



Centre Number

71

Candidate Number

General Certificate of Secondary Education
2009–2010

Science: Double Award (Modular)

Using Materials and Understanding Reactions
End of Module Test
Higher Tier

B

[GDB02]



WEDNESDAY 24 FEBRUARY 2010, 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 Sodium hydrogen carbonate, NaHCO_3 , is known as baking soda.

(a) (i) How many **elements** are present in sodium hydrogen carbonate?

_____ [1]

(ii) How many **oxygen atoms** are present in the formula for sodium hydrogen carbonate?

_____ [1]

(b) Sodium hydrogen carbonate decomposes when heated to form sodium carbonate, carbon dioxide and water.

Write the formula of sodium carbonate. You may find your Data Leaflet helpful.

_____ [1]

Examiner Only

Marks Remark

2 The names of five different types of chemical reaction are given below.

combustion

electrolysis

neutralisation

reduction

oxidation

A, B, C, D and **E** below are statements or equations describing chemical reactions. Using the names given above state the type of reaction described by **A, B, C, D** and **E**. The first one is done for you.

Chemical Reaction	Type of reaction
A Fuel is burned to give out energy, water and carbon dioxide.	combustion
B $\text{NaOH} + \text{HCl} \rightarrow \text{NaCl} + \text{H}_2\text{O}$	_____
C Molten aluminium oxide is decomposed into its elements by the passage of electricity.	_____
D $\text{CuO} + \text{H}_2 \rightarrow \text{Cu} + \text{H}_2\text{O}$	_____
E Iron reacts with oxygen in the air to form hydrated iron oxide.	_____

[4]

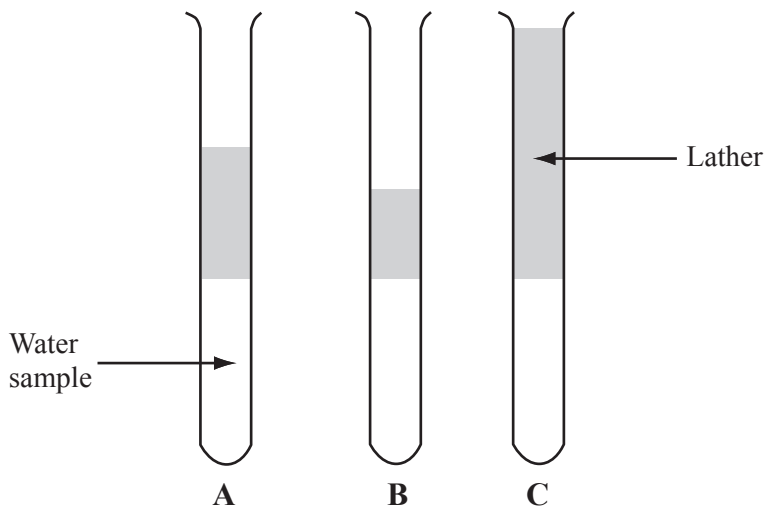
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Marks

Remark

3 Samples of water from three different towns, **A**, **B** and **C** were tested for hardness.

Soap solution (5 cm^3) was added to 10 cm^3 of each water sample and shaken. The height of the lather formed was noted. The diagram below represents the results.



(a) What is meant by hard water?

[1]

(b) Which town, **A**, **B** or **C** had the hardest water supply?

[1]

(c) State **one** disadvantage of hard water.

[1]

Examiner Only

Marks Remark

4 Acids react with alkalis to form salts.

(a) Complete the table by filling in the missing chemicals.

Acid	Alkali	Salt
sulphuric acid	potassium hydroxide	
	potassium hydroxide	potassium chloride
nitric acid		sodium nitrate

[3]

(b) Apart from a salt, what other substance is formed when an acid reacts with an alkali?

_____ [1]

Examiner Only

Marks Remark

- 5 There are three particles in an atom, the proton, the electron and the neutron. Complete the table below to give the relative mass, the charge and the position of each particle in the atom.

Name of particle	Charge	Relative mass	Position of particle in the atom
proton		1	
electron	-1		outside the nucleus
neutron		1	in the nucleus

[4]

Examiner Only	
Marks	Remark

6 This question is about the element chlorine.

(a) Chlorine exists as two isotopes. What is an isotope?

[2]

(b) Chlorine can form compounds with both metals and non-metals.

