

The Alchemy of Air by Thomas Hager

Questions for Book: Answer the questions and resubmit this document to your instructor with the subject line: Alchemy of Air - your name - Ch. 8 - Ch. 9. Please save this document as AA_04 _your_name

Chapter Eight

1. The process of improving the synthesis of ammonia was incremental. Explain the role of the thick-walled quartz tube, recycling hot unreacted gases, the element osmium in improving the yield of ammonia?
2. How high were the pressures required in the early small prototype of Haber's process?
3. What was the mass of the world's supply of osmium at that time?
4. What did Bosch discover about Ostwald's process that proved it did not work?
5. Bosch realized that to make an industrial size machine of Haber's process he would need a whole new set of technologies and cost millions. List these requirements.
6. What was the percent yield of ammonia in Haber's little machine when it was demonstrated to Bosch?
7. Why is this demonstration referred to as a turning point in history?



Fritz Haber

Chapter Nine



Carl Bosch

1. "As the size of the machine went up, every problem grew exponentially". List some of these problems.
2. Mittasch opened a new era in catalytic chemistry. What is a promoter and how did Mittasch solve the problem of the rare osmium catalyst?
3. Beginning with the sentence "It marked the end of Haber's importance to the company" a description follows that shows how industry and research science can have different goals, values and even work at cross purposes. Why didn't BASF support Haber when the process to produce ammonia began to become public?