



General Certificate of Secondary Education  
2010–2011

Centre Number

71

Candidate Number

**Science: Double Award (Modular)**  
Using Materials and Understanding Reactions  
End of Module Test

Higher Tier

**B**

[GDB02]



THURSDAY 24 FEBRUARY 2011, MORNING

**TIME**

45 minutes.

**INSTRUCTIONS TO CANDIDATES**

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.  
Write your answers in the spaces provided in this question paper.  
Answer **all twelve** questions.

**INFORMATION FOR CANDIDATES**

The total mark for this paper is 50.  
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.  
A Data Leaflet, which includes a Periodic Table of the elements, is provided for your use.

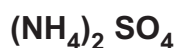
For Examiner's  
use only

Question Number	Marks
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	

**Total  
Marks**



1 The chemical formula for ammonium sulphate is:



(a) How many **different** elements are there in this compound?

\_\_\_\_\_ [1]

(b) How many hydrogen atoms are there in one molecule of ammonium sulphate?

\_\_\_\_\_ [1]

(c) What is the total number of atoms in one molecule of ammonium sulphate?

\_\_\_\_\_ [1]

2 Oxygen is a mixture of  $^{16}\text{O}$  and  $^{18}\text{O}$ .

You may find your Data Leaflet helpful.

(a) Explain, in terms of particles, how the nucleus of  $^{16}\text{O}$  is different from the nucleus of  $^{18}\text{O}$ .

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_ [2]

(b) Complete the sentence below using a phrase from the list.

**just as reactive as      more reactive than      less reactive than**

Atoms of  $^{16}\text{O}$  are \_\_\_\_\_ atoms of  $^{18}\text{O}$ . [1]

Examiner Only

Marks Remark

3 When sulphuric acid is added to copper carbonate a chemical reaction occurs.

(a) (i) Complete the symbol equation for the reaction of copper carbonate with dilute sulphuric acid.



(ii) What colour change would you observe during this reaction?

\_\_\_\_\_ to \_\_\_\_\_ [2]

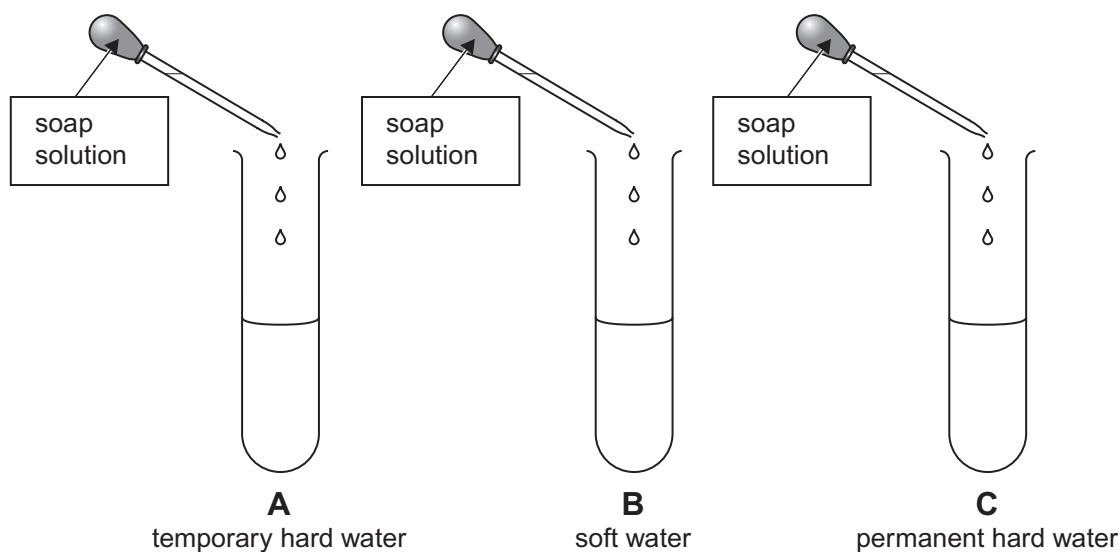
(b) If hydrochloric acid is added to copper carbonate, what gas would be produced?