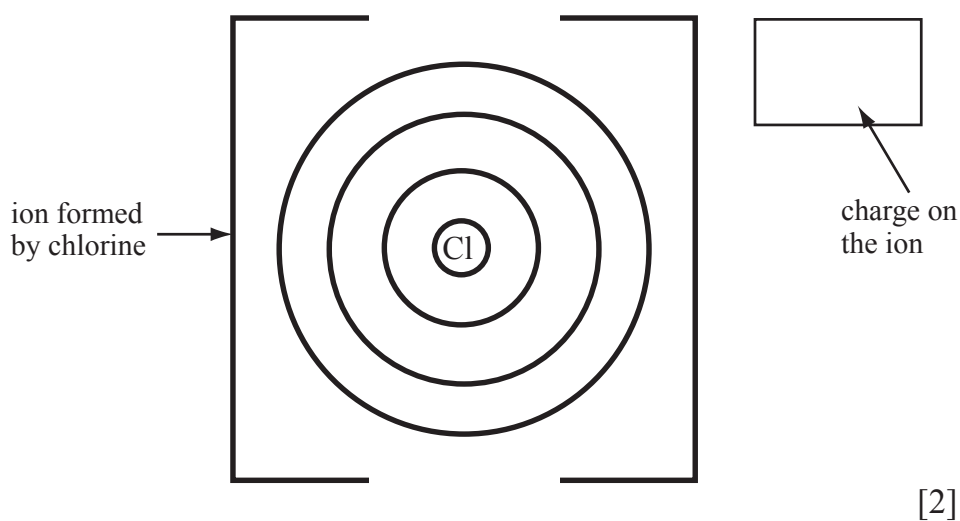
When it forms a compound with a non-metal such as hydrogen, the chlorine and the hydrogen share one electron each on their outer shells.

What is this type of bond called?

[1]

(c) When chlorine forms a compound with a metal such as sodium, the chlorine and the sodium form ions.

(i) Complete the labelled diagram below to show the arrangement of all the electrons in the **ion** formed by chlorine and give the charge on the ion.



(ii) What is the **name** of the **ion** formed by chlorine?

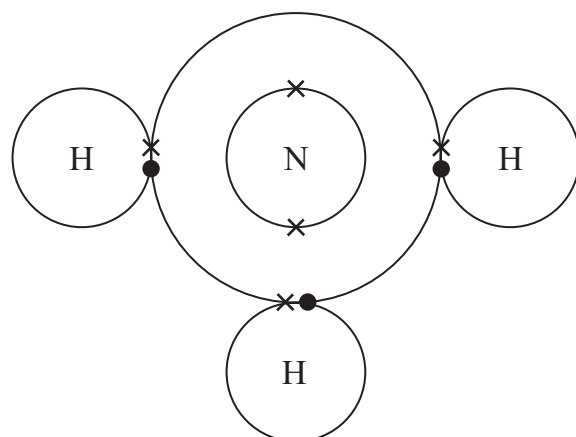
[1]

Examiner Only

Marks Remark

- 7 The diagram below shows the electronic structure of the compound ammonia, NH_3 .

Two electrons are missing from the diagram.



- (a) Complete the diagram by adding the missing **two** electrons. You may find your Data Leaflet helpful.

_____ [1]

- (b) Ammonia is colourless, has a distinctive smell and is soluble in water. Give **one other physical** property you would expect ammonia to have.

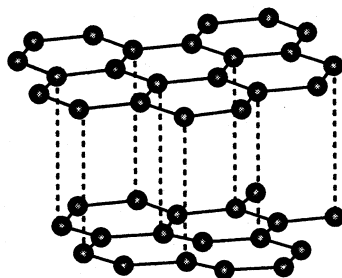
_____ [1]

- (c) Draw a diagram, in the space below, to show how hydrogen bonds with oxygen to form water. You should show **all** the electrons for both hydrogen and oxygen.

[2]

Examiner Only	
Marks	Remark

9 The diagram below shows the structure of graphite.



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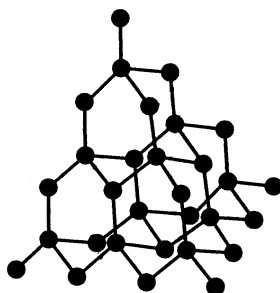
(a) Explain, with reference to its structure, why graphite is used as a lubricant.

[2]

(b) Graphite is a non-metal which is able to conduct electricity. Explain, with reference to its structure, how graphite is able to conduct electricity.

[2]

(c) Diamond has a giant structure also made up of carbon atoms.



