:</p> <ul style="list-style-type: none"> consistent use of a variety of transitional strategies to clarify the relationships between and among ideas effective introduction and conclusion logical progression of ideas from beginning to end; strong connections between and among ideas, with some syntactic variety 	<p>The response has an evident organizational structure and a sense of completeness, though there may be minor flaws and some ideas may be loosely connected:</p> <ul style="list-style-type: none"> adequate use of transitional strategies with some variety to clarify the relationships between and among ideas adequate introduction and conclusion adequate progression of ideas from beginning to end; adequate connections between and among ideas 	<p>The response has an inconsistent organizational structure, and flaws are evident:</p> <ul style="list-style-type: none"> inconsistent use of transitional strategies with little variety introduction and conclusion, if present, may be weak uneven progression of ideas from beginning to end; and/or formulaic; inconsistent or unclear connections between and among ideas 	<p>The response has little or no discernible organizational structure:</p> <ul style="list-style-type: none"> few or no transitional strategies are evident introduction and conclusion, if present, may be missing frequent extraneous ideas may be evident; ideas may be randomly ordered or have an unclear progression
Elaboration of Evidence	<p>The response provides thorough and convincing support/evidence for the controlling idea and supporting idea(s) that includes the effective use of sources, facts, and details.</p> <ul style="list-style-type: none"> comprehensive evidence from sources is integrated; references are relevant and specific effective use of a variety of elaborative techniques* 	<p>The response provides adequate support/evidence for the controlling idea and supporting idea(s) that includes the use of sources, facts, and details:</p> <ul style="list-style-type: none"> adequate evidence from sources is integrated; some references may be general adequate use of some elaborative techniques* 	<p>The response provides uneven, cursory support/evidence for the controlling idea and supporting idea(s) that includes uneven or limited use of sources, facts, and details:</p> <ul style="list-style-type: none"> some evidence from sources is weakly integrated, imprecise, or repetitive; references may be vague weak or uneven use of elaborative techniques*; development may consist primarily of source summary 	<p>The response provides minimal support/evidence for the controlling idea and supporting idea(s) that includes little or no use of sources, facts, and details:</p> <ul style="list-style-type: none"> evidence from the source material is minimal or irrelevant; references may be absent or incorrectly used minimal, if any, use of elaborative techniques*
Language	<p>The response clearly and effectively elaborates ideas, using precise language:</p> <ul style="list-style-type: none"> vocabulary is clearly appropriate for the audience and purpose effective, appropriate style enhances content 	<p>The response adequately elaborates ideas, employing a mix of precise with more general language:</p> <ul style="list-style-type: none"> vocabulary is generally appropriate for the audience and purpose generally appropriate style is evident 	<p>The response elaborates ideas unevenly, using simplistic language:</p> <ul style="list-style-type: none"> vocabulary is uneven or somewhat ineffective for the audience and purpose inconsistent or weak attempt to create appropriate style 	<p>The response is vague, lacks clarity, or is confusing:</p> <ul style="list-style-type: none"> vocabulary is limited or ineffective for the audience and purpose little or no evidence of appropriate style

Score	2	1	0
Conventions	<p>The response demonstrates a command of conventions:</p> <ul style="list-style-type: none"> adequate use of correct sentence formation, punctuation, capitalization, grammar usage, and spelling 	<p>The response demonstrates partial command of conventions:</p> <ul style="list-style-type: none"> limited use of correct sentence formation, punctuation, capitalization, grammar usage, and spelling 	<p>The response demonstrates little or no command of conventions:</p> <ul style="list-style-type: none"> infrequent use of correct sentence formation, punctuation, capitalization, grammar usage, and spelling

NS	Unintelligible, in a language other than English, off-topic, insufficient evidence (incomplete) or copied text. (Off-purpose writing will still receive a score in Conventions.)
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*Elaborative techniques may include the use of personal experiences that support the controlling idea.