\_\_\_\_\_ [1]

Examiner Only

Marks Remark

- 4 An experiment was carried out to investigate the effect of soap and detergent on three different water samples **A**, **B** and **C**.



Each test tube was shaken after the three drops of soap solution were added. The experiment was then repeated with fresh water samples, using detergent instead of soap.

- (a) Complete the results table below to show what would be observed for each water sample.

Water sample	Observation with soap	Observation with detergent
<b>A</b> temporary hard	no lather	
<b>B</b> soft		lather
<b>C</b> permanent hard		

[2]

- (b) Explain what is meant by the term **temporary** hard water.

\_\_\_\_\_

\_\_\_\_\_ [1]

- (c) Give one advantage and one disadvantage of hard water.

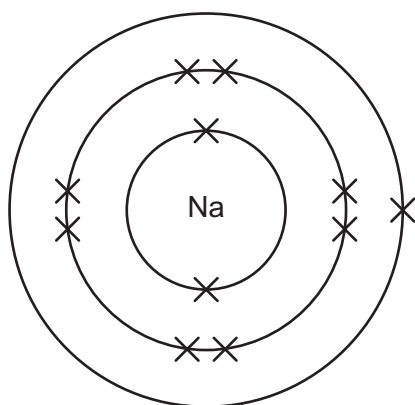
Advantage \_\_\_\_\_

Disadvantage \_\_\_\_\_ [2]

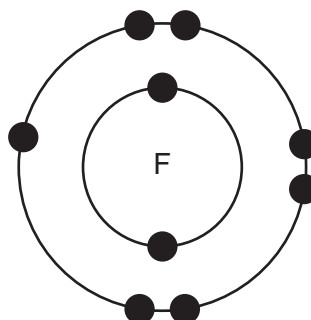
Examiner Only

Marks Remark

- 5 When sodium reacts with fluorine it forms a compound called sodium fluoride. The electronic structures of a sodium atom and fluorine atom are shown below.



sodium atom



fluorine atom

- (a) Draw the electronic structures for the **ions** produced from these atoms in the space below and include their charges.

**sodium ion**

**fluoride ion**

[2]

Charge on sodium ion \_\_\_\_\_

Charge on fluoride ion \_\_\_\_\_

[1]

- (b) The force joining these ions together is described as:

**electrostatic**

**electronic**

**magnetic**

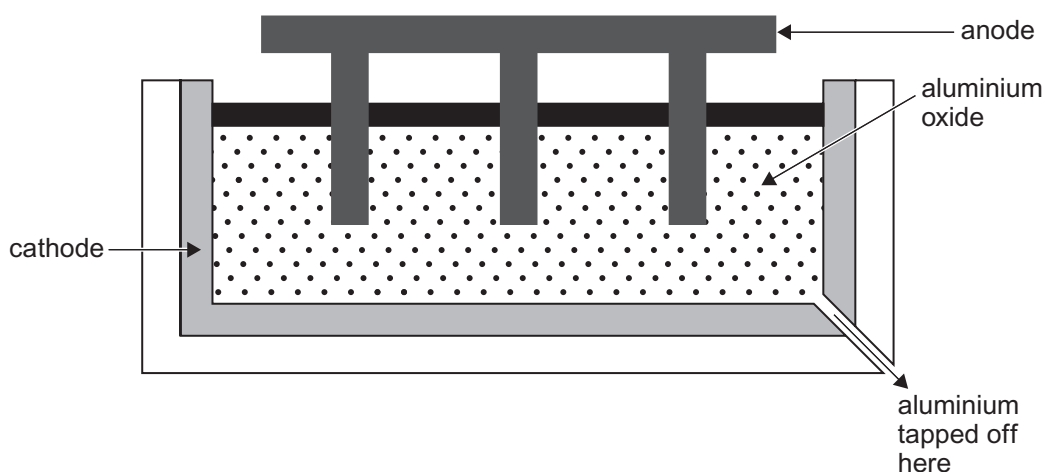
Circle the correct answer.

