The Chemistry Blimp WebQuest
In this WebQuest we are going to look at some of the chemistry behind lighter-than-air flight. Your task is to find the answers for the questions on the WebQuest and prepare explanations as indicated. You should be able to answer all of the questions using the links provided, your book, or other resources. You should answer these questions in your notebook.

Introduction
Blimps, balloons, and zeppelins all fly because they are lighter than air, so they float in the atmosphere rather than sinking in it. Airships are made of lightweight materials and historically have been filled with either one of the two least dense elements there are: hydrogen or helium. The history of airships involves some great chemistry, but it also involves some really bad chemistry. The chemical mistakes made by airship designers of the past have led to tragic results. This WebQuest now takes you on a lighter-than-air flight through the chemistry behind the successes and failures of airships.

The Process and Resources
In your quest, you are to complete the assignments and find answers to the questions below. Some you should be able to answer using only your class textbook. In other cases, links have been provided to websites where you can begin your search. You can find these links on peretich.weebly.com.

1. The German zeppelin Hindenburg was filled with hydrogen gas. Not surprisingly, the airship was destroyed in a violent fire near Lakehurst, New Jersey, in 1937.
   a. Write a balanced chemical reaction for the combustion of hydrogen. (2 points)
   b. Is this reaction exothermic or endothermic know that exothermic reacts feel HOT to the touch due to the release of heat (endothermic reactions feel COLD to the touch)? (1 point)

2. Modern airships are filled with helium. Unlike hydrogen, helium doesn't burn. Use your knowledge of valence electrons and reactivity to explain why helium is safer than hydrogen for use in airships. (2 points)
   Periodic Table: The Noble Gases—from Chemical Elements.com.
   Helium—from Los Alamos National Laboratory.

3. Though more dangerous, a given volume of hydrogen gas will lift more weight than an equal volume of helium. This is because hydrogen is less dense than helium. (3 points)
   a. What did Avogadro say about the volume of gases?
   b. What is the mass of 1 mole of helium molecules?
   c. What is the mass of 1 mole of hydrogen molecules?
   Amadeo Avogadro—biographical sketch, part of Chemical Achievers from the Chemical Heritage Foundation.

4. Balloons are usually filled with simple hot air instead of helium.
   a. Use the following link and go to the activity called “Floating and Sinking”. Do the required activity and follow all the links to explain why a hot air balloon floats. (2 points)
   b. At the end of the ‘Floating and Sinking’ section, is a new section called ‘Hitchin’ A Ride’. Complete this activity and record the route. Identify the starting location, and then give directions (East…) and the location where any change in direction was taken. (2 points)
   Balloon Race Around the World—a NOVA Online Adventure from WGBH Boston and PBS.org.

5. French chemist Joseph-Louis Gay-Lussac is most famous for describing the law of combining volumes, also known as Gay-Lussac’s law. But he also did research using hot air balloons. How did Gay-Lussac use balloons to study chemistry in the early 1800s? (2 points)
   Joseph-Louis Gay-Lussac—biographical sketch, part of Chemical Achievers from the Chemical Heritage Foundation.
6. The *Hindenburg* was filled with flammable hydrogen, but recent research suggests that hydrogen wasn't the only dangerous material involved in its tragic demise.

a. How did a paint made from powdered aluminum contribute to the disaster? Be specific and detailed in your explanation. *(3 points)*

b. How is powdered aluminum used on the Space Shuttle? *(2 points)*

c. Write the chemical equation for the reaction aluminum underwent in the disaster. This is a combustion reaction. Be sure to balance the charges in the product. *(2 points)*

d. Is the reaction in 6c exothermic or endothermic? *(1 point)*

e. Do you think an aluminum can would behave in the same manner as powdered aluminum? Why or why not? *(1 point)*

f. Describe the experiments carried out by Addison Bain. *(2 points)*

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**The Hindenburg**—part of *Secrets of the Dead*, from Thirteen/WNET New York and PBS.org. Look at the various sections, especially the “Chemistry” section. The intro has some live footage of the disaster which is very interesting. The “Resources” section has a link called “Transcript”. It is long, but about ¾ of the way to the end, you will find most of the answers.

*The Hindenburg: Was Hydrogen Really To Blame?*

**Evaluation**

You will be graded on how effectively you carry out the assignments in this WebQuest. The point values are listed next to each assignment. There are an additional 2 points that will evaluate the overall spelling and grammar of your final report.

*The original CHF Chemistry WebQuest was created by Mark Michalovic.*

**SCORING RUBRIC**

__/2 #1a
__/1 #1b
__/2 #2
__/1 #3a
__/1 #3b
__/1 #3c
__/2 #4a
__/2 #4b
__/2 #5
__/3 #6a
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__/1 #6d
__/1 #6e
__/2 #6f
__/25 TOTAL