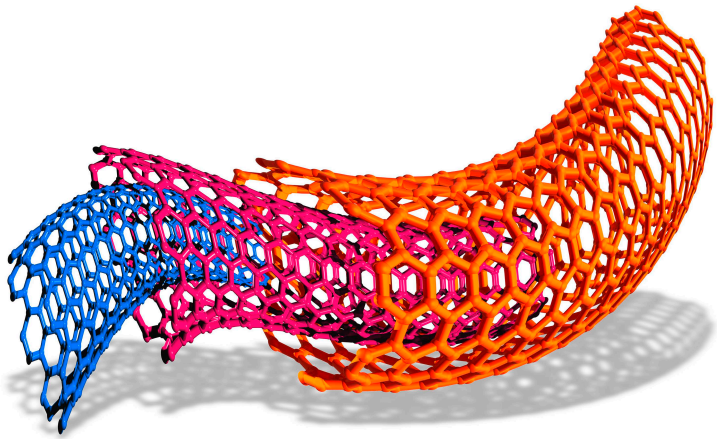
Cambridge Assessment International Education

Interactive

Interactive Example Candidate Responses

Paper 3 (May / June 2016), Question 6

Cambridge IGCSE™
Chemistry 0620



Version 2.0

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HIGH | MIDDLE | LOW

6 Ammonia is manufactured by the reaction of nitrogen with hydrogen in the presence of a catalyst.

(a) What is the purpose of a catalyst?

to speed up the reaction with ..... [1]

(b) The reaction is reversible.

Complete the equation below by adding the sign for a reversible reaction.

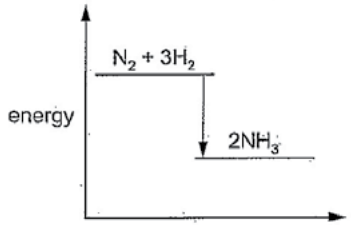
$N_2 + 3H_2 \rightleftharpoons 2NH_3$

[1]

(c) The energy level diagram for this reaction is shown.

Is this reaction exothermic or endothermic?

Give a reason for your answer.

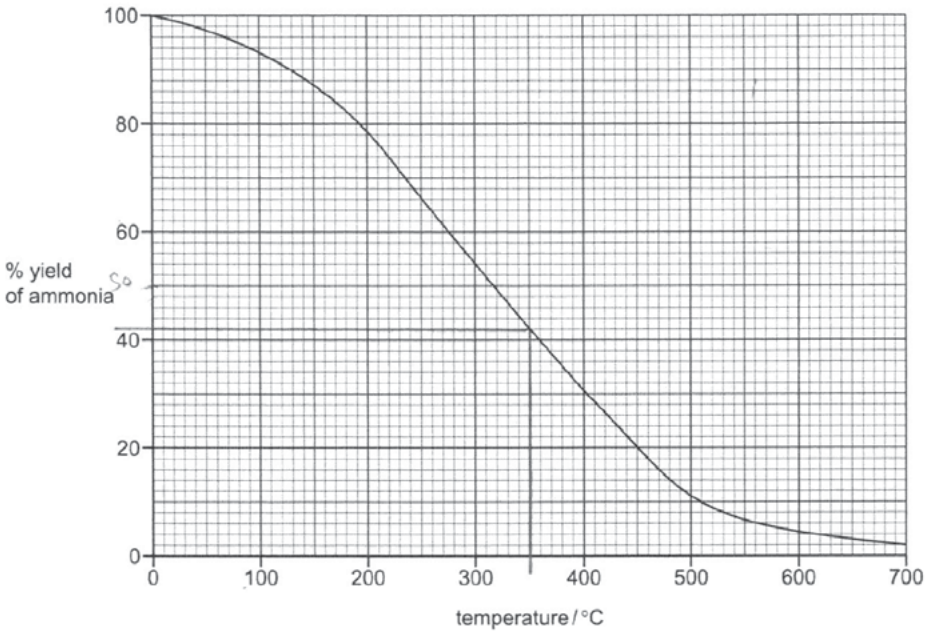


endo ther endothermic because it is losing heat losing energy [1]

Your Mark		Examiner marks and comments	
		Mark	**Comment**
6(a)		**1/1**	Correct.
6(b)		**1/1**	The sign for the reversible reaction is correct.
6(c)		**0/1**	Although the reason given here ('losing energy') is correct, this means that energy is being given out (exothermic).
6(d)(i)		**1/1**	Both yield and temperature have been referred to, so this gains the mark.
6(d)(ii)		**1/1**	Correct.
6(e)		**2/2**	The test and the result are correct. The answer could have been improved by giving the test as '*damp* red litmus paper'.
6(f)		**1/2**	The idea of adding the Universal Indicator to the solution has been given, but there is no reference to a comparison with a colour chart, only the colour obtained.
6(g)		**2/2**	The equation has been balanced correctly.

