**Unit 3 – Section II -Lesson 9: Air Force - Air Pressure**

**Purpose**: to observe and explore situations that involve air pressure.

**Materials**

* 2 liter bottle x 2
* balloons
* soda can for each partner group
* hot plate
* beaker tongs
* ice bath
* 600 mL beaker
* plastic cups
* small piece of paper
* syringe
* small marshmallows
* Cartesian diver

**Procedure and Analysis**

**Part 1 – Balloon in a Bottle**

Watch the class demo and competition. The first person will place the un inflated balloon inside a 2L plastic bottle. Fold the opening of the balloon back over the opening of the mouth of the bottle so it stays in place. They will then try to blow air into the balloon inside the bottle. This as a race with one student using the balloon inside the bottle set up and another blowing up a balloon the usual way.

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| **Demonstration** | **Observations** | **Explain what happened**  Why was the balloon so hard to inflate? |
| **Balloon in a bottle** |  |  |

**Part 2 – Soft Drink Can**

Put 5 ml of water in the bottom of an empty aluminum soft drink can. Heat the can on a hot plate until you see steam coming out of the opening. Holding the can with a pair of beaker tongs, quickly invert the can into the ice bath.

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| **Demonstration** | **Observations** | **Explain what happened**  What causes the can to collapse? |
| **Soft Drink Can** |  |  |

**Part 3 – Submerged Cup**

Fill a large beaker about two thirds full with water. Crumple a dry piece of paper and squeeze it into the bottom of a plastic cup. Invert the cup, making sure the paper stays up in the cup and does not drop into the water. Immerse the cup completely under water, holding it as vertical as possible.

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| **Demonstration** | **Observations** | **Explain what happened**  Why didn’t the paper get wet? |
| **Submerged Cup** |  |  |

**Part 4 – Syringe – Marshmallows**

**\*\* Please do NOT squish the marshmallows in the syringe! If you do, you will need to scrub and clean the syringe with warm soapy water.**

* Obtain one marshmallow. For fun, you may use a sharpie marker to draw a face on the marshmallow!
* Place the marshmallow inside the barrel of the syringe and carefully put the plunger in.
* Put the cap on the tip of the syringe (if there is no cap, then cover the hole with your finger.)
* Pull the plunger outward to increase the volume of the gas. Record what happens to the marshmallow.
* Slowly depress the plunger - **without squishing the marshmallow!** - to decrease the volume of the gas (be sure the cap is on). Record what happens to the marshmallow.

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| **Demonstration** | **Observations** | **Guiding Questions** | **Explain what happened** |
| **Marshmallow in Syringe** |  | Why do the marshmallows increase in size when you increase the volume of the air in the syringe? |  |
| **Marshmallow in Syringe** |  | Why do the marshmallows decrease in size when you decrease the volume of the air in the syringe? |  |

**Part 5 – Cartesian Diver**

Experiment with the “Cartesian Diver.”

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| **Demonstration** | **Guiding questions** | **Explain what happened** |
| **Cartesian Diver** | What happens to the dropper as you squeeze the bottle? |  |
|  | What happens as you release the pressure on the bottle? |  |
|  | What happens to the volume of air in the dropper as you squeeze the bottle? |  |
|  | What happens to the volume of the air in the dropper as you release the pressure on the bottle? |  |

**Post-activity**

1. Site evidence that air pressure exists.

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1. What happens to the volume of a gas when the pressure is increased? Cite at least one observation from your experiments to support your answer.  
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2. What happens to the volume of a gas when the pressure is decreased? Cite at least one observation from your experiments to support your answer.  
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3. Is the volume of a gas directly proportional or inversely proportional to the pressure?  
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4. In your own words, describe what you think air pressure is.

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