

Surname		Other Names	
Centre Number		Candidate Number	
Candidate Signature			

For Examiner's Use

General Certificate of Secondary Education
January 2009



CHEMISTRY
Unit Chemistry C3

CHY3F
F

Foundation Tier

Thursday 15 January 2009 1.30 pm to 2.15 pm

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 maximum mark for this paper is 45.
- The marks for questions are shown in brackets.
- 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.

For Examiner's Use			
Question	Mark	Question	Mark
1		5	
2		6	
3			
4			
Total (Column 1)		→	
Total (Column 2)		→	
TOTAL			
Examiner's Initials			



J A N O 9 C H Y 3 F O 1

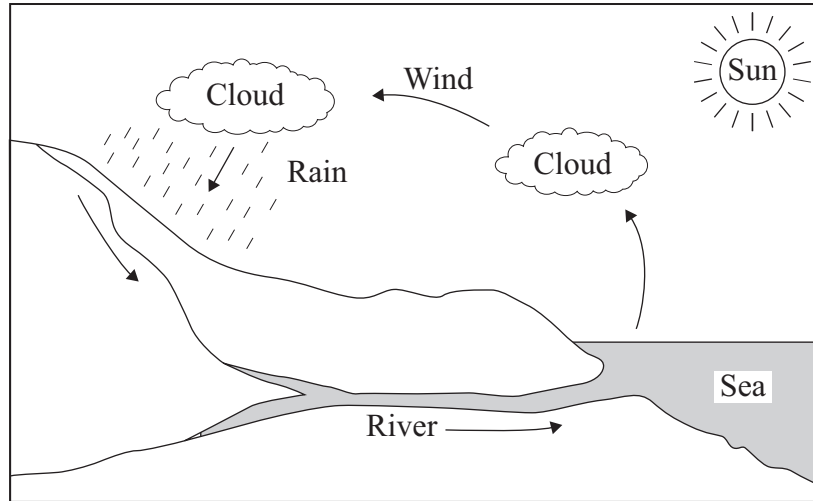
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CHY3F

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

1 Water is a natural resource.

1 (a) The diagram shows the *water cycle*.



Use the diagram to help you describe what happens in the *water cycle*.

.....

.....

.....

.....

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.....

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(3 marks)



1 (b) In some parts of the world the water is hard, but in other parts the water is soft.

Draw a ring around the correct answer to complete these sentences.

1 (b) (i) When water comes into contact with rocks, ions

condense

dissolve

evaporate

into the water.

(1 mark)

1 (b) (ii) Hardness in water is caused by

calcium

hydrogen

sodium

ions.

(1 mark)

1 (b) (iii) Hard water can be made soft by adding

sodium carbonate.

sodium chloride.

sodium sulfate.

(1 mark)

1 (b) (iv) The ions that cause hardness are removed by adding a substance

which

neutralises

oxidises

precipitates

them.

(1 mark)

Question 1 continues on the next page

Turn over ►



1 (c) Hard water reduces the efficiency of kettles.

The picture shows a heating element from a kettle.



Explain how hard water reduces the efficiency of kettles.

.....

.....

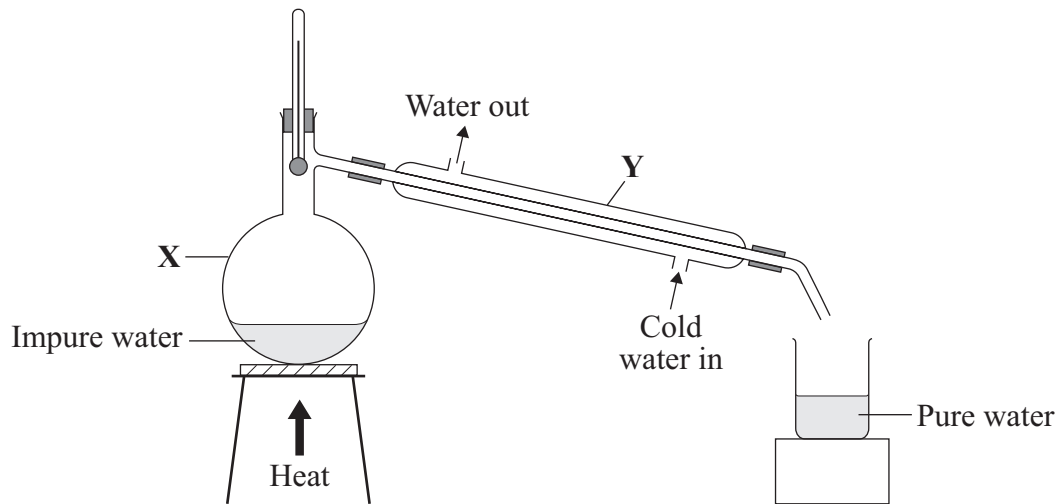
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.....

