

Objective: Students will animate gas behavior for three different gas laws

Target student audience: COLLEGE-PREP,

ChemSense User Level: / INTERMEDIATE / EXPERIENCED

ChemSense Tools used: DRAWING, ANIMATION, MODELLING

TEXT NOTES – EXPLAIN

FEEDBACK – TEACHER / PEER

Specialized Tools needed: none

Classroom Implementation

Time: 50- 60 minutes

Student Grouping: pairs

Activity type: animation/drawing/ class review

Chemistry Concepts in Activity (linked to CA stds & ChemSense 5 themes):

Cal state standard 4. The kinetic molecular theory describes the motion of atoms and molecules and explains the properties of gases. As a basis for understanding this concept:

a. *Students know* the random motion of molecules and their collisions with a surface create the observable pressure on that surface.

c. *Students know* 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.

g.* *Students know* the kinetic theory of gases relates the absolute temperature of a gas to the average kinetic energy of its molecules or atoms.

Pre-requisite Chemistry Concepts: Introductions to kinetic molecular theory and the gas laws

Inquiry Skills (linked to NSES):

Formulate and revise scientific explanations and models using logic and evidence
(NSES)

Identify questions and concepts that guide scientific investigations **(NSES)**

Communicate and defend a scientific argument **(NSES)**

ACTIVITY Summary:

1. Students will animate the gas behavior of a closed container of hydrogen gas, using a template slide and at least 20 total frames.
2. Students should clearly animate the movement and vibration of molecules and write a narrative explanation for at least 6 frames, using the text tool.

Sources:

Application: this activity could be used in Earth Science in the discussion of our atmosphere and how air pressure changes with altitude.

ACTIVITY :

1. Students copy and paste the template of provided which shows ten molecules of Hydrogen gas(H_2) in a container. This will be your first frame.
2. Students will show the proper behavior of a gas in a closed container under the following conditions:
 - a) *volume of the container decreases due to a piston compressing down, while temperature remains constant.*
 - b) *The temperature of the enclosed gas increases, as the container remains the same size.*
 - c) *The temperature decreases as the pressure remains constant.*
3. For each of the conditions, students should include a description of the gas behavior and the variables involved(text should remain for at least 5-6 frames in order to read during animation)

Rubric/s for scoring:

4 animation clearly shows correct gas behavior. Animation is smoothly transitioned, with at least 20 frames. Gas molecules show vibrational motion and collisions between container and one another. Two variables are clearly represented (P,V, T) Text explanations are accurate and include details about the behavior of the gases.

3 animation shows correct behavior. Animation includes at least 20 frames, but may include some small errors, or may not be very smooth in transitions. Gas molecules show movement, but may be missing some vibrational or collisional movement. Text is mostly accurate and generally describes gas behavior but may be missing some details.

2 animation shows gas movement but incorrectly represents the vibration and/or collision movement of particles. Fewer than 20 frames included. Movement of particles do not show vibration and collisions between particles and container . Variables are not clearly represented, or the two variables are not correctly shown. Text contains errors in explanation.

1 animation is poorly transitioned, and contains fewer than 15 frames. Gas particles do not show movement (collisions or vibrational) Little or no text shown.