EXAMINER COMMENTS | MARK SCHEME

(d) The graph shows how the percentage yield of ammonia changes with temperature when the pressure is kept constant.



(i) Describe how the percentage yield of ammonia changes with temperature.

The higher the temperature the less % yeild of ammonia [1]

(ii) Determine the percentage yield of ammonia at 350 °C.

42% [1]

(e) Describe a test for ammonia.

test red litmus paper

result turns blue. [2]

Select page

HIGH | MIDDLE | LOW

	Your Mark	Examiner marks and comments	
		Mark	Comment
6(a)		1/1	Correct.
6(b)		1/1	The sign for the reversible reaction is correct.
6(c)		0/1	Although the reason given here ('losing energy') is correct, this means that energy is being given out (exothermic).
6(d)(i)		1/1	Both yield and temperature have been referred to, so this gains the mark.
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6(e)		2/2	The test and the result are correct. The answer could have been improved by giving the test as '*damp* red litmus paper'.
6(f)		1/2	The idea of adding the Universal Indicator to the solution has been given, but there is no reference to a comparison with a colour chart, only the colour obtained.
6(g)		2/2	The equation has been balanced correctly.

EXAMINER COMMENTS | MARK SCHEME

(f) Ammonia is a weak base.

Describe how you would measure the pH of an aqueous solution of a weak base using Universal Indicator.

add 2-3 drops of universal indicator, ~~A Then~~

universal indicator should turn green-blue [2]

(g) Complete the chemical equation for the reaction of ammonia with chlorine.

$2\,NH_3 + 3Cl_2 \rightarrow N_2 + 6\,HCl$ [2]

[Total: 11]

Select page

HIGH | MIDDLE | LOW

Your Mark	Examiner marks and comments	
	Mark	Comment
6(a)	1/1	Correct.
6(b)	1/1	The sign for the reversible reaction is correct.
6(c)	0/1	Although the reason given here ('losing energy') is correct, this means that energy is being given out (exothermic).
6(d)(i)	1/1	Both yield and temperature have been referred to, so this gains the mark.
6(d)(ii)	1/1	Correct.
6(e)	2/2	The test and the result are correct. The answer could have been improved by giving the test as '*damp* red litmus paper'.
6(f)	1/2	The idea of adding the Universal Indicator to the solution has been given, but there is no reference to a comparison with a colour chart, only the colour obtained.
6(g)	2/2	The equation has been balanced correctly.

EXAMINER COMMENTS | MARK SCHEME

Select page

HIGH | MIDDLE | LOW

6 Ammonia is manufactured by the reaction of nitrogen with hydrogen in the presence of a catalyst.

(a) What is the purpose of a catalyst?

Speed up the reaction and remains unchanged [1]

(b) The reaction is reversible.

Complete the equation below by adding the sign for a reversible reaction.

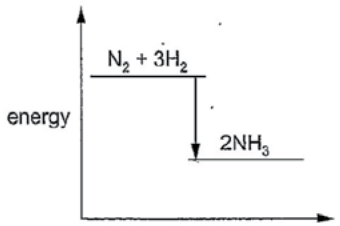
$N_2 + 3H_2 \rightleftharpoons 2NH_3$

[1]

(c) The energy level diagram for this reaction is shown.

Is this reaction exothermic or endothermic?

Give a reason for your answer.



