

Guidelines for CHEM 362 Research Paper
Dr. Dunbar Spring 2008

This paper is worth 100 points which is equivalent to 2 mini-exams

The paper will be due on **April 11, 2008**

The topic of this paper is ammonia, one of the most important compounds in the history of chemistry. The writing is to focus on the history, reactions, uses and impact of NH_3 and chemicals made from it.

Specifically, divide the paper into the following two discussion sections:

- A. The achievements of Fritz Haber (Nobel Prize 1918), Carl Bosch (Nobel Prize 1931) and Gerhard Ertl (Nobel Prize 2007), all three of whom received a Nobel Prize for some aspect of ammonia chemistry. Information regarding these three Nobel Prize winners will be provided in class and made available on the website.
- B. The uses of ammonia and compounds made from ammonia such as nitric acid. Include in this part the impact that ammonia has on world history (for example, throughout WWI, ammonia synthesis plants were built and used in Germany to supply the country with ammonium nitrate, an explosive – all because of Fritz Haber!), economy, and issues such as poverty in places where the fertilizers made from ammonia are not available (ammonia is not cheap to make). Cite numbers about the amount of ammonia produced annually in the US and other countries if you can find a break-down of the economics, how much it costs to produce *etc.*, (whatever you can learn about the chemical industry as it pertains to ammonia and its by-products would be fun to hear about!).

The paper must be an original* work and no *more than 7 pages in length; 5 pages minimum (the length includes figures)*, 1.5 line spacing, 12 point New Roman font. This is a technical paper and must include figures and a bibliography of literature cited (Use American Chemical Society format for references). Include an outline of the paper on the front page (**it does not count in the page limit**). **The paper should be divided into three main sections: Introduction, Discussion Point A and Discussion Point B above.** The purpose of a technical paper is to present all necessary information as efficiently as possible, so please be concise so you can include more information. The paper should include at least one recent scholarly publication (published in a professional journal in the last ten years). The library has on-line access to SciFinder and Web of Science which are both excellent tools for research topics in chemistry. It is also possible to find numerous “hits” on ammonia chemistry, especially the Nobel Prizes, by simply typing keywords into the search field of common internet search engines.

*Remember the act of *plagiarism* includes not only using *verbatim* text written by another person, but also *paraphrasing* the text (changing a few words here and there).