



General Certificate of Secondary Education  
2011

## Science: Chemistry

Paper 2  
Foundation Tier

[G1402]

TUESDAY 7 JUNE, AFTERNOON

StudentBounty.com

71

Candidate Number



G1402

### TIME

1 hour 30 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 six** questions.

### INFORMATION FOR CANDIDATES

The total mark for this paper is 120.

Quality of written communication will be assessed in question **5(a)(v)**.

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 Examiner's use only |       |
|-------------------------|-------|
| Question Number         | Marks |
| 1                       |       |
| 2                       |       |
| 3                       |       |
| 4                       |       |
| 5                       |       |
| 6                       |       |

|                    |  |
|--------------------|--|
| <b>Total Marks</b> |  |
|--------------------|--|



6345

1 (a) Nitrogen is diatomic like several other non-metallic elements. It is one of the most abundant non-metallic elements on the Earth, making up 79% of the atmosphere.

(i) What is meant by the term diatomic?

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

(ii) Name one other diatomic element.

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

(iii) Name one other **element** present in the Earth's atmosphere.

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

(iv) Complete the table below giving the physical properties of nitrogen.

| Name                                   | Nitrogen |
|----------------------------------------|----------|
| State at room temperature and pressure |          |
| Colour                                 |          |
| Odour                                  |          |

[3]

(v) Nitrogen is used in food packaging. Suggest one **chemical** property of nitrogen which makes it suitable for this use.

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

Examiner Only

Marks Remark

- (b) One of the most important compounds of nitrogen is ammonia. A solution of ammonia in water is called aqueous ammonia.

Complete the table below giving the physical properties of ammonia.

| Name                                   | Ammonia |
|----------------------------------------|---------|
| State at room temperature and pressure |         |
| Colour                                 |         |
| Odour                                  |         |
| pH of aqueous ammonia                  |         |

[4]

| Examiner Only |        |
|---------------|--------|
| Marks         | Remark |
|               |        |

- (c) The presence of ammonia can be detected chemically by reacting it with hydrogen chloride gas. The hydrogen chloride gas is released from concentrated hydrochloric acid.

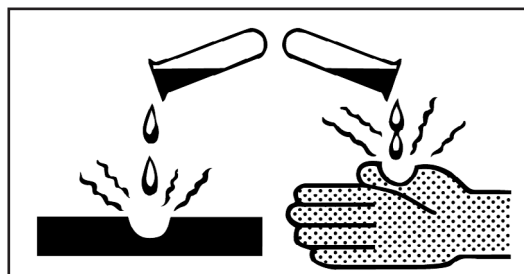
The information given below describes how the test is carried out.

1. Wear safety glasses.
2. Dip a glass rod into concentrated hydrochloric acid.
3. Apply the glass rod to ammonia.

- (i) What observations would you make for a positive test?

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

- (ii) The hazard symbol below is found on the bottle of concentrated hydrochloric acid.



© Crown copyright

Name this hazard symbol.

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

- (iii) Apart from wearing safety glasses, state one safety precaution you should take when carrying out this test.

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

Examiner Only

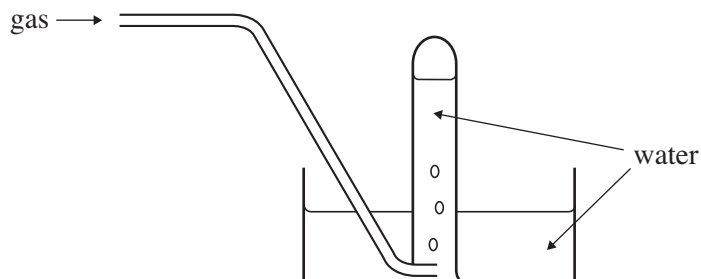
Marks

Remark

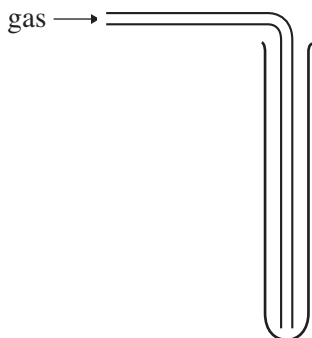
(d) The collection of gases prepared in the laboratory depends on their solubility in water and their density compared to air.

| Examiner Only |        |
|---------------|--------|
| Marks         | Remark |
|               |        |

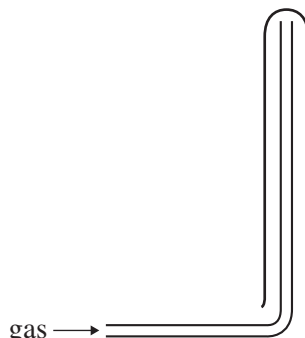
**METHOD 1**



**METHOD 2**



**METHOD 3**



The table below shows the solubility in water and density compared to air for three different gases.

| Gas               | Solubility in water | Density compared to air |
|-------------------|---------------------|-------------------------|
| Nitrogen          | low                 | same                    |
| Ammonia           | high                | less dense              |
| Hydrogen chloride | high                | more dense              |

State which method (1, 2 or 3) could be used to collect each gas.

