

Worksheet 6.3

The Haber process

NAME:

CLASS:

INTRODUCTION

In 1908, Fritz Haber developed a process for synthesising ammonia from its elements. Until this time, Germany had been reliant on imported nitrates for the synthesis of fertilisers and explosives. With the outbreak of World War I, Germany's supply routes were blocked. Haber's process allowed Germany to remain in the war for much longer.

No.	Question	Answer
1	Write the thermochemical equation for the Haber process.	
2	How are the raw materials for the process obtained?	
3	Theoretically, what conditions would increase the <i>rate</i> of this process?	
4	Theoretically, what conditions would increase the <i>yield</i> of this process?	
5	What conflict exists between rate and yield considerations and how is this conflict resolved in practise?	
6	a Name the catalyst used in the Haber process. b Is this an example of a heterogeneous or a homogeneous catalyst?	

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No.	Question	Answer
7	How do catalysts speed up the rate of a chemical reaction?	
8	Draw a reaction profile for this reaction, showing the catalysed and uncatalysed pathways.	
9	<p>a What is the maximum mass of ammonia that could be produced when 300 kg of nitrogen reacts with excess hydrogen?</p> <p>b What is the minimum mass of nitrogen needed to produce 5.68 tonnes of ammonia?</p>	
10	Does the Haber process involve the oxidation or reduction of nitrogen? Use oxidation numbers to explain your answer.	
11	On a separate page, draw a flowchart to summarise the Haber process for ammonia production.	