(2 marks)



- 1 (d) The diagram shows how pure water can be made from impure water by distillation.



Choose the correct words from the box to name apparatus **X** and **Y**.

beaker	condenser	flask	thermometer
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- 1 (d) (i) Apparatus **X** is a (1 mark)

- 1 (d) (ii) Apparatus **Y** is a (1 mark)

Turn over for the next question

Turn over ▶



2 Lemons contain citric acid.

Pure citric acid is a white solid that dissolves in water to form a weak acid.

2 (a) A student tested some solid citric acid with universal indicator paper.

Suggest why the universal indicator paper did **not** change colour.

.....

(1 mark)

2 (b) Citric acid produces hydrogen ions in aqueous solution.

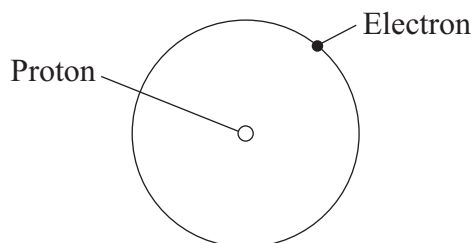
These ions can be represented as $H^+(aq)$.

Complete this sentence.

The (aq) means that the acid has been dissolved in

(1 mark)

2 (c) The diagram represents a hydrogen atom, H.



Use the diagram to explain why a hydrogen ion, H^+ , is a proton.

.....

(1 mark)

2 (d) Citric acid is a *weak* acid.

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

The word *weak* means that the acid

has a low boiling point.

is dilute.

is partially ionised in water.

(1 mark)



- 2 (e) A student measured the pH of four acids, **A**, **B**, **C** and **D**.

The acids were the same concentration. The same quantity of magnesium ribbon was added to each of the acids. The volume of gas produced after 5 minutes was recorded.

The results are shown in the table.

Acid	pH	Volume of gas in cm ³
A	2	18
B	5	6
C	1	24
D	4	12

- 2 (e) (i) State **one** way in which the student made sure that the experiment was fair.

.....
(1 mark)

- 2 (e) (ii) Use the results to arrange the acids, **A**, **B**, **C** and **D** in order of **decreasing** acid strength.

Most acidic Least acidic.
(1 mark)

- 2 (f) When acids react with alkalis, the hydrogen ions from the acid react with the hydroxide ions from the alkali.

- 2 (f) (i) Which **one** of the following represents the formula of a hydroxide ion?

Draw a ring around your answer.



(1 mark)

- 2 (f) (ii) Draw a ring around the correct answer to complete the sentence.

A solution with more hydrogen ions than hydroxide ions is

acidic.
alkaline.
neutral.

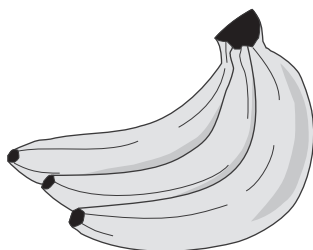
(1 mark)

8

Turn over ►



3 Ethene causes bananas to ripen.



Unsaturated organic molecules such as ethene can be identified by a chemical test using bromine water.

3 (a) Draw a ring around the correct answer to complete these sentences.

3 (a) (i) *Unsaturated* means that the molecule

- contains a carbon carbon single bond.
- contains a carbon carbon double bond.
- does **not** contain a carbon carbon bond.

(1 mark)

3 (a) (ii) The colour of bromine water is

- blue.
- green.
- orange.

(1 mark)

3 (a) (iii) When ethene is shaken with bromine water, the bromine water is

- darkened.
- decolourised.
- denatured.

(1 mark)



3 (b) Ethene can also be identified using instrumental methods.

3 (b) (i) Name **one** instrumental method used to identify elements or compounds.

.....

.....
(1 mark)

3 (b) (ii) Give **one** advantage of using instrumental methods compared with chemical tests.

.....

