

Objective:

This activity is designed to have students demonstrate their understanding of the relationship between volume and temperature, commonly called Charles' Law.

Target student audience:

ChemSense: all levels of chemistry students

ChemSense User Level:

Intermediate, prior experience is necessary

ChemSense Tools used:

Animation, Feedback-Peer

Specialized Tools needed:

None

Classroom Implementation

Time: Including pre-laboratory assignment, 1.5 hours

Student Grouping: Pairs

Activity Type: Summative Assessment

Chemistry Concepts in Activity:

California State Standard in Chemistry 4.c The student knows how to apply the gas laws to relations between the pressure, temperature, and volume of any amount of an ideal gas or any mixture of ideal gases.

ChemSense Theme: Concentration. The relationship of kinetics to the number of molecules that mix and collide with one another is a factor of concentration.

Pre-requisite Chemistry Concepts:

The student must understand there is no temperature lower than 0 (zero) Kelvin, and the kinetic theory of gases relates the absolute temperature of a gas to the average kinetic energy of its molecules or atoms.

ACTIVITY

Charles' Law

Purpose:

The student will visualize and represent the change in volume of a gas caused by a change in system temperature when pressure and number of moles is held constant.

Background:

This summative assessment will be used to test student understanding of Charles' Law. Each lab team will create an animation that illustrates the change in volume associated with an increase or a decrease in system temperature. The animation must include

narrative to support the action sequence. You may choose to include a graph of laboratory data, a model of laboratory equipment that would be used to find the Charles' Law relationship, or an application of how Charles' Law affects common phenomena.

California State Standard:

The student knows how to apply the gas laws to relations between the pressure, temperature, and volume of any amount of an ideal gas or any mixture of ideal gases.

Procedure:

1. Decide whether your animation will illustrate the change in volume associated with an increase or a decrease in system temperature. In your laboratory notebook, sketch a 5-scene storyboard that represents the beginning, middle, and end of the temperature and volume change relationship. It must include your method of displaying the relationship such as a graph of laboratory data, a model of laboratory equipment that would be used to find the Charles' Law relationship, or an application of how Charles' Law affects common phenomena.
2. Determine placement and method of representation for the conditions of constant pressure and number of moles in your animation.
3. Log on to the ChemSense application program and select Build On under your file name. Use the ChemSense animation tool to create 35 or more frames to complete your storyboard.
4. When completed, save your animation using a title that includes your name and "Charles' Law".
5. Invite another lab team to view and comment on your animation. Comments should address three areas: Is the Charles' Law relationship accurately represented? Is the method of displaying the relationship between volume and temperature accurate and does the narration support it? Is the animation smooth, and is the artwork effective in communicating the relationship? Record the comments made about your artwork in your laboratory notebook.
6. View the work of another lab team and use the same criteria to critique their animation. Record your comments in your laboratory notebook.
7. Log out and record your work time in your laboratory notebook.

Rubric for scoring:

Grading Rubric:

Rubric Score	Level of Competence	Expectation Level
4	Mastery	The relationship between volume and temperature is correctly displayed. Animation has smooth transitions between frames. Artwork effectively represents the relationship between temperature and volume. Narration is readable and supports the animation accurately. The critique of another lab team's work addresses all three criteria.
3	Skilled	The relationship between volume and temperature is correctly displayed. Animation may not be smooth and may contain minor errors. Artwork represents the relationship between temperature and volume, but it may contain narration errors. The critique addresses two or three of the required components.
2	Proficient	The relationship between volume and temperature is correctly displayed. Animation is not smooth, and contains minor errors. Artwork misrepresents the relationship between temperature and volume, but the narration is accurate. The critique addresses one or two of the criteria.
1	Introductory	The relationship between volume and temperature is not correctly displayed. Animation may not be smooth. Artwork does not represent the relationship between temperature and volume. There are multiple narration errors. The critique is incomplete.
0	Incomplete	The relationship between volume and temperature is not correctly displayed. Animation may have smooth transitions between frames, but the artwork does not accurately represent the relationship between temperature and volume. The narration is incomplete, incorrect, or missing. The critique is incomplete or missing.

Links:

None

Integrated Uses:

None