

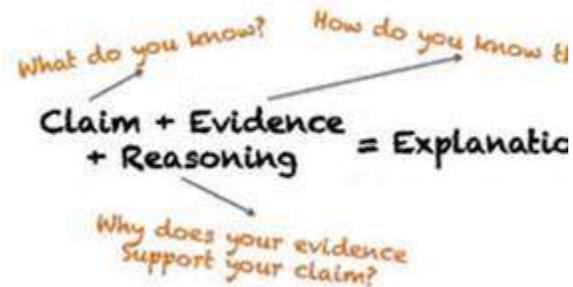
## CER Writing

A CER (Claim, Evidence, Reasoning) is a format for writing about science. It allows you to think about your data in an organized, thorough manner. See below for a sample and the grading rubric.

**Claim:** a conclusion about a problem

**Evidence:** scientific data that is *appropriate* and *sufficient* to support the claim

**Reasoning:** a justification that shows why the data counts as evidence to support the claim and includes appropriate scientific principles



### Sample #1

#### WHAT ARE FACTORS THAT AFFECT PLANT GROWTH?

**Claim:**

The rate of pumpkin plant growth increases as the temperature increases.

**Evidence:**

Our control group was growing at normal room temperature, while our experimental group was growing in a hot greenhouse for one week. Over the course of the week, we observed that the experimental plant was healthier looking, had more leaves, and grew taller than the control plant. The mass of the experimental plant increased from 10 g to 20 g, while the control plant increased from 10 g to 15 g. The experimental group grew from 14 cm to 18 cm (increase of 4 cm), and the control group grew from 12 cm to 14 cm (increase of 2 cm). The experimental plant got five new leaves and the control only got two new leaves.

**Reasoning:**

Pumpkin plants are sensitive to the temperature of their surroundings. All plants grow best within a certain temperature range (some plants would actually grow better in at cool temperatures than warm temperatures). Maybe pumpkin plants originated in a habitat with a warm climate. Plants need energy to grow, and their energy comes from photosynthesis. Maybe pumpkin plants are able to do photosynthesis faster at warm temperatures, so they are able to grow more. I would have thought that the only factors influencing plant growth are water, sunlight, and soil nutrients, but this experiment illustrated that other factors can affect growth, too. I wonder if anything besides the temperature difference could affect the growth rate. Maybe there was more carbon dioxide in the greenhouse than the classroom. Maybe the glass window in the classroom filters out some kind of light that plants need, while the plastic greenhouse does not. There are some factors that we could not control, so I guess we don't know for sure that temperature was the ONLY difference.

### Structure of an Opening statement

1. Claim - The claim is an assertion or conclusion that answers the original inquiry question.
2. Evidence - The evidence is scientific data that supports the student's claim. This data can come from an experiment that students conduct or from another information source such as a journal article, a textbook, or a data archive. The data needs to be relevant to, and sufficiently support, the proposed claim.
3. Reasoning - The reasoning provides a justification that links the claim and evidence and illustrates why the data counts as evidence to support the claim by using the appropriate logic.

Topic: Acid Rain  
Country: Ukraine

Greetings Fellow Delegates,

The Ukrainian Delegation is looking forward to working with the international community to address the problem of acid rain. Acid rain harms our people, environment, and economy. The high levels of pollution that create acid rain are linked to higher rates of cancer and other illness and decreased crop yields -- which is a big problem for us because we are a major food producer.

Our country is working on policies designed to clean the environment and decrease amounts of acid rain within the Ukraine and across Europe. Within the Ukraine we have put programs in place on everything from drinking water, to climate change, to consumer (household) and industrial waste. These policies will make our country a healthier place to live and protect our environment. The Ukraine has also signed the International Protocol to the 1979 Convention on Long Range Transboundary Air Pollution. This policy limits the sulfur emissions from Ukrainian factories, leading to less acid rain.

While we have worked hard at reducing acid rain within our own country, we believe that the international community must work together to create a response that will reduce amounts of acid rain across Europe and other parts of the world. Forest damage from acid rain in southern Germany and southern Canada is well-documented. Similar problems exist around other industrialized regions. Acid rain is a problem for countries like India, Korea, and China, all of which depend on coal for fuel and have high urban populations. Pollution is a transnational problem that does not respect national boundaries.

The Ukrainian Delegation understands that no single nation can fix this issue alone. It requires all nations to work together. We are eager to hear from fellow delegates and are open to a wide range of proposals and policies, including binding international treaties and emissions trading systems designed to curb pollution.

The Ukrainian Delegation

## Biodiversity and Evolution Unit Test

### YOUR ASSIGNMENT:

Write an essay to answer one of the following questions. Use the CER format to write your answers. Sample #1 shows the difference between the claim, evidence, and reasoning. Sample #2 shows how to assemble your CER into an essay. The CER rubric shows how your essays will be graded. You will have to research some evidence in addition to the examples discussed in class. Your essay will require organizing, proofreading, and editing; it may be neatly handwritten or typed, and must be at least 2 typed pages (~ 4 handwritten). This is a test grade and is due on Monday, May 13<sup>th</sup>.

### Questions to answer (choose 1):

- Some scientists are trying to manipulate information contained in seeds to produce different tomatoes. They have even tried inserting a gene from a winter flounder (a type of fish) into a tomato so that the tomato is cold-resistant! What benefits could be had by this type of genetic manipulation? Provide evidence of additional examples of genetic manipulation (with explanations of the goals). Include vocabulary terms and concepts assigned and/or discussed in class.
- Genetic anthropologists merge their knowledge of DNA with physical evidence to explain human history. Explain how life on Earth has evolved through time and how changes to the Earth, in the past, is responsible for life as it exists today. Provide evidence of how the adaptations and evolution of ancient life are related to the changes that the Earth undergoes. Include vocabulary terms and concepts assigned and/or discussed in class.
- Coral reefs are biologically-diverse communities. Why are the relationships between the organisms that live there important in sustaining the reef? Provide evidence of the types of relationships that exist in coral reefs. How do those relationships sustain the environment? Discuss why environments that do not have diverse populations of organisms will not survive. Include vocabulary terms and concepts assigned and/or discussed in class.

### CER Rubric

	<i>3</i> <i>Excellent</i>	<i>2</i> <i>Acceptable</i>	<i>1</i> <i>Needs Revision</i>
<i>Claim</i>	<ul style="list-style-type: none"> <li>• Concise statement (1-2 sentences)</li> <li>• Relates directly to the question and hypothesis</li> <li>• Focuses on only the most important features of the experiment</li> </ul>	Only two conditions to the left are met, or all three conditions are partially met	Two or more conditions are not met
<i>Evidence</i>	<ul style="list-style-type: none"> <li>• At least one paragraph</li> <li>• Several data sources used to explain claim, including observations and accurate measurements</li> <li>• Clear connections to question and hypothesis</li> </ul>	Only two conditions to the left are met, or all three conditions are partially met	Two or more conditions are not met
<i>Reasoning</i>	<ul style="list-style-type: none"> <li>• At least one paragraph</li> <li>• Illustrates understanding of how experiment fits into the “big picture”</li> <li>• Incorporates background knowledge, and makes connections to science concepts studied in class, to draw conclusions about experiment</li> </ul>	Only two conditions to the left are met, or all three conditions are partially met	Two or more conditions are not met
<i>Format and Editing</i>	<ul style="list-style-type: none"> <li>• Proofread for spelling and mechanical errors</li> <li>• Proper heading on paper</li> <li>• Black, Times New Roman, 12-pt. font</li> <li>• Each section clearly labeled</li> </ul>	Only three conditions to the left are met	Two or more conditions are not met