

Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

For Examiner's Use	
Examiner's Initials	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
8	
TOTAL	



General Certificate of Secondary Education
Foundation Tier
January 2010

Chemistry

CHY3F

Unit Chemistry C3

F

Written Paper

Monday 18 January 2010 9.00 am to 9.45 am

For this paper you must have:

- a ruler
- the Data Sheet (enclosed).

You may use a calculator.

Time allowed

- 45 minutes

Instructions

- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Answers written in margins or on blank pages will not be marked.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information

- The marks for questions are shown in brackets.
- The maximum mark for this paper is 45.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.

Advice

- In all calculations, show clearly how you work out your answer.



J A N 1 0 C H Y 3 F 0 1

Answer **all** questions in the spaces provided.

- 1 (a) The periodic table on the Data Sheet may help you to answer these questions.

Part of the periodic table is shown below.

The letters are **not** the symbols of these elements.

Choose your answers **only** from the letters shown in the periodic table above.

Which letter, **A**, **B**, **C**, **D** or **E**, represents:

- 1 (a) (i) an alkali metal

Letter

(1 mark)

- 1 (a) (ii) the element calcium

Letter

(1 mark)

- 1 (a) (iii) a transition element

Letter

(1 mark)

- 1 (a) (iv) a Group 4 element?

Letter

(1 mark)



- 1 (b) A chemistry teacher demonstrated the reaction between sodium and water to some students. One of the students wrote the following notes.

The reaction between sodium and water

A piece of sodium was cut easily into smaller pieces with a knife.

The sodium was added to water in a trough.

The sodium:

- floated
- melted quickly to give a silvery ball
- moved on the surface of the water
- fizzed.

Use the information in the box to help you to answer these questions.

What evidence is there that:

- 1 (b) (i) sodium has a low melting point

.....
.....
(1 mark)

- 1 (b) (ii) sodium is soft

.....
.....
(1 mark)

- 1 (b) (iii) a gas was produced?

.....
.....
(1 mark)

7

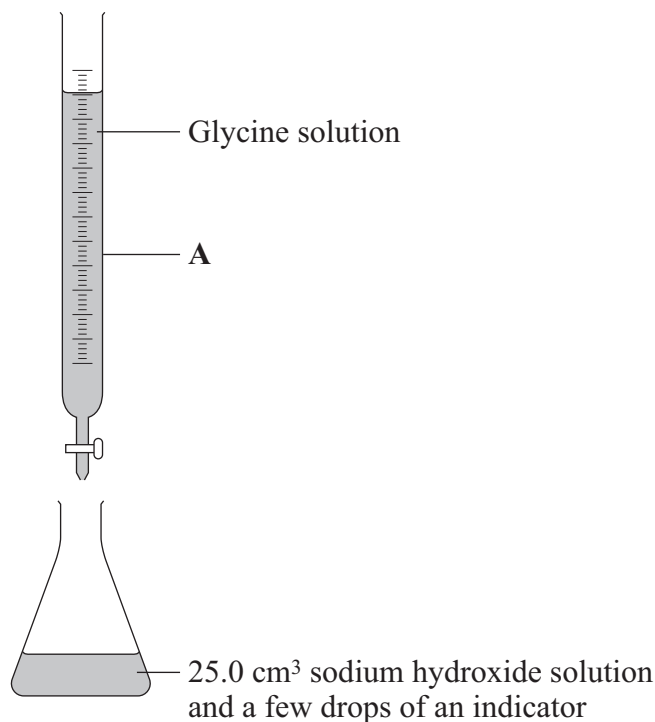
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2 Glycine is an amino acid. It is found in fish, meat, beans and dairy produce.

A student carried out a titration to find the amount of glycine solution that reacts with 25.0 cm^3 of sodium hydroxide solution.

The diagram shows the apparatus that the student used.



2 (a) Which **one** of the following words is the correct name for apparatus A?

Draw a ring around your answer.

burette

cylinder

pipette

(1 mark)

2 (b) How would the student know when enough glycine solution had been added to react with all of the sodium hydroxide solution?

.....

.....

(1 mark)



2 (c) The student's results are given in the table.

Titration	Volume of glycine solution added in cm ³
1	18.5
2	18.3
3	18.4

2 (c) (i) What is the range?

.....
(1 mark)

2 (c) (ii) Calculate the mean.

.....
(1 mark)

2 (c) (iii) Suggest why the student repeated the titration.

.....
.....
(1 mark)

5

Turn over for the next question

Turn over ►



- 3 During a thunderstorm lightning strikes the Eiffel Tower.



In lightning the temperature can reach 30 000 °C. This causes nitrogen and oxygen in the air to react, producing nitrogen oxide. This reaction has a high *activation energy* and is *endothermic*.

- 3 (a) Nitrogen and oxygen in the air do not react easily.

What makes nitrogen and oxygen react during thunderstorms?

