

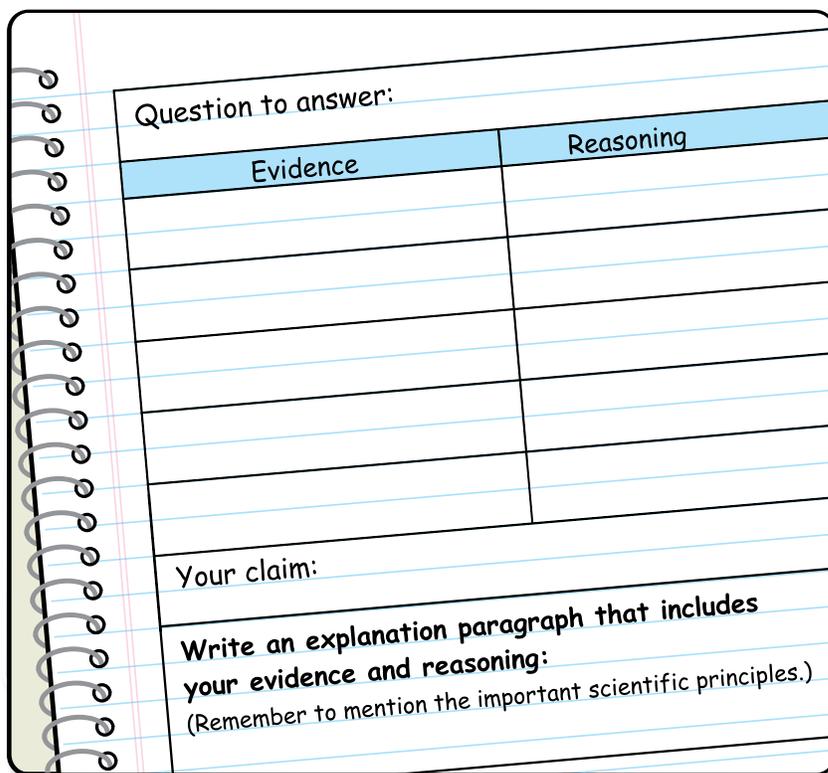
I Can Develop a Scientific Explanation

Have you ever had to explain something to your parents or a friend? How did you convince them that they should accept your explanation? Maybe you were late meeting a friend. You had to explain why you were late to your friend. To convince your friend to accept your explanation, you must have had good reasons for being late. Your argument must have made sense and been logical. The explanations you make every day are similar to the explanations that scientists make.

Scientists work to explain the natural world. Their explanations begin with a question they have or a problem they are trying to solve. Scientists collect and analyze data to see if the data will help them answer the question or solve the problem. The data that help answer the question and solve the problem become the evidence that they will use in their scientific explanations. In their scientific explanations, they use evidence and reasoning about what they are investigating in order to support their claims. Their claims are the answer to the question they are investigating or the problem they are trying to solve. Your explanations in science should include evidence, reasoning, and claims. As part of becoming proficient in science, you will learn to support your claims with evidence. This evidence may be from data that you have collected or that someone else has collected. You may also use evidence from reports and summaries from scientists or even from other students. This evidence will provide you with what you need to support your claims in science.

When you write a scientific explanation, you will use reasoning. Reasoning links your evidence to your claim. This makes your explanation stronger and more convincing. Your reasoning should be logical and explain why the data you are using are evidence that supports your claim. As you learn more about a science concept, you will want to use scientific principles in your reasoning. These scientific principles are the accepted understandings in science that you will learn about in your science classes. When you use scientific principles to support your explanation, you will add to the logical connections you make. This creates a stronger scientific explanation.

The explanation template (figure 1) provides you with a way to organize the important parts of a scientific explanation—your claim, evidence, and reasoning. This organization will help other people make sense of your work. There are many ways to use this tool. Each situation may call for a slightly different approach to using it. Do not think of this tool as a rigid structure that must be followed precisely for every situation. Rather, think of it as a template to help you organize your ideas.



Question to answer:	
Evidence	Reasoning
Your claim:	
Write an explanation paragraph that includes your evidence and reasoning: (Remember to mention the important scientific principles.)	

Figure 1: Explanation template.

This explanation template can help you write a scientific explanation from a claim, evidence, and reasoning.

Notice that the explanation template tool in figure 1 has five basic parts. Following is a summary of the basic parts of the tool.

1. The question that you are trying to answer or the problem you want to solve.

Doing science involves answering questions about the world around you. Testable questions in science are those that you can answer by investigations. The questions that you ask help you decide what data you will collect.

