



ST ANDREW'S SECONDARY SCHOOL

NAME

CLASS

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DATE

CHEMISTRY



Self-Assessment Topical Test

Ammonia

30 minutes

INSTRUCTIONS

Write your name, class and date on the spaces provided above.

Complete **all** questions on this question paper.

You are reminded to revise this topic first before attempting the questions.

MARKS OBTAINED
25

Multiple-Choice Questions

[10 marks]

- 1 When 1 mol of nitrogen is reacted with 3 mol of hydrogen at 250 atm and 450°C in the presence of an iron catalyst, less than 2 mol of ammonia is formed.

Which of the following best explains this observation?

- A** The pressure used was too low.
B The temperature used was too low.
C The nitrogen and hydrogen used in the reaction contained impurities.
D The reaction of nitrogen and hydrogen to form ammonia is reversible. ()

- 2 In the Haber process, gases are combined directly in a hydrogen to nitrogen ratio of _____.

- A** 1 : 1 **B** 2 : 1
C 1 : 3 **D** 3 : 1 ()

- 3 The catalyst used in the Haber process is _____.

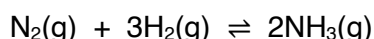
- A** copper **B** iron
C hydrogen chloride **D** nickel ()

- 4 Ammonia gas is produced when ammonium chloride is heated with _____.

- A** calcium carbonate **B** nitric acid
C potassium hydroxide **D** water ()

Use the following information to answer Questions 5 and 6.

The Haber process is used to manufacture ammonia gas. The reaction is exothermic and the chemical equation for the process is:



- 5 What is the effect of increasing the pressure inside the reaction vessel on the rate of production and the yield of ammonia gas?

	Rate	Yield
A	decrease	decrease
B	increase	unchanged
C	increase	decrease
D	increase	increase

()

- 6 What is the effect of increasing the temperature inside the reaction vessel on the rate of production and the yield of ammonia gas?

	Rate	Yield
A	decrease	decrease
B	increase	unchanged
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D	increase	increase

()

- 7 Which of the following statements is not true of the Haber process?

- A The raw material, nitrogen gas, is obtained from the cracking of petroleum.
 B Unreacted nitrogen and hydrogen are recycled and transferred back into the converter.
 C Nitrogen and hydrogen gases are compressed at 250 atm during the process.
 D Liquid ammonia is the product of the Haber process.

()

- 8 Which of the following statements are true of the Haber process?

- 1 An increase in pressure increases the speed of reaction.
 2 An iron catalyst is used to increase the yield of ammonia.
 3 A high temperature of 450°C is used to increase the yield of ammonia.
 4 A relatively low pressure of 250 atm is used because it is costly to maintain a high pressure.

A 1 and 4

B 1, 3 and 4

C 2 and 3

D 1, 2, 3 and 4

()

- 9 Which ion will react with ammonium sulfate to give ammonia gas?

A NH_4^+

B OH^-

C H^+

D Cl^-

()

- 10 Which of the following will not react with ammonium salts to give ammonia gas?

A Limewater

B Potassium hydroxide

C Hydrochloric acid

D Sodium hydroxide

()

Structured Questions

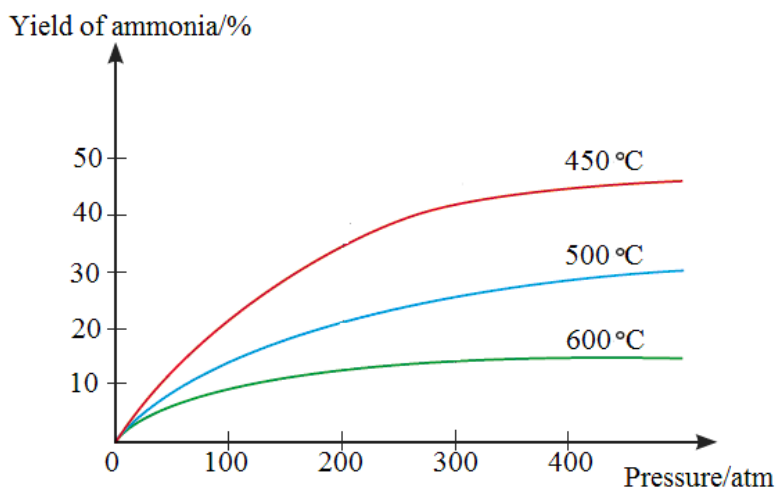
[15 marks]

- 11 Complete this statement about a reversible reaction:

[3]

A reversible reaction is a reaction that can go in _____. The forward reaction is when _____ become products and the _____ is when products are converted back into reactants.

- 12** Ammonia is produced commercially by the Haber process. The graph shows the percentage yield of ammonia at different pressures and temperatures.



- (a) How does pressure affect the yield of ammonia? [2]
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- (b) How does temperature affect the yield of ammonia? [2]
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- (c) What happens to the speed of reaction when the temperature is lowered? [1]
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- (d) Why is the temperature used in the Haber process usually around 450°C? [2]
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- (e) Based on the graph, what will be the percentage of ammonia formed at 450°C and 200 atm? [1]
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- 13** Below are the names of some compounds.

Ammonia	Ammonium sulfate	Ammonium nitrate
Nitric acid	Potassium nitrate	Potassium hydroxide

- (a) Name three compounds that can be used as fertilisers. [1]
-
- (b) Which two compounds react to make a third? [1]
-

(c) Which two compounds give off ammonia gas when warmed together? [1]

(d) Write a balanced equation with state symbols for the reaction in **(c)**. [1]