.....
(1 mark)

5

Turn over for the next question

Turn over ►



4 The periodic table on the Data Sheet may help you to answer some of these questions.

4 (a) Draw a ring around the correct answer to complete these sentences.

4 (a) (i) Dimitri Mendeleev attempted to classify

compounds.

elements.

mixtures.

(1 mark)

4 (a) (ii) He arranged them in order of their

atomic weight.

boiling point.

electrical conductivity.

(1 mark)

4 (a) (iii) They are now arranged in order of their

atomic (proton) number.

atomic weight.

mass number.

(1 mark)

4 (b) In the periodic table between Groups 2 and 3 there is a block of metals which includes chromium, iron and nickel.

4 (b) (i) Which **one** of the following is the correct name for this block of metals?

Draw a ring around the correct answer.

alkali metals

reactive metals

transition metals

(1 mark)

4 (b) (ii) The properties of iron and those of the Group 1 metal sodium are different.

Put a tick (✓) next to the **two** correct phrases which could complete the following sentence.

Compared to sodium, iron

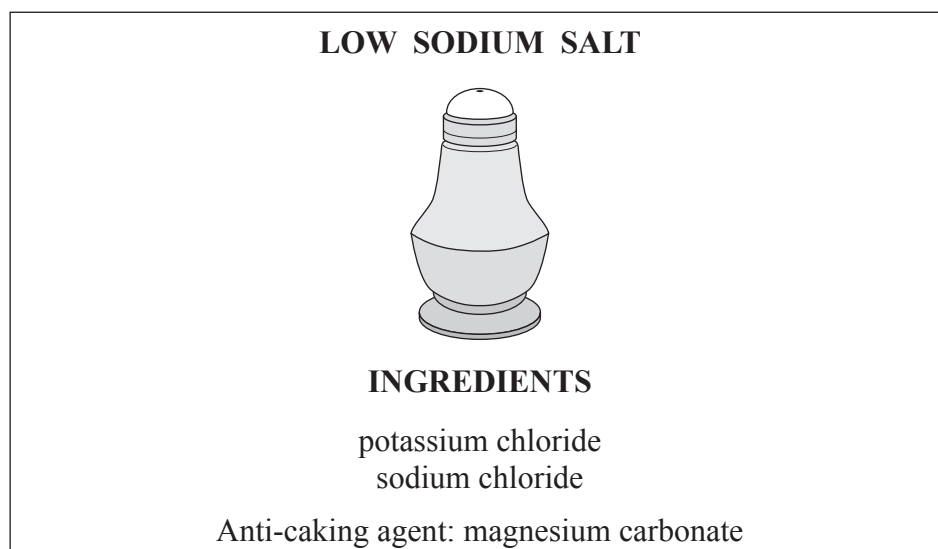
	(✓)
has a higher melting point.	
has a lower density.	
is harder.	
is more reactive.	
is weaker.	

(2 marks)

6



- 5 The label is from a packet of Low Sodium Salt.



- 5 (a) A student tested some Low Sodium Salt to show that it contains carbonate ions and chloride ions.

- 5 (a) (i) Describe and give the result of a test for carbonate ions.

.....

.....

.....

.....

(2 marks)

- 5 (a) (ii) A student identified chloride ions using acidified silver nitrate solution.

State what you would **see** when acidified silver nitrate solution is added to a solution of Low Sodium Salt.

.....

(1 mark)

- 5 (a) (iii) Flame tests can be used to identify potassium ions and sodium ions.

Suggest why it is difficult to identify **both** of these ions in Low Sodium Salt using a flame test.

.....

.....

(1 mark)

Question 5 continues on the next page

Turn over ►



- 5 (b) Read the following information and then answer the questions.

Salt – friend or foe?

Sodium chloride (salt) is an essential mineral for our health. It is used to flavour and preserve foods. Too much sodium in our diet may increase the risk of high blood pressure and heart disease. Heart disease is the biggest cause of death in the United Kingdom. Some people claim that excess sodium is a poison that can cause cancer, while others say that more evidence is needed.

Many processed foods contain salt, so it is easy to exceed the recommended daily upper limit of about 5 g of salt per person. A ‘healthier’ amount should be about 3 g. In the United Kingdom many people consume over 10 g of salt each day.

One way to reduce sodium in our diet is to use Low Sodium Salt. This has two thirds of the sodium chloride replaced by potassium chloride.

