Name:_____

Initials_____

Chemistry 100 Laboratory Kinetic Theory

Purpose: To develop a theory that explains why gases behave the way they do
Note: All Pages get turned in next week.

Introduction

Gas Laws

1. The pressure and temperature of a gas are indirectly proportional
If the gas pressure is halved then the volume is doubled if the temperature remains the same.

$$V_1P_1 = V_2P_2$$

2. The temperature and volume of a gas are directly proportional.
If the temperature of a gas is doubled then the volume is doubled if the pressure remains the same.

$$\frac{V_1}{T_1} = \frac{V_2}{T_2}$$

Pressure
Standard pressure is 1 atmosphere (atm) or 760 mm Hg

Temperature
When doing gas calculations the Celsius temperature must be changed to Kelvin.

Kelvin = Celsius + 273 Celsius = Kelvin –273

Standard Temperature is 0 degrees celsius or 273 K

STP means standard temperature and pressure

Procedure and Observations and Data:

1. In this lab you will work in groups of 3. Go to each station (not necessarily in order) and follow the directions on the instruction card.
2. Record observations and give a brief explanation for each station
3. Draw a diagram (model) for each station showing at the molecular level what the particles of gases are doing (Black box diagram)

Station one: Cartesian diver
Station two: Fill inverted vial
Station Three: Candle under beaker
Station four: Boyle's law apparatus and computers
Station five: can crush

Stations

Station one: Cartesian diver

Materials: Eye dropper and 2 liter bottle

Procedure: Can you make the eye dropper stay in the middle of the bottle. Keep the bottom of the bottle on the table. Make careful observations and describe what happens to the eye dropper.

Observations:

How did you get the eye dropper to stay in the middle?

Station two: Fill inverted vial

Materials: Tray of water (1 inch) and a vial and a syringe

Procedure: Can you fill the vial with water using the syringe? You must not remove the mouth of the vial above the water level.

Observations:

How did you get the water into the vial?

What did this station teach you about pressure?

Station Three: Candle under beaker

Materials: Tray of water (1inch) a candle held up by clay and a 150 ml beaker

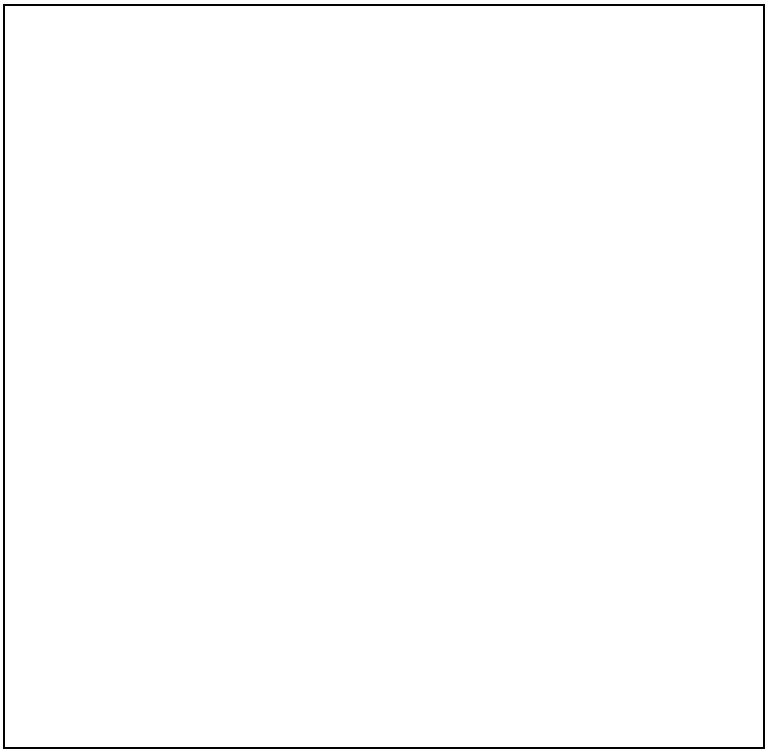
Procedure: Light the candle, then put the beaker over the candle

Observations:

What happened to the water inside the beaker?

Explain your answer to the above question? Why did the water do what it did?

Draw a diagram of what happens in the above experiment at the molecular level.



Station four: Boyle's law apparatus

Materials: Boyle's Law apparatus, 15 books of uniform size

Procedure: Place a book on the apparatus and record the volume in your table. Continue by adding one book at a time, recording data, until all of the books are on the syringe

Observations:

Data Table: make a table and record your data (pressure in books and volume in ml) into your notebook.

