

Surname		Other Names	
Centre Number		Candidate Number	
Candidate Signature			

For Examiner's Use

General Certificate of Secondary Education
January 2008

CHEMISTRY
Unit Chemistry C3

Foundation Tier

Friday 18 January 2008 1.30 pm to 2.15 pm

<p>For this paper you must have:</p> <ul style="list-style-type: none"> the Data Sheet (enclosed) a pencil. <p>You may use a calculator.</p>

Time allowed: 45 minutes

Instructions

- Use blue or black ink or ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- Answer the questions in the spaces provided.
- 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.

CHY3F
F



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



J A N O 8 C H Y 3 F O 1

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

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

Part of the periodic table is shown below.

B												C					A	
						D												
	E																	

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

Which letter, **A** to **E**, represents:

- | | |
|----------------------------|-----------------|
| (i) sodium | Letter |
| | <i>(1 mark)</i> |
| (ii) a non-metal | Letter |
| | <i>(1 mark)</i> |
| (iii) a Group 2 element | Letter |
| | <i>(1 mark)</i> |
| (iv) a transition element? | Letter |
| | <i>(1 mark)</i> |



(b) Complete these sentences by drawing a ring around the correct answer.

(i) Attempts to classify the elements into a periodic table were made

by

Arrhenius and Dalton
Brønsted and Lowry
Mendeleev and Newlands

(1 mark)

(ii) They arranged the elements in order of their

atomic weight
melting point
reactivity

(1 mark)

(iii) They put elements in the same Group if they had similar

boiling points
chemical reactions
electrical conductivities

(1 mark)

(iv) We now know that elements in the same Group have the same number of

electrons
neutrons
protons

in their outer shell (energy level).

(1 mark)

8

Turn over ►



- 2 A bottle of washing soda was found in a school laboratory. The modern name of washing soda is sodium carbonate.



A student tested the washing soda to prove that it was sodium carbonate.

- (a) The student did a flame test to show that washing soda is a sodium compound.

The student used a clean wire to put the washing soda into the flame.

- (i) Why should the wire be clean when used for a flame test?

.....
(1 mark)

- (ii) The table shows some properties of metals.

Two of these are properties that the wire must have if it is used for a flame test.

Put a tick (✓) next to the **two** correct properties.

Property	(✓)
Good electrical conductor	
High density	
High melting point	
Low boiling point	
Unreactive	

(2 marks)



- (iii) Which **one** of the following flame colours shows that washing soda is a sodium compound?

Draw a ring around your answer.

brick-red

lilac

yellow-orange

(1 mark)

- (b) The student used dilute hydrochloric acid to show that washing soda was a carbonate. Carbon dioxide gas was given off.

- (i) Describe what you **see** happening when a gas is given off.

.....

(1 mark)

- (ii) The student used limewater to prove that the gas given off was carbon dioxide.

Complete this sentence by choosing the correct word from the box.

clear

colourless

milky

When carbon dioxide reacts with limewater, the limewater turns

.....
 (1 mark)

- (c) Instrumental methods are used to identify chemicals.

Describe some advantages of instrumental methods compared with chemical tests by considering:

- the length of time needed to carry out a test
- the amount of chemical used.

.....

(2 marks)