[1]

Examiner Only

Marks Remark

- 6 Aluminium metal is produced by passing electricity through a cell containing molten aluminium oxide.



The aluminium is formed at the cathode.

- (a) What is the meaning of the term **cathode**?

\_\_\_\_\_ [1]  
 \_\_\_\_\_

- (b) Name the substance which is used to make the **anode**.

\_\_\_\_\_ [1]

- (c) What substance is formed at the **anode** during this reaction?

\_\_\_\_\_ [1]

Examiner Only	
Marks	Remark

7 Methane is the chemical name for the natural gas which is piped into many homes in Northern Ireland. It has the chemical formula  $\text{CH}_4$ .

(a) Draw a diagram to show how **all** the electrons are arranged in a molecule of methane.

[2]

(b) Name the type of bonding in methane.

\_\_\_\_\_ [1]

(c) Which one of the following would you expect to have the same kind of bonding as methane? Tick the correct box.

sodium chloride

sulphur dioxide

magnesium chloride

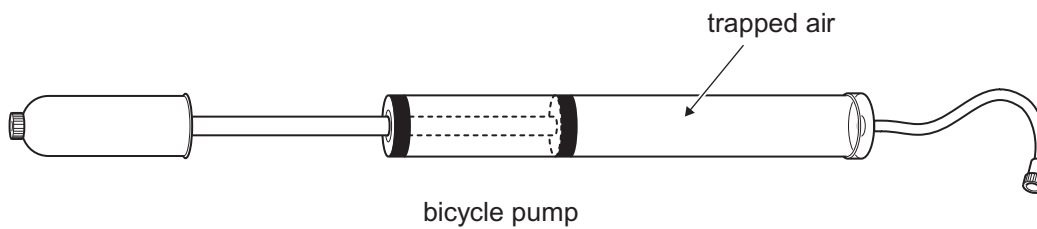
[1]

Examiner Only

Marks

Remark

- 8 The diagram shows a bicycle pump containing  $50 \text{ cm}^3$  of trapped air at a temperature of  $280 \text{ K}$  when a student pushed on the handle causing a pressure of  $9240 \text{ Pa}$ .



What would the volume of air be if the pressure was increased to  $16000 \text{ Pa}$  at a temperature of  $320 \text{ K}$ ?

$$\frac{PV}{T} = \text{a constant}$$

Show your working out and **give the units**.

Answer: \_\_\_\_\_ [4]

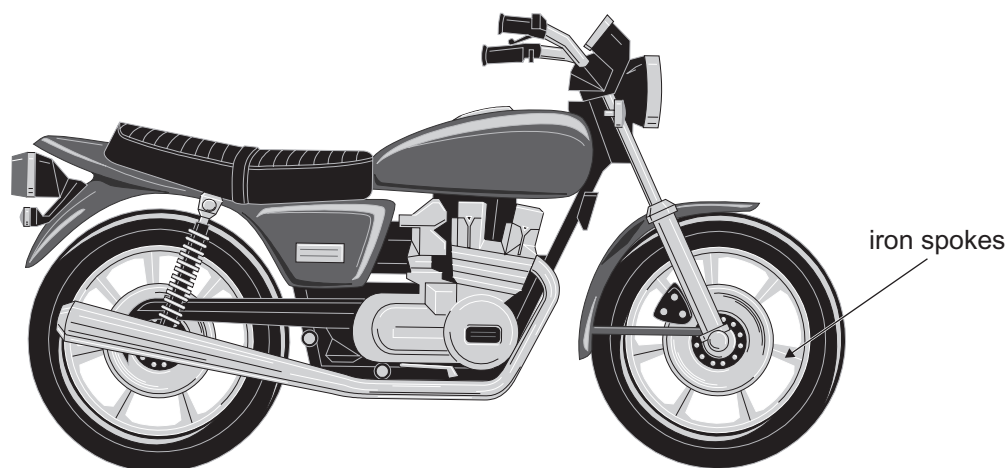
Examiner Only

Marks

Remark



- 9 Peter is very proud of his new motorbike. He is determined to protect it from rusting.