.....
(1 mark)

- 3 (b) Complete the word equation for the reaction of nitrogen with oxygen.

nitrogen + →
(1 mark)

- 3 (c) In an *endothermic* reaction, energy is taken in from the surroundings.

Draw a ring around the correct answer to complete the sentence.

In an *endothermic* reaction, the energy needed to break existing bonds is

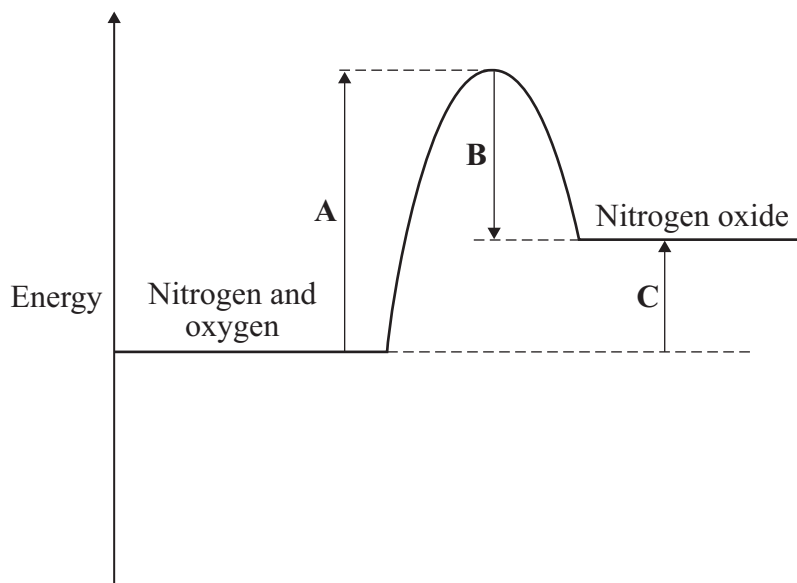
less than
more than
the same as

the energy released from forming new bonds.

(1 mark)



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



Use the energy level diagram to help you to answer these questions.

3 (d) (i) Which energy change, **A**, **B** or **C**, represents the *activation energy*?

(1 mark)

3 (d) (ii) Which energy change, **A**, **B** or **C**, shows that this reaction is *endothermic*?

(1 mark)

5

Turn over for the next question

Turn over ▶



- 4 Alums are salts. They have been used since ancient times in dyeing and medicine and still have many uses today.

Three alums are shown in the table:

Name	Ions present		
Ammonium alum	NH_4^+	Al^{3+}	SO_4^{2-}
Potassium alum	K^+	Al^{3+}	SO_4^{2-}
Sodium alum	Na^+	Al^{3+}	SO_4^{2-}

A student tested these alums to show which ions were present.

- 4 (a) The student did a flame test on these alums. A sample of each alum was held on a wire in a colourless flame.

In (a)(i) and (a)(ii) use the correct word from the box to complete each sentence.

blue	lilac	yellow	green
-------------	--------------	---------------	--------------

- 4 (a) (i) Sodium ions give a flame. (1 mark)
- 4 (a) (ii) Potassium ions give a flame. (1 mark)
- 4 (a) (iii) Draw a ring around the correct answer to complete the sentence.

The wire used in a flame test should have a high

density. electrical conductivity. melting point.
--

(1 mark)



4 (b) Draw a ring around the correct word to complete the sentences.

4 (b) (i) The student tested a solution of each salt for sulfate ions (SO_4^{2-}).

The student added dilute hydrochloric acid and

barium chloride
nitric acid
silver nitrate

 solution and
a white

gas
liquid
solid

 was formed.

(2 marks)

4 (b) (ii) The student tested a solution of each salt for aluminium ions (Al^{3+}).

The student added sodium hydroxide solution and a

green
red
white

 precipitate
was formed. When excess sodium hydroxide solution was added, the
precipitate

boiled.
condensed.
dissolved.

(2 marks)

7

Turn over for the next question

Turn over ►



5 Some people use water filters because they are concerned about the quality of drinking water.

5 (a) Draw a ring around the correct answer to complete each sentence.

5 (a) (i) One of the active chemicals in many water filters is

- | |
|------------|
| carbon. |
| magnesium. |
| sulfur. |

(1 mark)

5 (a) (ii) In many areas of the United Kingdom the water is hard.

The hardness in water is caused by

- | |
|----------|
| bromide |
| calcium |
| hydrogen |

ions.

(1 mark)

5 (b) Describe and give the result of a test to show that some drinking water is hard.

Test

.....

Result of test

.....

(2 marks)

5 (c) State and explain **one** benefit of drinking hard water.

.....

.....

.....