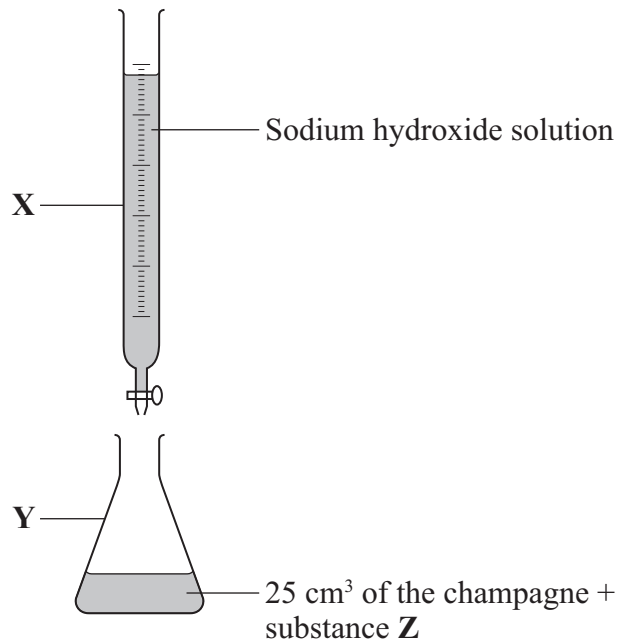
8

Turn over ►



- 3 In 1916 a ship was sunk by a German submarine. The ship was carrying bottles of champagne. The wreck was discovered in 1997 and the champagne was brought to the surface and analysed.

The diagram shows the apparatus used to find the amount of acid in 25 cm³ of the champagne.



- (a) Choose the correct words from the box to name apparatus **X** and **Y**.

beaker	burette	conical flask	measuring cylinder
--------	---------	---------------	--------------------

- (i) Apparatus **X** is a
(1 mark)
- (ii) Apparatus **Y** is a
(1 mark)



- (b) Sodium hydroxide solution was added to this champagne until substance **Z** showed that the reaction was complete. The volume of sodium hydroxide used was recorded. The result was used to calculate the amount of acid present.

Complete these sentences by drawing a ring around the correct answer.

- (i) Substance **Z** is

a catalyst
a conductor
an indicator

(1 mark)

- (ii) The reaction was complete when substance **Z**

changed colour
formed a gas
gave a precipitate

(1 mark)

- (iii) The name of this method of analysis is

distillation
filtration
titration

(1 mark)

- (c) 250 cm³ of this champagne were found to contain 1 g of acid.

Calculate the mass of acid in 750 cm³ of this champagne.

.....

.....

.....

Mass = g
(2 marks)

Question 3 continues on the next page

Turn over ►



- (d) (i) Which **one** of the following ions makes champagne acidic?

Draw a ring around your answer.

chloride

hydrogen

sodium

(1 mark)

- (ii) The acid in champagne is a *weak* acid.

Complete this sentence by drawing a ring around the correct answer.

The word *weak* means that the acid

has a low boiling point

is dilute

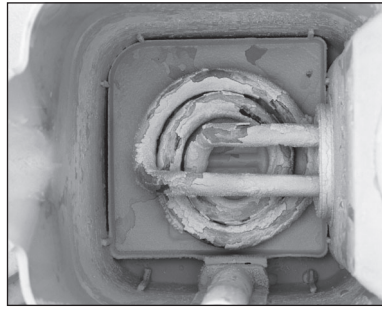
is partially ionised

(1 mark)

9



4 Two problems of hard water are scale and scum, as shown in the pictures of a heating element and a wash basin.



(a) Name **one** ion that causes water to be hard.

.....
(1 mark)

(b) Hard water can be softened using an ion-exchange column.

Complete this sentence by choosing the correct word from the box.

aluminium copper sodium

When hard water passes through the column, the ions that cause hardness are exchanged for ions, and soft water is produced.
(1 mark)

(c) Describe how soap solution can be used to show that the water going into the column is hard **and** the water coming out is soft.

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

(3 marks)

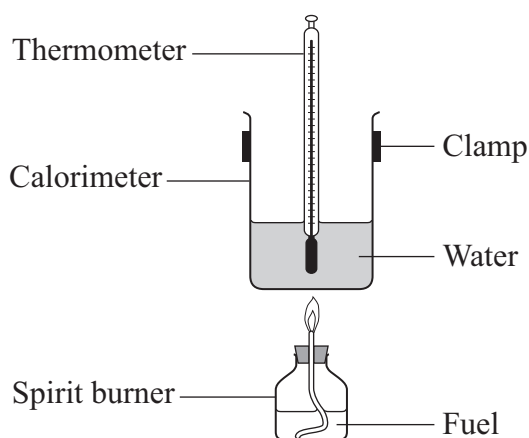
5

Turn over ▶



- 5 A student burned four fuels and compared the amounts of energy they produced.

