

Module 9: States of Matter and Gas Laws

Topic 5 Application: Gas Velocity Scientific Investigation

Before you begin the scientific investigation below, make sure to download the *Gas Velocity Scientific Investigation Report*. As you complete this scientific investigation, fill in any needed information on the report template. If you need more information about each section of the report, please visit the Developmental Module.

Introduction

Ideal gases are different from real gases. Ideal gases are assumed to have no intermolecular forces between the molecules and their motion is dictated by the elastic collisions with the walls of their container. The behavior of these gases can be altered by altering the conditions. In this laboratory activity, you will observe how changing the molar mass or temperature of a gas has an effect on the velocity of the gas.

Objectives

In this scientific investigation, you will:

- predict how changing a variable, such as molar mass or temperature, impacts the velocity of the gas molecules.

Hypothesis

Using the Procedure and Data Collection section below, read through the procedural information for this scientific investigation. Based on your understanding of the procedure, develop your own hypotheses which describe the expected results. You should consider the following questions: How do molar mass, temperature, and pressure affect the velocity of a gas? Record your hypotheses in the Hypothesis section of your *Gas Velocity Scientific Investigation Report*.

Required Simulation

Gas Velocity Excelet by Scott Sinex

Procedure and Data Collection

Part I

1. Open the Gas Velocity Excelet and click the tab labeled Distribution.
2. In the area labeled Temperature for Gas 1, enter an initial temperature of 298 K.
3. Enter any number for the two different molar masses.
4. Take a screenshot of the graph and the data that you entered. Paste the screenshot into the Data section of your *Gas Velocity Scientific Investigation Report*.
5. On your *Gas Velocity Scientific Investigation Report*, record your observations in the data table in the row for Part I.

Part II

1. Now, use your cursor to slide the bar on the temperature cell to the right (increase) and then to the left (decrease).
2. Observe what happens as you increase and decrease the temperature.

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3. Take a screenshot of the graph and the data that you entered. Paste the screenshot into the Data section of your *Gas Velocity Scientific Investigation Report*.
4. On your *Gas Velocity Scientific Investigation Report*, record your observations in the data table in the row for Part II.

Data

Use the data tables provided on your *Gas Velocity Scientific Investigation Report* to record your data from this scientific investigation. The data table is also shown below.

Observations	
Part I	
Part II	

Data Analysis

In the Data Analysis section of your *Gas Velocity Scientific Investigation Report*, provide the responses to the following questions:

Part I

Answer these questions by analyzing the graph on the excellet. There is no manipulation of the excellet needed while answering these questions.

1. What two gas variables are plotted on the graph?
2. What two gases are you studying?
3. Which gas travels faster? Why?

Part II: Analysis Questions

Answer these questions by analyzing the graph on the excellet. There is no manipulation of the excellet needed while answering these questions.

1. What is happening to the velocity curve?
2. Why does the y value decrease? What does the decrease indicate?
3. When the temperature was decreased what happened to the gas velocity?
4. Is it possible to get the two gases to travel at the same average velocity?
5. What type of relationship is illustrated between temperature and velocity?
6. What type of relationship is illustrated between molar mass and velocity?

Conclusion

Using the *Gas Velocity Scientific Investigation Report*, compose three to four sentences describing an overall conclusion about the relationship between molar mass, temperature, and gas velocity. Base your conclusions on your data. Were your hypotheses true or false, and how do you know? Use the data and notes that you collected from your simulation experience to form your conclusion. Make sure that your include information that your gained from data analysis to support your conclusion.

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Experimental Sources of Error

On your *Gas Velocity Scientific Investigation Report*, provide responses to the following questions: Are there any sources of error? If so, what are they, and what could be done to minimize error?



Once you have completed the *Gas Velocity Scientific Investigation Report*, please submit your work to the dropbox.