**Name:**

**Date:**

**School:**

**Facilitator:**

2.04 Gas Investigations Lab

**Follow the instructions below to complete the 2 gas investigations. Answer each question fully and use complete sentences. Make sure you give detailed, descriptive observations and answers based on what you see in your investigations.**

**For these investigations, you will need the following:**

* **4 balloons**
	+ **You should use regular balloons that you can inflate, NOT helium balloons or already inflated balloons.**
	+ **You may want to get 4 – 6 balloons in case some pop too soon!**
* **A permanent marker**
* **A camera** **to document your completion of these investigations**
* **Space inside a freezer to place a balloon**
* **Space in an indoor, air-conditioned room to place a balloon**
* **Space in a “hot area” to place a balloon (examples of spaces you may use include: inside a car on a hot day, a space that doesn’t have air conditioning like a garage on a warm day, or near a warm, sunlit window)**
* **String or twine**
* **A ruler**
* **A permanent marker**

**If you have trouble finding any of these materials or locations, please talk to your facilitator or teacher.**

# Investigation 1: Squeezing a Balloon

1. For this investigation you will need: 1 balloon*.* Blow up the balloon until it is mostly but not completely full of air.
2. Take a few minutes to *gently* squeeze the balloon in different places. Try squeezing it near the top, near the bottom, or in the middle. **Do NOT pop the balloon**. Take a picture of yourself squeezing the balloon. You may insert that picture here or attach it as a separate file in Dropbox.

|  |
| --- |
| *Insert image here* |

1. Observe what happens to the air (gas) inside the balloon as you squeeze. Write your detailed and descriptive observations here:
2. Using your observations, answer the following questions:
	1. When you squeezed the balloon, what happened to the pressure of the air inside the balloon? Did it increase, decrease, or stay the same?
	2. Based on your results, what can you say about the relationship between volume and pressure of a contained gas? Fill in the blanks in the statement below. *(Hint: As you were squeezing the balloon, you were decreasing the volume of the gas).*

**As the volume of the gas decreased, the pressure** (increased, decreased, or stayed the same).

* 1. Why do you think this change in pressure occurs?
1. Now, try to squeeze the balloon so much that it **pops**.
	1. What happened to the pressure of the air inside the balloon this time?
	2. In terms of pressure and volume, what caused the balloon to pop? *(Hint: Do not say you squeezed it so hard, it popped.)*

# Investigation 2: Comparing Balloons

**In part of this investigation, you will place balloons in different areas with different temperatures for 1 hour. After 1 hour, you will check each balloon and answer questions about it. You may store the balloons at the same time. However, be sure to budget time for this part of the assignment.**

1. For this investigation you will need:
* 3 balloons
* Space inside a freezer to place a balloon
* Space in an indoor room to place a balloon
* Space in a “hot area” to place a balloon (example spaces are listed above in the instructions)
1. Blow up all three balloons mostly, but not completely. Balloons should be approximately the same size when you have finished blowing them up. This is very important for the rest of the investigation.
2. Use your permanent marker to label each balloon. One should be labeled “Freezer – Balloon 1”, one should be labeled “Hot area – Balloon 2”, and one should be labeled “Room temp – Balloon 3.” Now, use your permanent marker to draw a line around the middle, or circumference, of each balloon. The line doesn’t have to be perfect, just fairly even.
3. We will now measure the circumference of the balloon using some string. Wrap the string around your first balloon, using the line you drew earlier as a guide. Then, measure the string length against your ruler. You can measure the length in either inches or centimeters; just be sure to get as specific a measurement as possible. If you’re using inches, measure to the nearest eighth of an inch. Write the measurements below:
	1. Initial circumference of Balloon 1 (Freezer):
	2. Initial circumference of Balloon 2 (Hot area):
	3. Initial circumference of Balloon 3 (Room temp):
4. In the next steps (Steps 6, 7, and 8), you will place the balloons in different areas and check them after an hour. **Be sure you will be free to check each balloon after an hour before completing these steps!**

1. Place one balloon inside the freezer; think of this balloon as **Balloon 1**. Make sure it is not being squeezed by other objects in the freezer and there are no sharp objects around it. Leave for 1 hour.
	1. Make a prediction: How do you think the size of the balloon will change from being in the freezer?
2. Place one balloon in a “hot area” (think of this balloon as **Balloon 2**). Make sure it is not being squeezed and do not place too close to a hot light or it may pop. Leave for 1 hour.
	1. **Make a prediction:** How do you think the size of the balloon will change from being in the “hot area”?
3. Leave the final balloon at room temperature for 1 hour. This will be your comparison balloon (or the control). Think of this balloon as **Balloon 3**. The circumference of Balloon 3 won’t change during the next hour since the temperature will remain the same.
4. After one hour, take your comparison balloon (Balloon 3) to the freezer and compare the size and pressure of the balloon with the balloon in the freezer (Balloon 1). **Make your observations quickly!** As soon as the freezer balloon is exposed to the room temperature air, it will begin to undergo changes.
	1. Measure and record the final circumference of Balloon 1 (Freezer) using your string and ruler. How does this final measurement compare to the initial circumference measurement?
	2. Describe your observations about the size (volume) of the freezer balloon as compared to the room temperature balloon:
	3. Describe your observations about the pressure of the freezer balloon as compared to the room temperature balloon *(Hint: you can squeeze each balloon gently to feel the pressure)*:
	4. Take a picture of both balloons (Balloon 1 and 3). You may insert that picture here or attach it as a separate file in Dropbox.

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| *Insert image here* |

1. After one hour, bring your “hot area” balloon (Balloon 2) beside the room temperature balloon (Balloon 3). Make observations about the size and pressure of the “hot area” balloon as compared to the room temperature balloon. **Make your observations quickly!** As soon as the “hot area” balloon is exposed to the room, it will begin to undergo changes.
	1. Measure and record the final circumference of Balloon 2 (Hot area) using your string and ruler. How does this final measurement compare to the initial circumference measurement?
	2. Describe your observations about the size (volume) or the “hot area” balloon as compared to the room temperature balloon:
	3. Describe your observations about the pressure of the “hot area” balloon as compared to the room temperature balloon (Hint: you can squeeze each balloon gently to feel the pressure) :
	4. Take a picture of both balloons (Balloon 2 and 3). You may insert that picture here or attach it as a separate file in Dropbox.

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| *Insert image here* |

Using your observations, answer the following questions:

1. Based on your results, what can you say about the relationship between temperature and volume (size) of a contained gas? Fill in the blanks in the statements below with either: increased, decreased, or stayed the same.
	1. **As the temperature of the gas increased, the volume (size)**      **.** *(Hint: think about the balloon in the hot area.)*
	2. **As the temperature of the gas decreased, the volume (size)**      **.** *(Hint: think about the balloon in the hot area.)*
2. Why do you think these changes in volume (size) happened?      .