The student set up the apparatus as shown in the diagram.



The heat produced when each fuel was burned was used to raise the temperature of 100 g of water. The student noted the mass of fuel burned, the increase in temperature and whether the flame was smoky.

The results are shown in the table.

Fuel	Mass of fuel burned (g)	Temperature increase ($^{\circ}\text{C}$)	Type of flame
Ethanol	4	24	Not smoky
Methanol	3	9	Not smoky
Peanut oil	2	20	Smoky
Vegetable oil	1	15	Smoky

- (a) The student suggested that the vegetable oil was the best fuel for producing heat.

Explain why.

.....

.....

.....

.....

(2 marks)



(b) Suggest an environmental problem that could be caused when large amounts of vegetable oil are burned. Suggest how the problem could be overcome.

.....

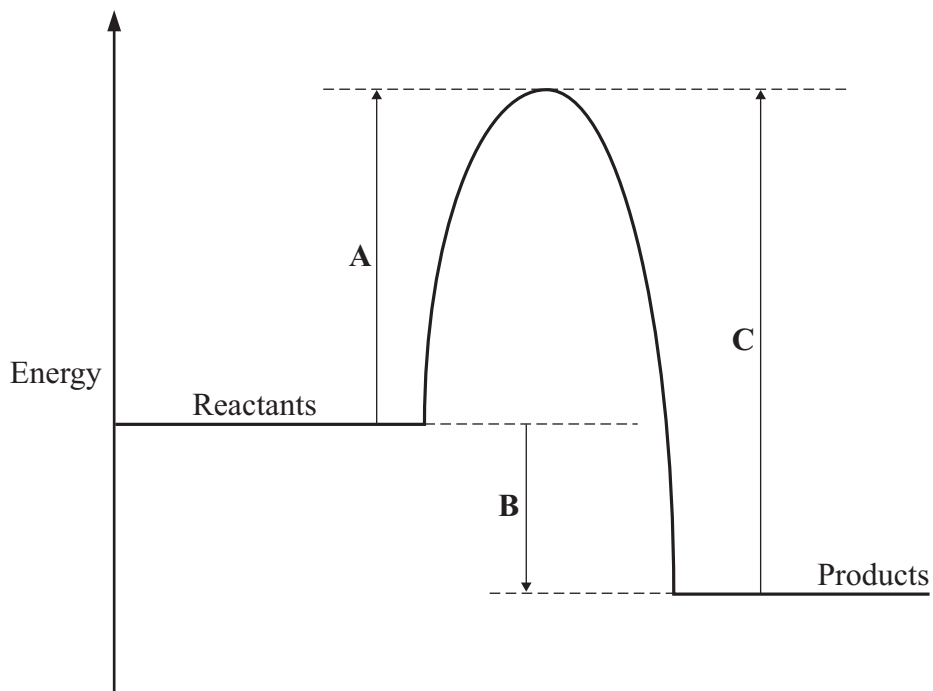
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.....

.....

(2 marks)

(c) An energy level diagram for the burning of vegetable oil is shown below.



Which of the energy changes **A**, **B** or **C**:

(i) represents the activation energy
(1 mark)

