Gas Law Lab

Complete each of the 8 activities found in the lab. Explain at each lab station what is occurring and what law applies to it. Some stations contain questions. Be sure to answer all questions completely.

Station 1: Soda Can Crush - Make sure you wear your Goggles!

To an empty aluminum soft drink can, add a small amount of water. Heat the can on the hot plate until the water boils, and "steam" comes out of the top of the can. Using a pair of tongs, quickly invert the can into a dish of cold ice water.

a) What happens? Describe your observations.

b) Which law(s) _____

Why? Explain by telling what is happening on the molecular level as well as what variables were changing._____
_____
_____
_____
_____
_____
_____

Station 2: How DID the Balloon get inside the Flask?

At this station is a flask with a balloon inside it. Without touching the balloon, examine it carefully, and explain how the balloon was put inside the flask.
(HINT: The balloon was placed on the Erlenmeyer flask and then inflated. Something then occurred to cause the results you see at this station. Take into consideration the lab equipment you see around you in order to help explain how this phenomenon occurred.)

a) Explain how the flask ended up with the balloon inside of it.

b) Which law(s) _____

Why? Explain by telling what is happening on the molecular level as well as what variables were changing._____
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_____
_____
_____
_____
_____

Station 3: Inflating or Deflating a Balloon – Make sure you wear your Goggles!

Place approximately 50 mL of water into the 125 mL Erlenmeyer flask. Measure the temperature of the water and record it. Securely place a balloon over the mouth of the flask. With a string, determine the circumference of the balloon, and then measure the length of the string which corresponds to the circumference. Record the length of string in cm.

Place the flask on a hot plate and begin to heat the flask. Carefully observe what happens to the balloon. After the flask has heated for a few minutes, measure the circumference of the balloon.

Temperature of water	Size Balloon in centimeters
100 °C	

a) Describe your observations. Note that the pressure on the surface of the balloon remained constant, at atmospheric pressure.

_____
_____
_____
_____

b) Which law(s) _____

Why? Explain by telling what is happening on the molecular level as well as what variables were changing._____
_____
_____
_____
_____
_____

Station 4: Squeezing Marshmallows

Place three marshmallows inside the plastic syringe. Push the plunger as far down as possible without squashing the marshmallows. Place one finger on the end of the syringe and pull the plunger out to the end of the syringe. Observe the marshmallows. Next, leave the plunger at the end of the syringe and place a finger on the other end. Push the plunger into the syringe and observe the marshmallows.

a) Explain what happened. Describe your observations.

b) Which law(s) _____

Why? Explain by telling what is happening on the molecular level as well as what variables were changing._____
_____
_____
_____
_____
_____

Station 5: Gas Law Simulator

Using the following website: https://phet.colorado.edu/en/simulation/gas-properties, manipulate the different variables (Volume, Pressure, Amount (moles), and temperature) and answer the following questions.

1. Make volume a constant. What happened to the gas particles when you:
a) Increased pressure?
b) Decreased pressure?
c) What variable(s) changed during these trials?

2. Make pressure a constant. What happened to the gas particles when you:
a) Increased temperature?
b) Decreased temperature?
c) What variable(s) changed during these trials?

3. Make temperature a constant. What happened to the gas particles when you:
a) Increased volume?
b) Decreased volume?
c) What variable(s) changed during these trials?

4. Make pressure and temperature constants. What happened when you:
a) Increased the amount of gas?
b) Decreased the amount of gas?

Explain by telling what is happening on the molecular level for #1 – 4 above.
_____
_____
_____
_____

Station 6: Probeware

Twenty milliliters of air has been placed into the syringe. Starting at 20.0 mL, decrease the volume by 2.5 mL for each data point until the volume reaches 5.0 mL. Stop taking samples at this point.

- Create a table of the data collected and label your data on your graph paper.

- Construct a graph of volume as a function of pressure of the gas. Be sure to include units and an appropriate title for your graph. Make sure your graph is completed on graph paper!

Answer the following:
a) What is the relationship between pressure and volume as shown in your graph?

b) Which law(s) _____

Why? Explain by telling what is happening on the molecular level as well as what variables were changing._____
_____
_____
_____

Station 7: Pop Your Top

MAKE SURE EVERYONE AROUND YOU IS WEARING GOGGLES!

1. Fill the film canister about half full with water.
2. Crush or crumble an antacid tablet.
3. Quickly put the lid back on, and STAND BACK.

Answer the following:

a) What did you observe? _____
_____
_____
_____
_____

b) What properties of gas resulted in the popping of the top?
_____
_____
_____

c) Which law was observed? Why? Explain by telling what is happening on the molecular level as well as what variables were changing._____
_____
_____
_____
_____

Station 8: Candle and Water – Make sure you wear your Goggles!

Directions:

1. Light it the votive candle in the center of the petri dish using the matches provided.
2. Quickly, place the inverted jar over the candle and allow it to rest on the bottom of the pan. Report your observations
3. Make sure you dry the inverted beaker when you finish. Dry any wet spots on the candle. Be sure to throw all of your used paper towels and matches into the trash can.
4. List the sequence of events and the reason for each.

Answer the following:

a) Observations/Sequence of events you saw_____
_____
_____
_____
_____

b) Which law(s) _____

Why? Explain by telling what is happening on the molecular level as well as what variables were changing._____
_____
_____
_____
_____
_____

Station 9: Gas Law Fun!

At this station you need to solve gas law math problems and conversions. Be sure to use the correct units, sig figs, and **SHOW YOUR WORK**!!! ***BOX YOUR ANSWER***

1) How many liters of water can be made from 34 grams of oxygen gas and 6.0 grams of hydrogen gas at STP? What is the limiting reactant for this reaction?

2) The temperature inside my refrigerator is about 40°C. If I place a balloon in my fridge that initially has a temperature of 220°C and a volume of 0.5 liters, what will be the volume of the balloon when it is fully cooled by my refrigerator?

3) On hot days, you may have noticed that potato chip bags seem to "inflate", even though they have not been opened. If I have a 250 mL bag at a temperature of 19^0C, and I leave it in my car which has a temperature of 60^0C, what will the new volume of the bag be?

4) The highest pressure ever produced in a laboratory setting was about 2.0×10^6 atm. If we have a 1.0×10^{-5} liter sample of a gas at that pressure, then release the pressure until it is equal to 0.275 atm, what would the new volume of that gas be?

5) A gas has a temperature of 14^0C, and a volume of 4.5 liters. If the temperature is raised to 29^0C and the pressure is not changed, what is the new volume of the gas?

6) My car has an internal volume of 2600 liters. If the sun heats my car from a temperature of 20^0C to a temperature of 55^0C, what will the pressure inside my car be? Assume the pressure was initially 760 mm Hg.

7) If I have 7.7 moles of gas at a pressure of 0.09 atm and at a temperature of 56^0C, what is the volume of the container that the gas is in?

8) Convert 30.15 in Hg to each of the following units listed below. Make sure to show ALL of your work.

_____ mm Hg

_____ atm

_____ kPa

_____ torr

Station 10: Real-Life Application

Research and analyze ***ONE*** of the following real-life applications of the gas laws. Indicate what variables are changing and the relationship between them. Explain, in detail, what is happening on the molecular level.

Make sure that you cite your source(s)!

Choices:

- Weather and pressure
- Tire pressure
- Aerosol can
- Hot air balloon
- Pressure cooker