

Name \_\_\_\_\_

Date \_\_\_\_\_

Partners Names \_\_\_\_\_

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*by Jeff Bradbury and Patricia Buchanan*

### **Kinetic Theory Lab**

**Question:** All of these individual experiments found in this lab relate to one another. In knowing this, what one property of gases is demonstrated in the following experiments?

**Purpose:** To develop a theory that explains why gases behave the way they do.

#### **Procedure, 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. Take no more than 15 minutes per station.
2. Record observations and give a brief explanation for each station
3. Draw a diagram (model) for each station showing it at the molecular level what the particles of gases are doing (Black box diagram)

#### **Stations:**

Station one: Cartesian diver

Station two: Fill inverted vial

Station Three: Candle under beaker

Station four: Boyle's law apparatus

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:**

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

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**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:**

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How did you get the water into the vial?

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What did this station teach you about pressure?

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**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, and then put the beaker over the candle

**Observations:**

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What happened to the water inside the beaker?

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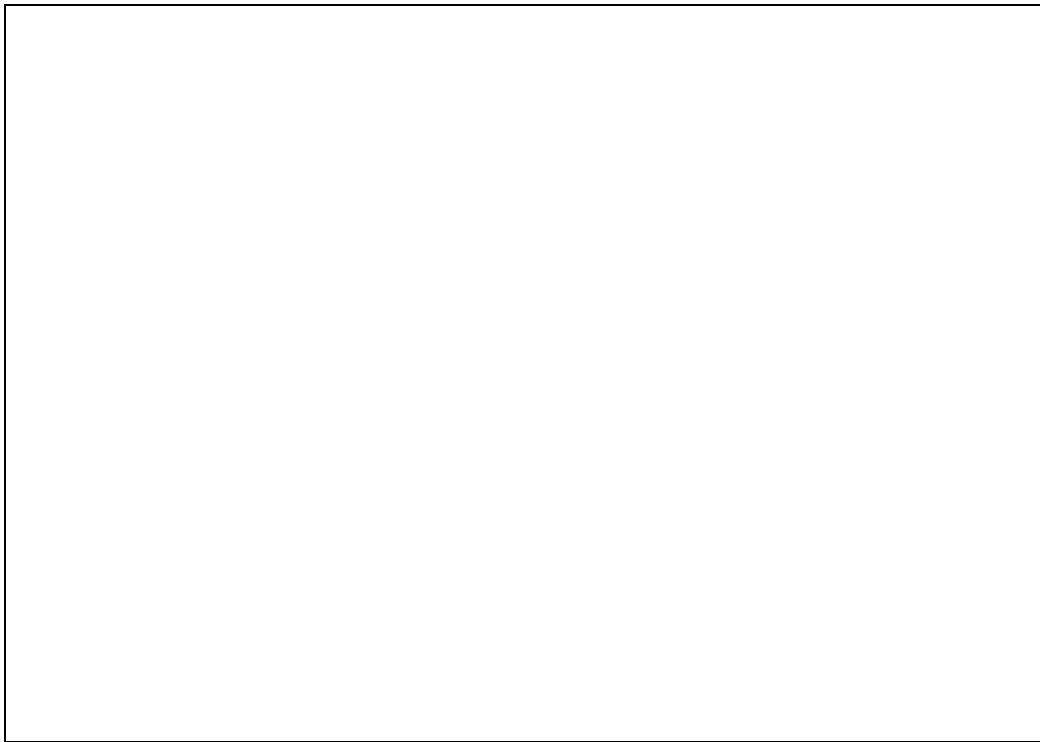
Explain your answer to the above question? Why did the water do what it did?