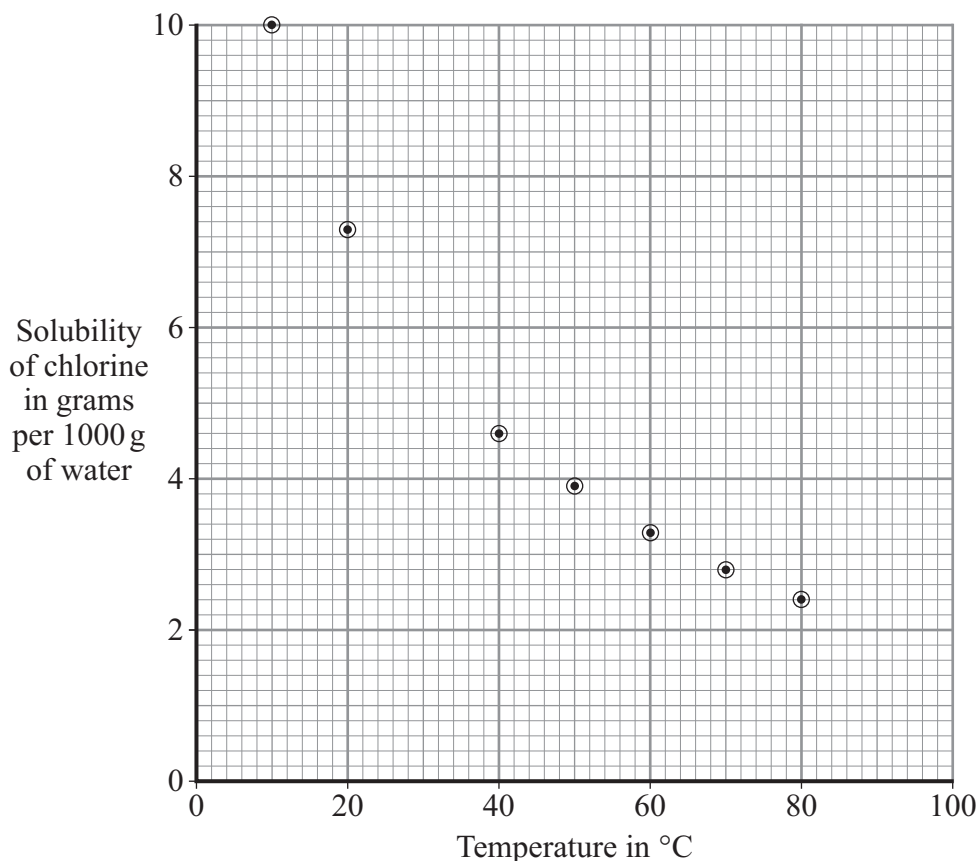
.....

(2 marks)

6



6 The points on the graph show the mass of chlorine that dissolves in 1000 g of water at different temperatures.



Use the graph to answer the following questions.

6 (a) Draw a smooth curve through all the points.

(1 mark)

6 (b) What is the mass of chlorine that dissolves in 1000 g of water at 30°C?

Mass = g
(1 mark)

6 (c) Calculate the mass of chlorine that bubbles out of 1000 g of water when the temperature increases from 10°C to 80°C.

.....
.....

Mass = g
(2 marks)

4

Turn over ►



7 Read the following information and then answer the questions.

Chlorine – for better, for worse?



Chlorine is used to make bleaches, plastics and medicines. Swimming pool water is often treated with chlorine.

Chlorine is used to make water safe to drink. It is relatively cheap and easy to use. People who drink untreated water risk dying from typhoid and cholera.

However, chlorine is a poisonous chemical. It causes breathing difficulties and can kill people. Some people are also allergic to chlorine.

7 (a) How does chlorine make water safe to drink?

.....
.....

(1 mark)

7 (b) The amount of chlorine in swimming pool water should be carefully monitored and controlled.

Explain why.

.....
.....
.....
.....

(2 marks)



7 (c) Developing countries are likely to choose chlorination as their method of making water safe to drink.

Suggest why.

.....
.....
.....

(1 mark)

7 (d) A government is setting up an enquiry into the safety of using chlorine.

7 (d) (i) Suggest why people from all political parties should be represented.

.....
.....
.....

(1 mark)

7 (d) (ii) Suggest why the opinion of a well-respected scientist might change the outcome of any discussion.

.....
.....
.....

(1 mark)

7 (d) (iii) The decision taken about the safety of using chlorine should be based on evidence and data rather than on hearsay and opinion.

Suggest why.

.....
.....
.....

(1 mark)

7

Turn over ►



- 8 Go Grease is a drain and oven cleaner.



The active ingredient in Go Grease is the alkali sodium hydroxide (NaOH).

- 8 (a) Name or give the formula of the ion that makes solutions alkaline.

.....
(1 mark)

- 8 (b) Sodium hydroxide is a *strong* alkali.

In terms of ionisation, what is meant by the word *strong*?

.....
.....
(1 mark)

- 8 (c) You are given solutions of sodium hydroxide and ammonia of the same concentration.

Describe and give the results of a test to show that sodium hydroxide is a stronger alkali than ammonia solution.

.....
.....
.....
.....
.....
(2 marks)

4

END OF QUESTIONS



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