- (a) What is the full chemical name for rust?

\_\_\_\_\_ [2]

The manufacturers have galvanised the iron spokes.

- (b) (i) What is meant by the term **galvanised**?

\_\_\_\_\_  
\_\_\_\_\_ [1]

- (ii) How does galvanising protect the iron spokes from rusting?

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_ [2]

Examiner Only

Marks Remark

- 10 The substances below may be classified as ionic, metallic, covalent, molecular or giant covalent in terms of their properties.

Substance	Melting point °C	Boiling point °C	Electrical conductivity	
			When solid	When molten
A	3730	4830	Poor	Poor
B	1083	2600	Good	Good
C	119	445	Poor	Poor
D	975	1465	Poor	Good
E	-182	-161	Poor	Poor

- (a) Which substance, A, B, C, D or E could be made up of oppositely charged ions joined together?

\_\_\_\_\_ [1]

- (b) Which substance A, B, C, D or E has a simple molecular structure and is a solid at room temperature?

\_\_\_\_\_ [1]

- (c) Which substance A, B, C, D or E could be used as a conductor in an electrical circuit?

\_\_\_\_\_ [1]

- (d) Give the name of a substance which could be A and explain your answer.

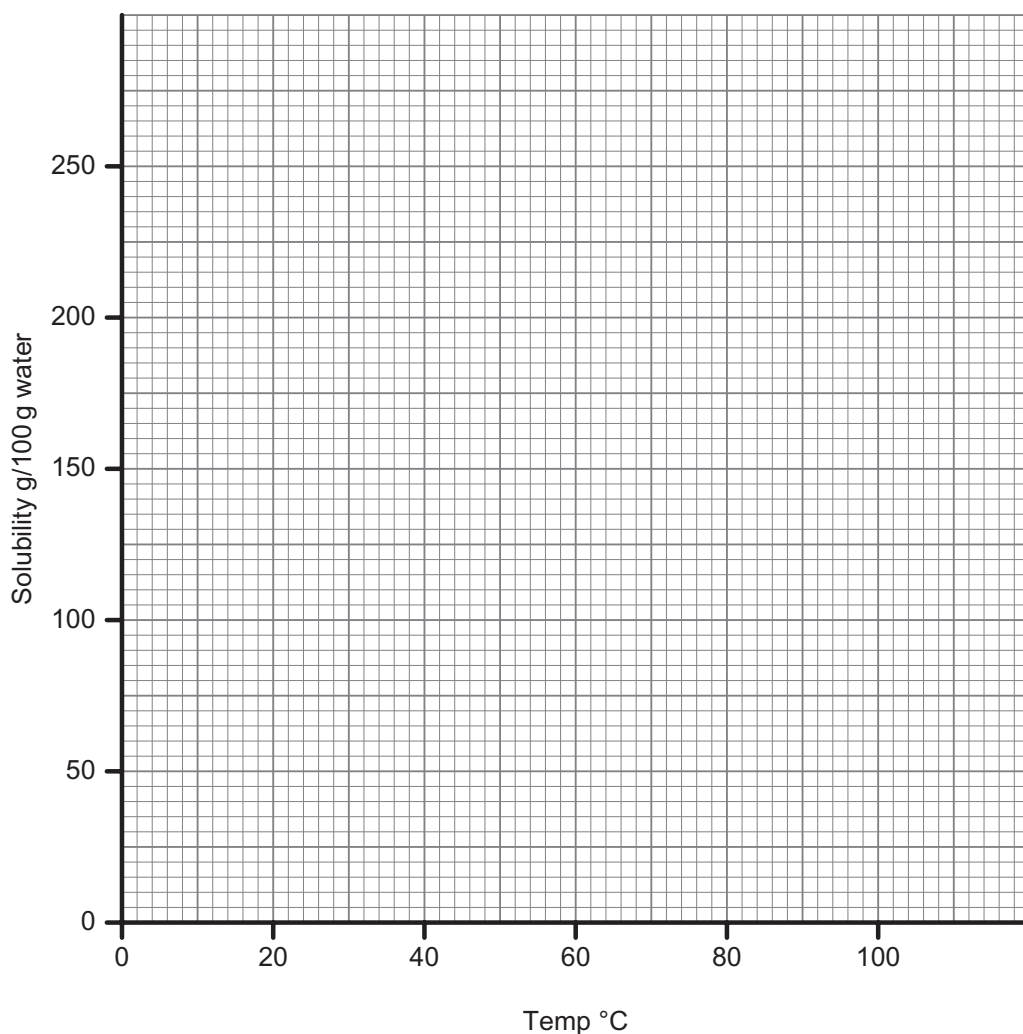
\_\_\_\_\_  
\_\_\_\_\_ [2]