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

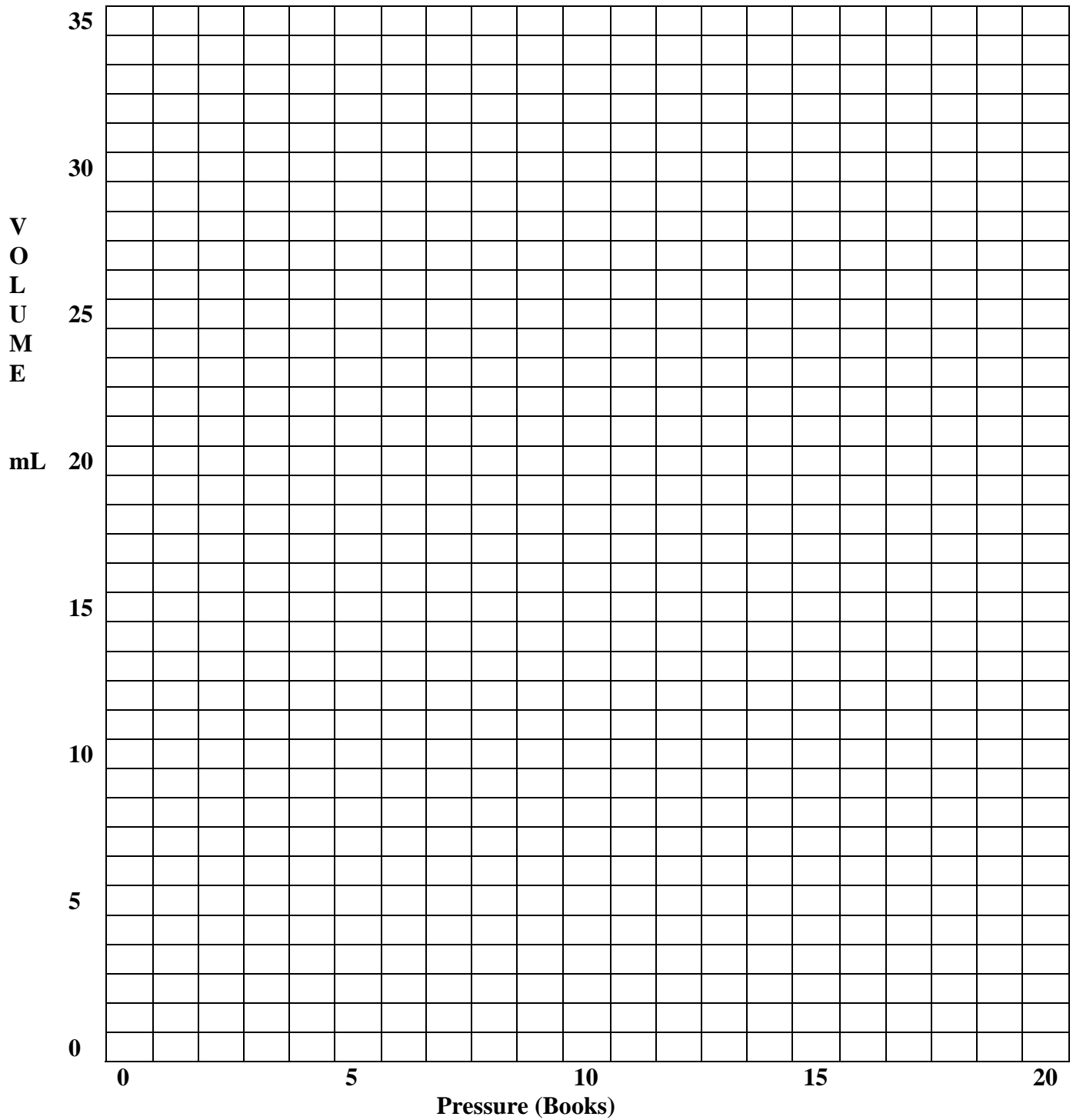


**Station four: Boyle's law apparatus**

**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.





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

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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:

<b>Before Books</b>	<b>12 Books</b>
<b>Before Books: Molecular Level</b>	<b>12 Books: Molecular Level</b>

### Station five: Can Crush

**SAFETY!**

Safety goggles must be worn at all times  
This part of the lab deals with a Bunsen burner, which should always be used with caution. Make sure the flame is not

pointed directly at any person. Follow the directions on how to complete this part. Be cautious: the water in the can will be HOT!

**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 over the Bunsen burner using the beaker tongs. When the water is boiling (you can hear it and you can see steam) very quickly stick the top of the can into the beaker of water so that the opening of the can is under water (the can should be upside down).

**Observations:**

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Explain what happened to the can.

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**Demonstrations:**

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

Demonstration: The Vacuum Pump

Observations & notes:

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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:

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Explain what happened to the balloon:

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**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. After the responses to the questions at each station answer the questions below.

1. What causes pressure?

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2. What are some ways to change pressure?

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

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

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**Conclusions and Reflections**

What does the kinetic theory mean to you now?

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*Jeff Bradbury is a Professor of Chemistry at Cerritos College in Norwalk and is Community College Director for CSTA; Patricia Buchanan is the Cal Grip Grant Project Assistant at Cerritos College. The original idea for this activity came from the Los Angeles County Office of Education 15 years ago, which the authors modified.*

