Name: \_**ANSWER KEY**

Gases Matter! Student Worksheet Advanced

1. How do you know something is a gas? What are the properties of gases?

Gases fit the shapes of their containers, they are less dense than liquids or solids, they have more energy that liquids or gases, they are invisible, and the particles of a gas move around freely.

1. Where do you find gases in your life?

This likely will include things like steam, farts, burps, breathing, laughing gas (nitrous oxide), and other gases they may think of.

1. Prediction: If you blow up a balloon with air, do you think the weight of the balloon will:

Circle one: Decrease Stay the same Increase

There is no wrong or right answer, since it is a prediction. However, the balloon should gain mass during the experiment. Looking at this question can help you see what your students were thinking beforehand and you should have students reflect on their predictions.

1. Weigh your empty balloon with your piece of tape. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_grams

Weigh your blown up balloon with your piece of tape. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_grams

Weight of blown up balloon \_\_\_\_\_\_\_\_grams

– weight of empty balloon \_\_\_\_\_\_\_\_grams

= weight of air \_\_\_\_\_\_\_\_grams

The air should weight 0.1 to 1 gram (or so) depending on the size of your balloons.

1. How much air do you breath in a year?

\_\_\_\_\_\_\_\_g Weight of air x 28,800 breaths x 365 days =\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_g

Balloon breath day year year

1. How much methane gas do all the cows in the world fart or burp in a year?

1.5 billion cows x 300 liters of gas x 365 days =164.25 trillion liters

 Cow-day year year

1. What is pop? How is it different than water?

Pop contains water, sometimes caffeine, flavors, sweeteners, and carbonation (the water is infused with carbon dioxide).

1. Prediction: What do you think will happen to the weight of the pop can when we open it and let the bubbles out?

Circle one: Decrease Stay the same Increase

(Again, no right answer here since you want students to make a prediction, but students should compare their prediction with what happened and reflect upon what they have learned. They should eventually realize that the weight of the pop can should decrease since some of the mass is escaping as a gas).

1. Record the weight of the soda pop in the chart below: Results will vary by brand of soda and size of the container, but the soda should lose weight as the gases escape.

|  |  |
| --- | --- |
| Time (in Minutes) | Mass (in grams) |
| Start: 0 minutes |  |
| 1 |  |
| 2 |  |
| 3 |  |
| 4 |  |
| 5 |  |
| 6 |  |
| 7 |  |
| 8 |  |
| 9 |  |
| 10 |  |

1. Graph your results below:

 Make sure the students include labels and units for the axes, and have them use as much of the graph area as possible.

1. Describe what happened to the soda pop. Did the soda lose or gain weight? Write your observations.

The soda should have produced bubbles as the gas escaped. The soda should have lost weight as the gases left the soda. Students could describe the sound, size of bubbles, etc.

1. Prediction: What do you think will to the containers of air filled with classroom air and exhaled air when they are placed in the sun?
	1. The temperature will not change in the containers
	2. Both will increase in temperature the same amount
	3. The exhaled air will increase more
	4. The classroom air will increase more

Students should realize that the sun warms things up because of the solar energy radiating to earth. That’s why the earth is warmer during the day than at night. However, it is often harder for students to realize that different gases have different properties. They will have to connect the idea that you breath out carbon dioxide and that carbon dioxide is a greenhouse gas in order to realize that the exhaled air should warm up more than the regular classroom air.

1. For the containers of classroom air and exhaled air, record the beginning and end temperature of the containers here. Both containers should increase in temperature, though the exhaled air should increase more. If possible, do more than one replicate of each treatment.

|  |  |  |
| --- | --- | --- |
| Type of Air | Classroom Air | Exhaled Air |
| Beginning Temperature |  |  |
| Ending Temperature |  |  |
| Difference (Ending-Beginning) |  |  |

1. Describe what happened in the containers when they were placed in the sun.

Students should talk about the energy from the sun going into the containers (since the containers are clear), and the gases in the containers capture some of the energy. Because the exhaled air contains more of the greenhouse gas carbon dioxide, the exhaled air should capture more energy than the classroom air.