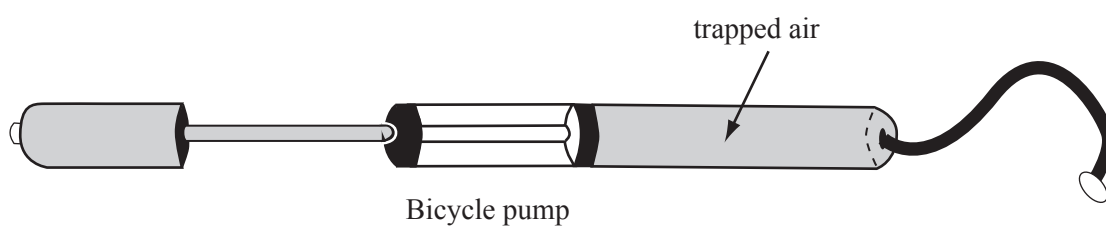
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Why can diamond **not** be used either as a lubricant or an electrical conductor?

[2]

Examiner Only	
Marks	Remark

- 10 The diagram below shows a bicycle pump containing 66 cm^3 of trapped air at 280 K and a pressure of 7000 Pa .



The student increased the pressure to 9000 Pa and the temperature to 300 K .

Use the formula $\frac{PV}{T} = \text{a constant}$ to calculate the new volume of air in the pump.

Show your working. Give the **units**.

Answer: _____ [4]

Examiner Only

Marks Remark

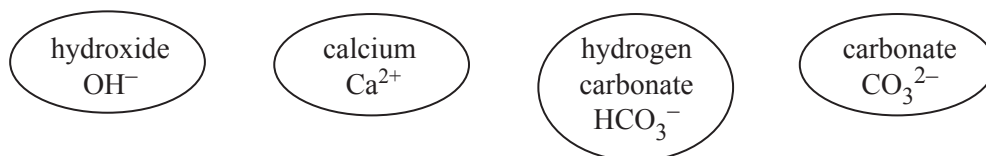
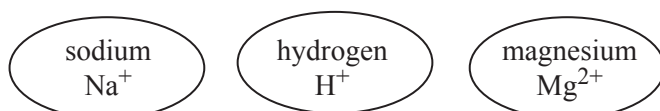
11 Hard water is formed when rain water containing dissolved carbon dioxide falls on limestone rock (calcium carbonate). This type of hard water contains calcium hydrogen carbonate.

(a) Complete the chemical equation for the formation of hard water from calcium carbonate.



[2]

(b) Below is a list of ions.



(i) Select **two** ions from the list which cause the water to be hard.

_____ [1]

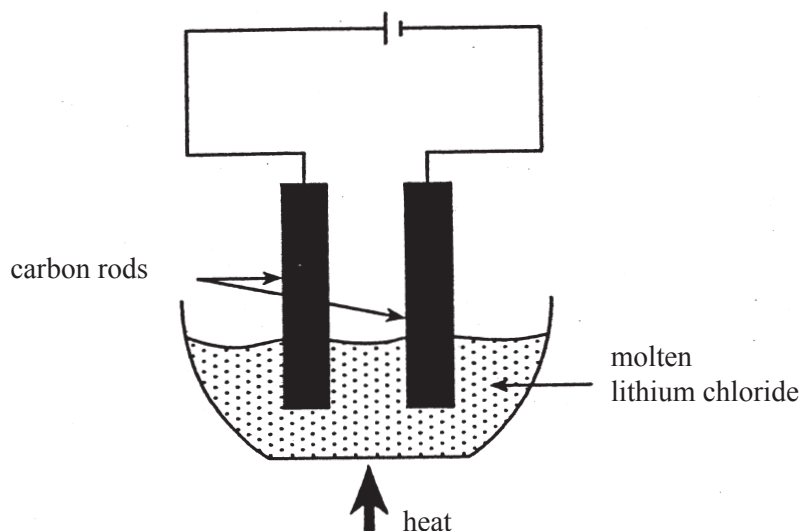
(ii) Select **one** ion which could be used in an ion exchange resin to soften hard water.

_____ [1]

Examiner Only

Marks Remark

12 Electrolysis of lithium chloride is carried out using the following apparatus.



(a) Give **two** reasons why carbon rods are used as electrodes in this electrolysis.

1. _____

2. _____ [2]

(b) Write an ionic equation for the reaction which takes place at the **cathode**.

_____ [2]

Examiner Only

Marks Remark

THIS IS THE END OF THE QUESTION PAPER

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