A national newspaper asked readers for their views on two options.

Option 1: Ban the use of sodium chloride in foods.

Option 2: Reduce the amount of sodium chloride in **all** foods to a ‘healthier’ level.

- 5 (b) (i) Suggest why Option 1 was rejected.

.....
.....

(1 mark)



5 (b) (ii) Suggest **two** advantages and **one** disadvantage of Option 2.

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(3 marks)

8

Turn over for the next question

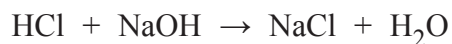
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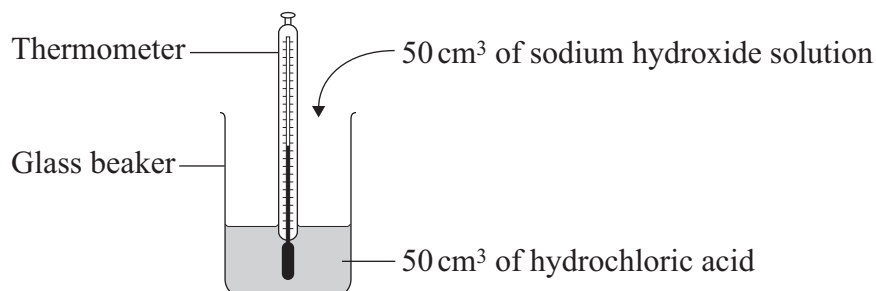
6 Read the information about energy changes and then answer the questions.

A student did an experiment to find the energy change when hydrochloric acid reacts with sodium hydroxide.

The equation which represents the reaction is:



The student used the apparatus shown in the diagram.



The student placed 50 cm³ of hydrochloric acid in a glass beaker and measured the temperature.

The student then quickly added 50 cm³ of sodium hydroxide solution and stirred the mixture with the thermometer. The highest temperature was recorded.

The student repeated the experiment, and calculated the temperature change each time.

	Experiment 1	Experiment 2	Experiment 3	Experiment 4
Initial temperature in °C	19.0	22.0	19.2	19.0
Highest temperature in °C	26.2	29.0	26.0	23.5
Temperature change in °C	7.2	7.0	6.8	4.5



- 6 (a) The biggest error in this experiment is heat loss.

Suggest how the apparatus could be modified to reduce heat loss.

.....
.....

(1 mark)

- 6 (b) Suggest why it is important to stir the chemicals thoroughly.

.....

(1 mark)

- 6 (c) Which **one** of these experiments was probably carried out on a different day to the others?

Explain your answer.

.....
.....

(1 mark)

- 6 (d) Suggest why experiment 4 should **not** be used to calculate the average temperature change.

.....
.....

(1 mark)

- 6 (e) Calculate the average temperature change from the first three experiments.

.....

Answer = °C

(1 mark)

- 6 (f) Use the following equation to calculate the energy change for this reaction.

energy change in joules = $100 \times 4.2 \times$ average temperature change

.....

Answer = J

(1 mark)

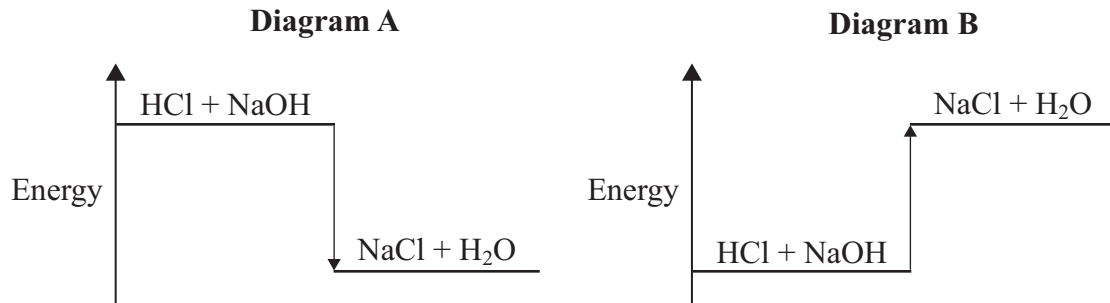
Question 6 continues on the next page

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- 6 (g) Which **one** of these energy level diagrams, **A** or **B**, represents the energy change for this reaction?

Explain why.



.....

(1 mark)

7

END OF QUESTIONS

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