**Gassy Business** Lab Activity Names:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Purpose:** to witness and record the changes that occur when calcium metal is placed in water; to observe evidence of chemical changes resulting from the formation of new bounds between different elements; to collect gas by water displacement.

***Groups of Two***

**Materials:**

250 mL beaker 1 small piece of calcium

50 mL beaker Lighter

Test tube Wooden splint

Test tube holder (tongs)

**Safety:**

***Wear safety goggles. Do not touch the calcium metal with your hands. Keep the calcium metal in the 50 mL beaker until use. Take care when lighting wooden splint! Light it and use it then rinse with water and put used splints back in bin. Hold test tube down while calcium is reacting or the tube will pop up and the calcium metal will escape.***

**Procedure:**

1. Fill the **250 mL** beaker **to 150 mL** with tap water.
2. The teacher will measure the initial temperature of the water for you from a test tube. Please record this in your results.
3. Fill the test tube full of water and place your thumb on the top. Without spilling any water from the test tube carefully flip the test tube upside down and submerge it into the beaker. No air should be in the test tube once submerged.
4. Carefully, without touching the calcium with your hands dump the calcium from the small beaker into the large beaker of water.
5. Place the opening of the test tube over the reacting piece of calcium so that any gas released is trapped in the test tube. Be sure to keep the test tube submerged in the water as you move it. ***Continue to*** h***old the test tube down in the beaker during the reaction or it will pop up and you will lose the calcium metal piece***.
6. Allow the calcium to fully react. This will take about 5 minutes.
7. **Record all observations of changes you witness during the reaction** in the results section.
8. The teacher will take the final temperature of the reacted solution in a test tube. Record this in your results.
9. Light the wooden splint with the lighter.
10. Carefully remove the test tube from the beaker using tongs. Be quick so the trapped gas does not escape. You may want to keep the test tube upside down.
11. Hold the test tube firmly (do not drop it) diagonally with the opening downwards and put the burning end of the splint into the test tube.
12. Record what happens when you do this.
13. Rinse the used splint and return it to the bin.
14. Record observations of any changes you notice in the test tube and beaker.
15. Clean up! Rinse the beaker and test tube in the sink with lots of water. *There should be nothing left of the original calcium metal piece before dumping.*
16. Put glass wear back in original bins and wipe your work space clean. Wash your hands!

**Results:**

Calcium + Water 🡪 calcium hydroxide + hydrogen

**Chemical Equation: Ca + 2HOH 🡪 Ca(OH)2 solid  + H2 gas**

**Forms**

**Observations:** Describe what you see, hear, feel, smell etc. as the calcium reacts with the water. Do not forget to describe any colour, texture or appearance changes of the water and calcium metal. What happens to the calcium?

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| **Initial Observations:** | **Observations During Reaction of Calcium and Water** | **Final Observations  (after reaction complete in the beaker):** |
| Initial Temp:\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Describe appearance of calcium |  | Final Temp:\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |

What happened when you put the burning splint into the test tube?

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**Analysis of Results:** *You may need to research some of the questions online for full understanding! You can use your cell phones for this purpose. For most questions refer to observations you made or the chemical equation.*

What is the name of the solid substance produced during the reaction? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

What is the name of the gas that is produced? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

What observation(s) are evidence of a new solid being created?  
  
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What observations(s) prove that a gas was formed?

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Why do you think it is unsafe to handle the calcium metal with your hands?

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When the burning splint is placed in the test tube this causes water vapour to be formed. What two gases must be present in the test tube for water to form? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Bonus:** *Research online!*

Calcium is normally a grey and shiny metal. What substance coated the calcium metal before you mixed it with water?\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

How did this happen?

Why did the burning splint cause a popping noise?\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
  
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**Conclusion:** In general, what have you learned from this lab? What have you learned about chemical changes witnessed in this lab? What evidence did you observe of chemical change occurring? What new substances were produced? Were the changes of state due to chemical changes or physical changes? How do you know? *Please type or print conclusion on separate sheet and staple to lab.*

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| Rubric | **Not Meeting Expectations <40** | **Beginning 40 45 48** | **Developing 52 63 70** | **Competent 74 80 84** | **Mastery 88 95 100** |
| **Observations** | * Most data incorrect * Missing many required observations | * Data lacks precision/accuracy * Several required observations missing | * Satisfactory representation of the data. * Minor omissions in observations | * Most data is accurately represented * Observations complete with some details | * Excellent and accurate representation of the data * Detailed, descriptive and complete observations |
| **Analysis** | * Several questions are not answered * Analysis is not relevant or many questions not answered correctly | * Responses are provided for most questions but often answers are incomplete * There are several significant errors | * Responses are provided for all questions but answers sometimes incomplete/ unclear * There may be some errors in responses | * All questions are answered * Most responses are accurate and complete * Bonus questions have been attempted and one is correct | * All questions are answered accurately and in complete sentences where appropriate * Both bonus questions have been answered correctly |
| **Conclusion** | * Conclusion shows little effort and reflection on the lab. An understanding of key concepts has not been demonstrated. | * The summary of the results is incomplete with little reflection on the lab. An understanding of key concepts is developing but still not clear. | * A short summary of the results of the lab indicates a satisfactory understanding of key concepts. More detail needed. | * Accurate summary of the results of the lab indicates a good understanding of key concepts. You have demonstrated that you have learned something new from completing this lab. | * Accurate summary of the results of the lab indicates an excellent understanding of key concepts. It is obvious that you have learned something new from completing this lab. |