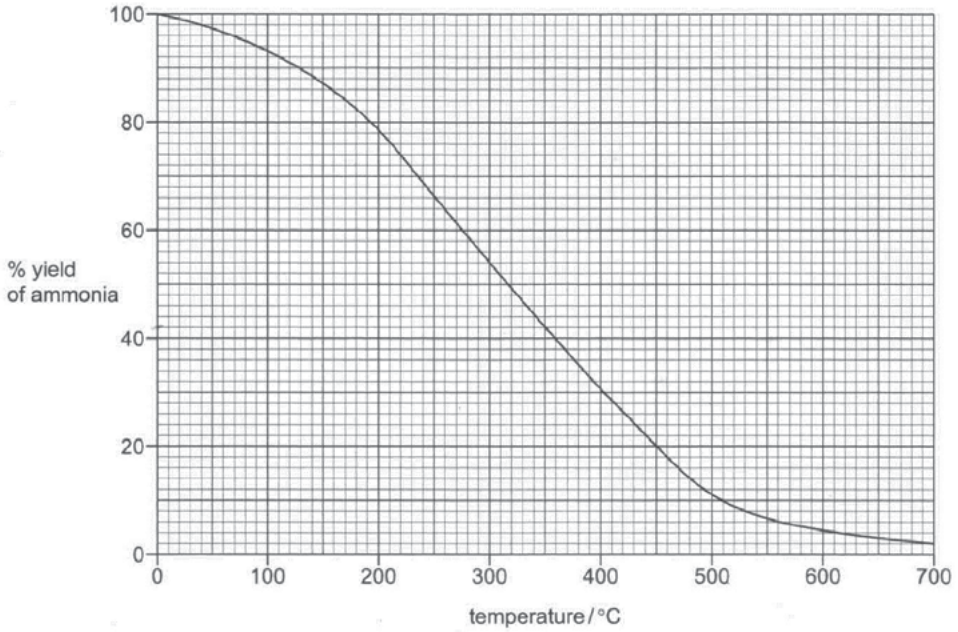
Endothermic

The energy is stored. [1]

Your Mark		Examiner marks and comments	
		Mark	Comment
6(a)		1/1	Correct.
6(b)		1/1	The symbol for the reversible reaction is correct.
6(c)		0/1	The energy decreases from reactants to products and so heat is given out and the reaction is exothermic (not endothermic).
6(d)(i)		0/1	'Decreases' alone is insufficient. No mention has been made as to whether the yield increases or decreases as temperature increases.
6(d)(ii)		1/1	Correct.
6(e)		0/2	Adding an acid is not accurate enough. The mark could have been given for 'concentrated hydrochloric acid'. The result should be a description, e.g. what you see, rather than the name of a compound.
6(f)		1/2	The addition of the indicator to solution is mentioned. A description of how you find the pH is required here (compare with a colour chart), not just stating the pH value.
6(g)		1/2	NH_3 is correctly balanced but HC*l* is not.

EXAMINER COMMENTS | MARK SCHEME

(d) The graph shows how the percentage yield of ammonia changes with temperature when the pressure is kept constant.



(i) Describe how the percentage yield of ammonia changes with temperature.

Decreases [1]

(ii) Determine the percentage yield of ammonia at 350 °C.

42 % [1]

(e) Describe a test for ammonia.

test acid

result ammonia gas [2]

Select page

HIGH MIDDLE LOW

Your Mark		Examiner marks and comments	
		Mark	Comment
6(a)		1/1	Correct.
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6(g)		1/2	NH_3 is correctly balanced but HC*l* is not.

EXAMINER COMMENTS MARK SCHEME

(f) Ammonia is a weak base.

Describe how you would measure the pH of an aqueous solution of a weak base using Universal Indicator.

By adding the universal indicator in to the aqueous solution. If the pH ~~is~~ is between 9-11 then it is a weak base. [2]

(g) Complete the chemical equation for the reaction of ammonia with chlorine.

$2NH_3 + 3Cl_2 \rightarrow N_2 + 3HCl$ [2]

[Total: 11]

Select page

HIGH | MIDDLE | LOW

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		Mark	Comment
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EXAMINER COMMENTS | MARK SCHEME

Select page

HIGH | MIDDLE | LOW

6 Ammonia is manufactured by the reaction of nitrogen with hydrogen in the presence of a catalyst.

(a) What is the purpose of a catalyst?

Slow down a reaction ..... [1]

(b) The reaction is reversible.

Complete the equation below by adding the sign for a reversible reaction.

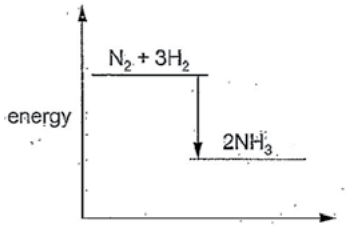
$N_2 + 3H_2 \rightleftharpoons 2NH_3$

[1]

(c) The energy level diagram for this reaction is shown.