Table 1: Changes in pressure and volume

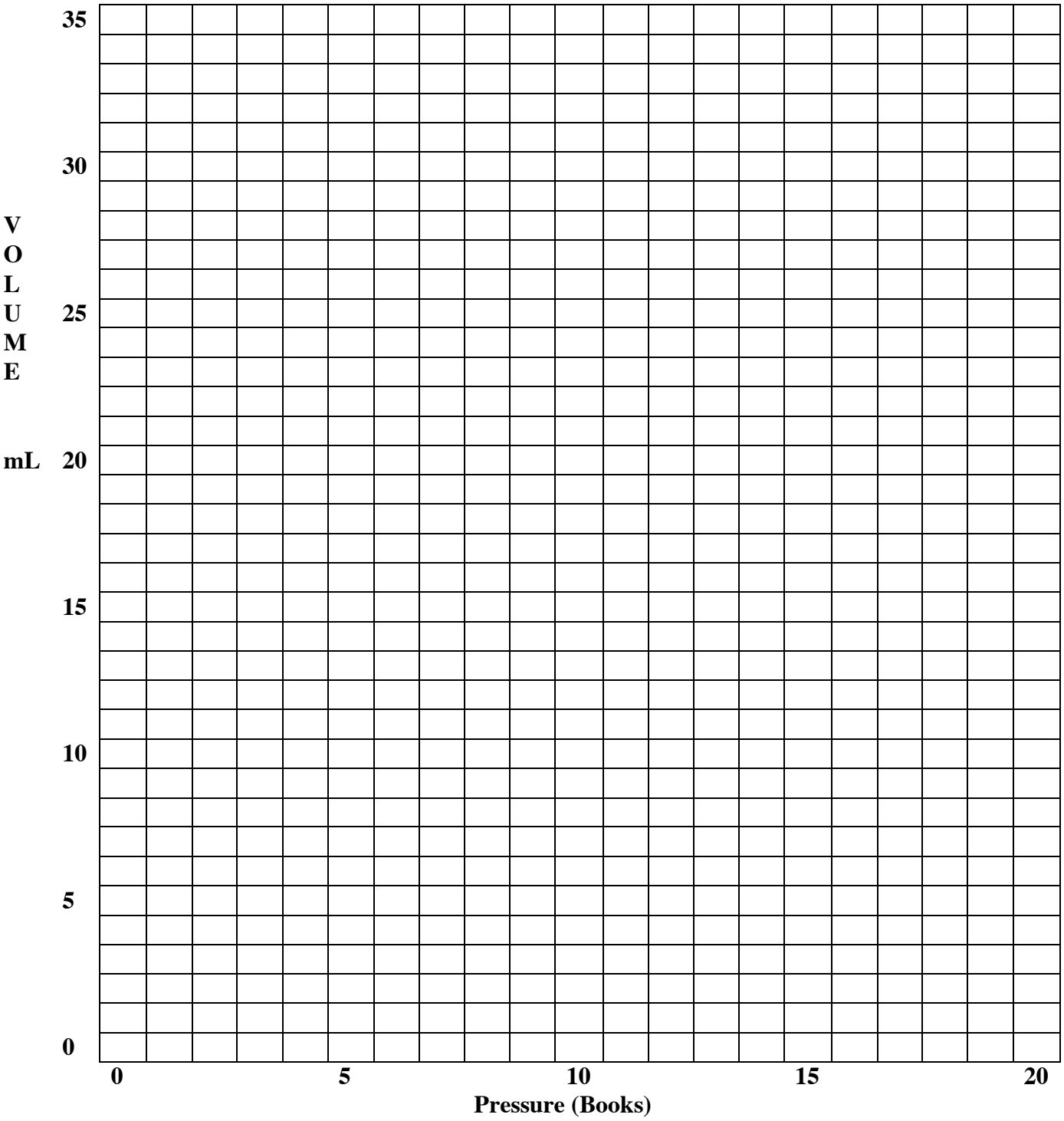
Pressure (Books)	Volume (ml)

What happens to the air molecules in the syringe?

What happens to the pressure inside the syringe?

Do you think the speed of the moving particles changes?

Graph 1: How gas volume changes with changes in pressure



What is the relationship between volume and pressure of a gas?

Make a sketch of your "Black Box" diagrams for the Boyle's law apparatus. Draw the apparatus before any books and after 12 books. Show a diagram of what it would look like at the molecular level:

Station five: can crush

Materials: Small hot plate, empty soda can, 1000 ml beaker, beaker tongs, cold water

Procedure: Put about 15-20 ml of water into the can and place it on the hot plate. When the water is boiling (you can hear it and you can see steam) grab the can with the beaker tongs and very quickly stick the top of the can into the beaker of water so that the opening of the can is under water.

Observations:

Explain what happened to the can.

Demonstrations:

Watch the demonstrations and record your observations and draw a diagram in the spaces provided

Demonstration : The Vacuum Pump

Observations & notes:

Demonstration 4 Balloon and a flask

Draw a picture of what will happen to the balloon:	Draw a picture of what actually happened to the balloon:

Demonstration 5 Egg and a flask

Draw a picture of what will happen to the egg:	Draw a picture of what actually happened to the egg:

Explain what happened to the balloon and the egg:

Questions and Answers:

Answer the questions that are on the instruction cards at each station. Write the station number and title of each station before you answer the questions. Next week's quiz will refer back to these questions. After the responses to the questions at each station answer the questions below.

1. What causes pressure?

2. What are some ways to change pressure?

3. What happens to the pressure of a gas as you increase the temperature?

4.

5. What happens to the volume of a gas as you change the pressure?

Conclusions and Reflections

What does the kinetic theory mean to you now?