Examiner Only

Marks Remark

- 11 (a) Use the data given to draw a solubility curve for potassium nitrate on the grid below.

Temperature °C	0	10	20	40	60	80	100
Solubility g/100g water	13	20	30	67	110	170	245



[3]

- (b) Use the graph to find the solubility of potassium nitrate at 90 °C.

Solubility \_\_\_\_\_ g/100g water [1]

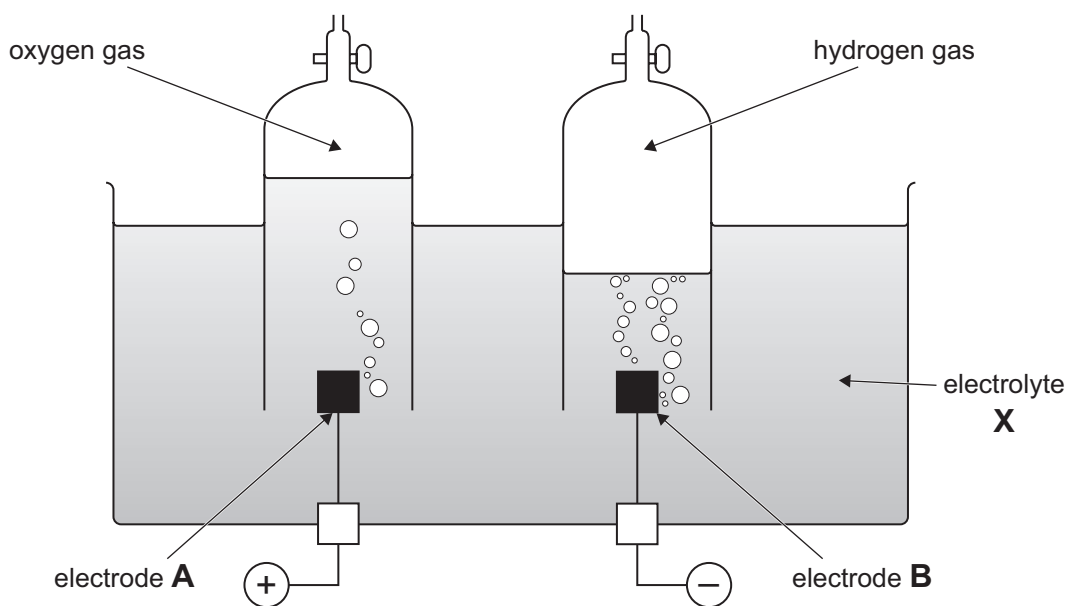
- (c) If a saturated solution is cooled in 100g water from 90 °C to 30 °C, how much potassium nitrate would be precipitated?

Answer \_\_\_\_\_ g [2]

Examiner Only

Marks	Remark

- 12 This diagram shows apparatus used to collect gases formed when electricity is passed through the electrolyte X.



- (a) During this electrolysis, hydrogen gas and oxygen gas are produced. Sulphate ions ( $\text{SO}_4^{2-}$ ) remain in the solution.

What is the name of electrolyte X?

\_\_\_\_\_ [1]

- (b) Write an ionic equation to show how hydrogen is produced at electrode B.

\_\_\_\_\_ [2]

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**THIS IS THE END OF THE QUESTION PAPER**

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Marks Remark







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