Nitrogen \_\_\_\_\_

Ammonia \_\_\_\_\_

Hydrogen chloride \_\_\_\_\_

[3]

- 2 Deodorants, body sprays and air fresheners are often supplied as an aerosol. Aerosol cans contain a solution of the substance to be sprayed and a propellant gas.

Due to copyright an image of an aerosol can has been removed which is not essential to answer this question.

- (a) (i) What is the meaning of the term solution?

---

---

[2]

- (ii) In the box below show the arrangement of the particles of a gas at room temperature and pressure. The particle should be approximately the size shown on the left.

  
gas particle



[1]

- (iii) How does the volume of a gas change if the pressure is increased?

---

[1]

- (iv) How does the volume of a gas change if the temperature is increased?


---

[1]

Examiner Only

Marks Remark

(b) The label shown below was found on an aerosol can.

|                                                                                   |                                                                                                                           |
|-----------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|
|  | <b>CAUTION:</b><br><b>USE ONLY AS DIRECTED.</b><br>Pressurised container.<br>Protect from sunlight and high temperatures. |
| <b>BOX A</b>                                                                      |                                                                                                                           |

© Crown copyright

- (i) What term is missing from box A on the label to describe the hazard associated with the aerosol?

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

- (ii) Explain why an aerosol can should not be exposed to sunlight or high temperatures.

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

- (c) An aerosol deodorant is made of many compounds which contain different elements. Some of these elements are listed in the table below.

| Element | Melting point (°C) | Boiling point (°C) | State at room temperature (20 °C) |
|---------|--------------------|--------------------|-----------------------------------|
| Silicon | 1410               | 2355               |                                   |
| Oxygen  | -219               | -183               |                                   |
| Sodium  | 98                 | 890                |                                   |
| Bromine | -7                 | 59                 |                                   |

- (i) Use the data given to help you complete the table by deducing the state of each element at room temperature (20 °C). [4]

Examiner Only

Marks Remark

(ii) What is meant by the term element?