2. The evidence that you gather. This part of the template includes the data you have collected that will help you answer the question. You may collect a lot of data in an investigation. But some of that data will not help you answer your question. Data become evidence when they help answer your question. Do not list individual data points but rather choose the data that will count as evidence. The data that count as evidence will help you answer the question. Then write a summary of your evidence. This evidence may come from a number of sources like your investigation, observations you make, or investigations that others have done.

3. Your reasoning. In this part, explain why each piece of evidence helps you answer the question. Your reasoning is a justification that logically links the answer to your question to the evidence. These statements show why the data count as evidence to help you answer the question. When you can, base your reasoning on appropriate scientific principles.

- Your claim or claims.** Your claim is an answer to the question you are trying to answer. You will state your claim in one or two sentences. Your claim should make a statement that answers the question or addresses the original problem. This may be in the form of a statement of a trend, a behavior, or a generality that your evidence supports.
- Your scientific explanation.** This is the most important work you will do—creating your scientific explanation. As you get better at writing scientific explanations, you may only complete this part of the template. The previous parts are to help you with this final step. Your explanation will likely be a short paragraph. There are two goals to writing a strong scientific explanation. The first goal is to write a logical explanation that includes a claim that is supported with your evidence and reasoning. Connect each piece of evidence and reasoning to your claim. The second goal is to use appropriate scientific principles in your reasoning when you can. In using a scientific principle, you show how the evidence supports your claim.

Study the example in figure 2 to develop your understanding of how to apply the explanation template to a set of data. This data set shows the relationship between the mass and the volume of three substances.

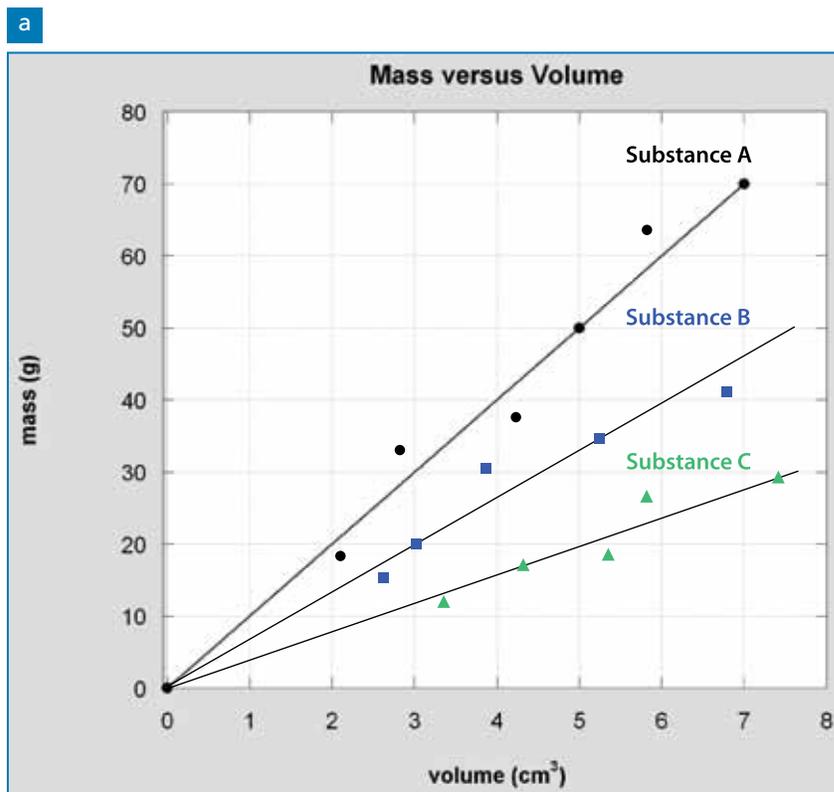


Figure 2: Sample explanation template. (a) The graph is the data used to create a scientific explanation about the relationship between mass and volume. (b) The explanation template helps organize the question, evidence, reasoning, and claim. You should work to create complete explanations that connect evidence and reasoning to support your claim.

b

Question to answer: What is the relationship between the mass and the volume of a substance?

Evidence	Reasoning
The data points for the mass and the volume of a single substance make a straight line.	The relationship between mass and volume does not change for a single substance.
The lines for each substance have a constant positive slope.	A constant positive slope means the variables plotted on each axis are directly proportional.
Each substance has a different slope.	The relationship between mass and volume is unique for substances.

Your Claim: Mass and volume are directly proportional, and their relationship is unique for different substances.

Write an explanation paragraph that includes your evidence and reasoning:

My data showed a constant positive slope for the mass and the volume measurements for three substances. The data from each substance resulted in a straight line with a different slope. This is evidence to support my claim that mass and volume are directly proportional and that each substance is unique. This is because linear graphs represent variables that are directly proportional. Pure substances have a mass and volume relationship that is unique, and this is a characteristic property of each substance.