Is this reaction exothermic or endothermic?

Give a reason for your answer.



endotherm because the energy is decreasing ..... [1]

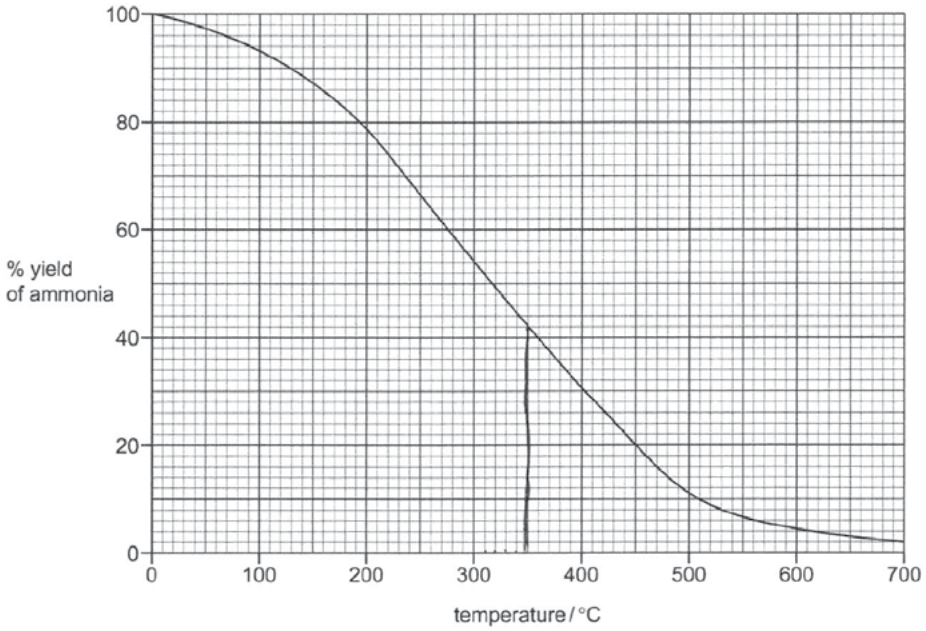
	Your Mark
6(a)	
6(b)	
6(c)	
6(d)(i)	
6(d)(ii)	
6(e)	
6(f)	
6(g)	

Examiner marks and comments

Mark	Comment
0/1	Catalysts speed up a reaction. A substance which slows a reaction is called an inhibitor.
1/1	This is sufficient to be awarded a mark.
0/1	Although the reason 'energy is decreasing' is correct, this means that energy is being given out (exothermic).
1/1	This was given the benefit of the doubt. A better answer would have been 'the lower the temperature, the greater the yield of ammonia'.
0/1	This value is not accurate enough to gain a mark.
0/2	The candidate has referred back to the graph instead of describing a test (damp red litmus) and a result (turns blue).
1/2	It is not clear how the pH strip is used here i.e. dip the (Universal Indicator) strip into the solution.
0/2	The dotted lines are intended to show where the number for balance should be written. These have not been used.

EXAMINER COMMENTS | MARK SCHEME

(d) The graph shows how the percentage yield of ammonia changes with temperature when the pressure is kept constant.



(i) Describe how the percentage yield of ammonia changes with temperature.

low temps = more ammonia [1]

(ii) Determine the percentage yield of ammonia at 350 °C.

41% [1]

(e) Describe a test for ammonia.

test the percentage of ammonium in high temperatures

result higher the temperatures the less the ammonia [2]

Select page

HIGH MIDDLE LOW

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EXAMINER COMMENTS MARK SCHEME

(f) Ammonia is a weak base.

Describe how you would measure the pH of an aqueous solution of a weak base using Universal Indicator.

You use a pH strip

..... [2]

(g) Complete the chemical equation for the reaction of ammonia with chlorine.

$.....NH_3 + 3Cl_2 \rightarrow N_2 + ...HCl + 2Cl_2 + N_3$ [2]

[Total: 11]

Select page

HIGH MIDDLE LOW

	Your Mark
6(a)	
6(b)	
6(c)	
6(d)(i)	
6(d)(ii)	
6(e)	
6(f)	
6(g)	

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EXAMINER COMMENTS MARK SCHEME

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