Name Date Pd

Chemistry – Unit 4 Notes

## Dalton’s Playhouse

In the late 18th century, Joseph Priestly, Antoine Lavoisier and others performed some critical experiments that helped Dalton develop his theories on the atomic model of matter. The simulation at the website: [**http://web.visionlearning.com/dalton\_playhouse/ad\_loader.html**](http://web.visionlearning.com/dalton_playhouse/ad_loader.html)will allow you to replicate some of the key experiments these scientists performed. Answer the questions on the website and keep track of your responses on this notes sheet.

**Instructions**

Read the first page of instructions and answer the questions below:



1. Write the name of the button next to its picture.



2. What do you need to do to the tools above in order to take a measurement of something in the lab?

### Part 1 – Priestley

*Answer the following questions using the introductory information when you enter Priestley’s lab.*

 - What happens to the mineral red calyx when its heated in a lab?

 - What was Priestly the first person to do during this experiment with red calyx?

After you’ve read the intro, you can hide the text box to see the lab. You will notice 3 different starting amounts of Calx listed across the top. For the first trial, 100g should be marked. Hit the “Heat Calx” button to run the experiment.

 - What happens in the large container when the Calx is heated?

After the experiment has run, use the scale and volume buttons to find the mass of the mercury and the mass and volume of the gas produced. Record these values in the chart below. Once the experiment finishes, hit “Reset” and complete it again with the two other starting amounts of Calx.

|  |  |  |  |
| --- | --- | --- | --- |
| Mass of Starting Calx | 100g | 200g | 216.59g |
| Volume of gas produced |  |  |  |
| Mass of gas produced |  |  |  |
| Mass of mercury produced |  |  |  |

***Analysis Questions***

1. What happened to the mass of the material left in the flask as it was heated?

2. What do you notice about the masses of the gas produced and the mercury metal left in the flask?

3. State the relationship between the volume of gas produced and the mass of the calx that was heated.

\_\_\_\_ 4. Did the mass of material in the flask on the right change upon heating?

 a. No b. Yes it increased. c. Yes it decreased.

\_\_\_\_ 5. How did the mass of the gas compare to the mass of the materials in the flask?

 a. The mass of the gas did not change during heating.

 b. The mass of the gas increased by the same amount that the flask decreased.

 c. The mass of the gas decreased by the same amount that the flask increased.

 d. The mass of the gas changed randomly.

\_\_\_\_6. How did the volume of the gas produced compare to the initial mass of calx?

 a. The volume of gas did not change.

 b. The volume of gas changed proportionally to the initial mass of calx.

 c. The volume of gas changed randomly.

7. What two things did Priestley observe about this gas?

8. What did he name it?

### Part 2 – Lavoisier

*Answer the following questions using the introductory information when you enter Lavoisier’s lab.*

 *-*What did Lavoisier rename Priestley’s gas?

 - What gas did he then burn?

When you’re ready to begin, hide the textbox and you will see two containers marked with oxygen and phlogiston, a third unmarked container where the product forms, and a circular container in the middle where the flame will burn. Before performing any of the experiment, you must record the initial masses and volumes for the gasses in the chart below.

|  |  |  |  |
| --- | --- | --- | --- |
| **Initial Mass** **Oxygen (g)** | **Initial Volume** **Oxygen (L)** | **Initial Mass****Phlogiston (g)** | **Initial Volume****Phlogiston (L)** |
|  |  |  |  |

At the top of the screen begin with “Burn 1/3 phlogiston” checked off. Hit the burn phlogiston and let the experiment proceed. You will need to complete the chart below with your data for all three trials (burn 1/3, burn 2/3, and burn all).

|  |  |  |  |
| --- | --- | --- | --- |
|  | Burn 1/3 | Burn 2/3 | Burn all |
| Mass oxygen leftover (g) |  |  |  |
| Mass phlogiston leftover (g) |  |  |  |
| Mass of product made (g) |  |  |  |
| Volume oxygen leftover (L) |  |  |  |
| Volume phlogiston leftover (L) |  |  |  |
| Volume of product made (L) |  |  |  |

Using your initial values that you recorded and the data in the chart above, perform the calculations listed in the table below.

|  |  |  |  |
| --- | --- | --- | --- |
|  | Burn 1/3 | Burn 2/3 | Burn all |
| Mass oxygen used (g) |  |  |  |
| Mass phlogiston used (g) |  |  |  |
| Volume oxygen used (L) |  |  |  |
| Volume phlogiston used (L) |  |  |  |

1. Looking at the **volumes of the gases**, in what specific proportion did phlogiston react with oxygen? (*HINT: Look at the last chart and find a relationship between the volumes used)*

2. How did the mass of the gas in all three vessels before burning compare to the total mass after burning? Show a sample calculation to support your written answer.

3. What did Lavoisier eventually realize the product of this reaction was?

4. What did he change the name phlogiston to and why?

### Part 3 – Diamonds

*Answer the following questions using the introductory information when you enter the diamond lab.*

 *-* What did Boyle say happened to diamonds when they’re exposed to intense heat?

Complete the following data table as you burn two different amounts of diamonds and charcoal. Make sure to complete the initial masses and volumes before you hit the burn button.

|  |
| --- |
| **Burning 0.20 g Diamond** |
|  | Mass of oxygen | Volume of oxygen | Mass of product | Volume of product |
| initial |  |  |  |  |
| final |  |  |  |  |
| **Burning 0.04 g Diamond** |
|  | Mass of oxygen | Volume of oxygen | Mass of product | Volume of product |
| initial |  |  |  |  |
| final |  |  |  |  |
| **Burning 0.20 g Charcoal** |
|  | Mass of oxygen | Volume of oxygen | Mass of product | Volume of product |
| initial |  |  |  |  |
| final |  |  |  |  |
| **Burning 0.04 g Charcoal** |
|  | Mass of oxygen | Volume of oxygen | Mass of product | Volume of product |
| initial |  |  |  |  |
| final |  |  |  |  |

1. How did the **mass of gas formed** compare if you used the same amount of diamond and charcoal?

### Concepts

\_\_\_\_\_1. Which of the core concepts below most logically follows the Track 1 Priestley experiments?

 a. Red calx turns into mercury when it is heated.

 b. Some substances are composed of discrete amounts of two or more other substances.

 c. All substances can be broken down into simpler materials by heating them.

\_\_\_\_\_2. Which of the core concepts below most logically follows from the Track 2 Lavoisier experiments?

a. The total mass of the products in a chemical reaction is greater than the mass of the reactants.

b. The total mass of the products in a chemical reaction is less than the mass of thereactants.

c. The total mass of the products in a chemical reaction is exactly equal to the mass of the reactants.

\_\_\_\_\_3. Which of the core concepts below most logically follows from the Track 3- Diamond experiments?

 a. Elements combine in specific, defined ratios in chemical reactions.

 b. Carbon reacts differently depending whether it is in the diamond or charcoal form.

 c. Carbon can form carbon dioxide when neither air nor oxygen is present.