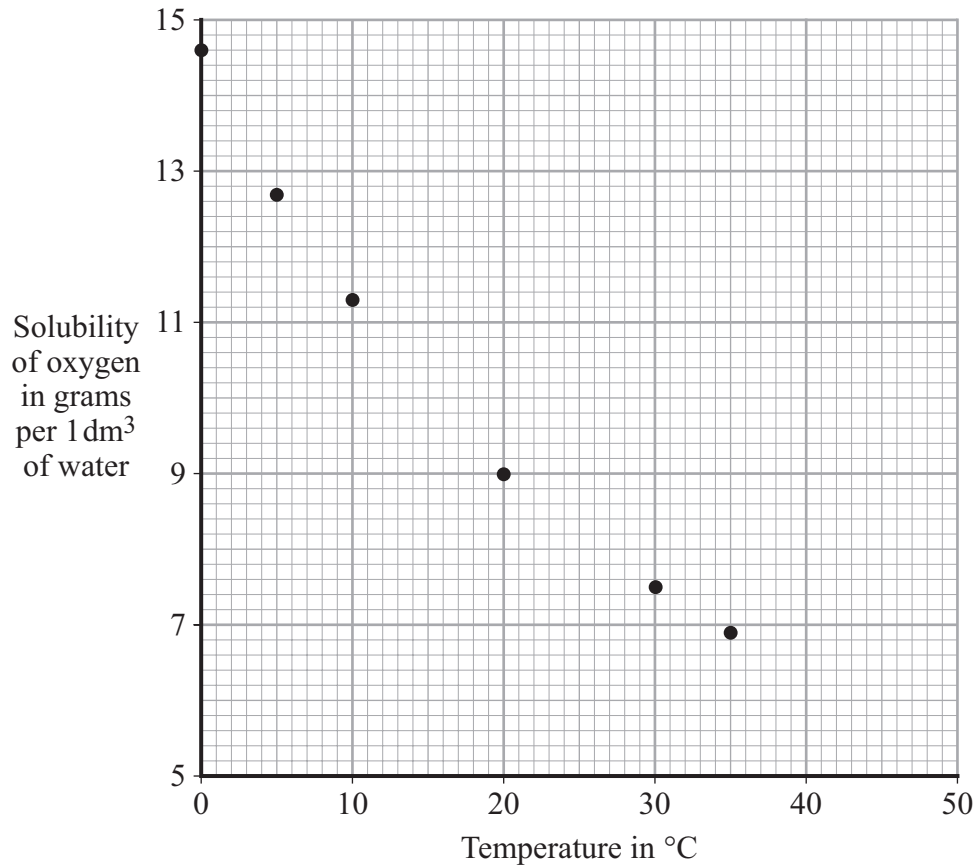
(ii) shows the amount of energy given out during the reaction?
(1 mark)

6

Turn over ►



- 6 The points on the graph show the mass of oxygen that dissolves in 1 dm³ of water at different temperatures.



Use the graph to answer the following questions.

- (a) (i) Draw a smooth curve through the points, extending your curve to 50°C. (1 mark)
- (ii) Use your curve to estimate the mass of oxygen that dissolves in 1 dm³ of water at 50°C.

Mass = g
(1 mark)



- (iii) What mass of oxygen gas comes out of 1 dm³ of water when the temperature increases from 15 °C to 50 °C?

.....
.....

Mass = g
(2 marks)

- (iv) A student claimed that they were more sure of the value at 15 °C than the value at 50 °C.

Do you agree? Explain the reason for your answer.

.....
.....

(1 mark)

Question 6 continues on the next page

Turn over ►



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

Dissolved oxygen is essential for aquatic life. For example, trout need about 7 g/dm^3 of dissolved oxygen. They can live in concentrations down to about 5 g/dm^3 for short periods but are likely to die if the water temperature is above 26°C .

The amount of oxygen dissolved in water depends on many factors, including whether it is summer or winter, day or night. Factors such as photosynthesis and the action of wind add oxygen to water. Respiration of aquatic plants at night, decomposition of organic matter and higher temperatures remove oxygen.

The management of a factory wants to put small amounts of waste hot water at 50°C directly into a lake that contains trout. The local council has objected to this proposal and there is to be an Independent Public Enquiry.

- (i) Suggest why it is important to have an Independent Public Enquiry into adding hot water to this lake.

.....
.....

(1 mark)

- (ii) Suggest how the experience and status of the people giving evidence at the Public Enquiry could influence the final decision.

.....
.....

(1 mark)



- (iii) At the Public Enquiry, the factory management and the council gave their opinions. Suggest what these opinions were by completing the sentences.

The factory management said that there was **no** risk to the trout because

.....
.....

The council said that there **was** a risk to the trout because

.....
.....

(2 marks)

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END OF QUESTIONS



There are no questions printed on this page

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