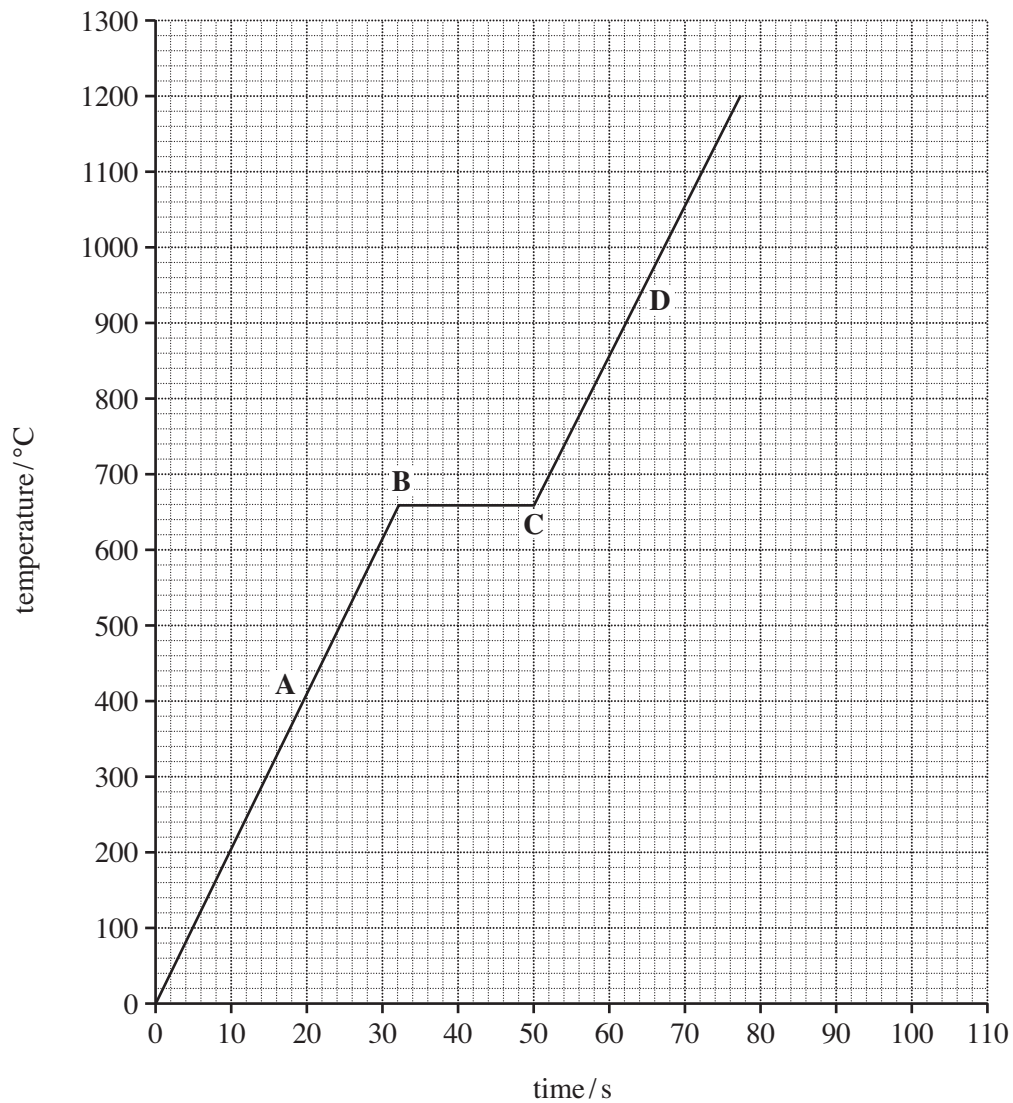
---

---

[2]

(d) Some aerosol cans are made of aluminium metal. Aluminium metal can be recycled and during this process the aluminium is heated.

The graph below shows the change in temperature against time when aluminium is heated.



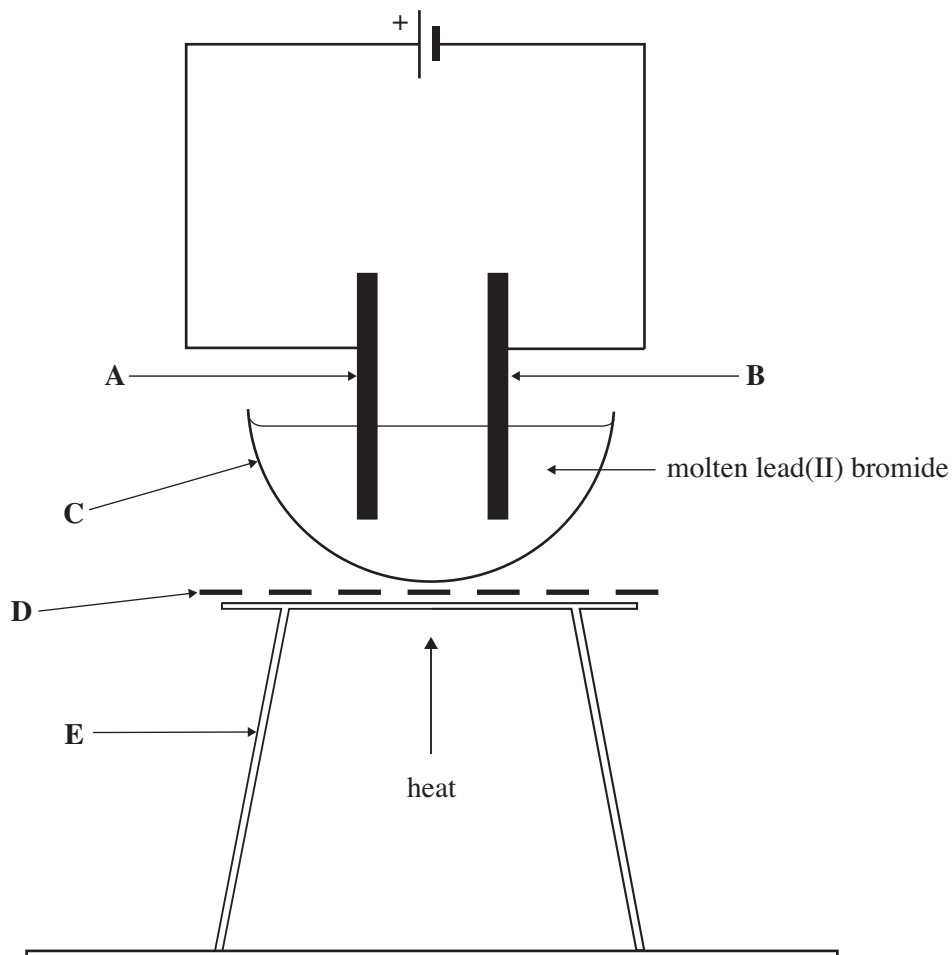
| Examiner Only |        |
|---------------|--------|
| Marks         | Remark |
|               |        |





3 Some substances, for example molten lead(II) bromide and molten sodium chloride, are electrolytes. Other substances, for example copper metal, are conductors.

(a) An experiment to investigate the electrolysis of molten lead(II) bromide was set up as shown in the diagram below.



(i) Some pieces of apparatus in the diagram are labelled A–E. Complete the table by stating the correct name for each piece of apparatus.

| Label | Name of apparatus |
|-------|-------------------|
| A     |                   |
| B     |                   |
| C     |                   |
| D     |                   |
| E     |                   |

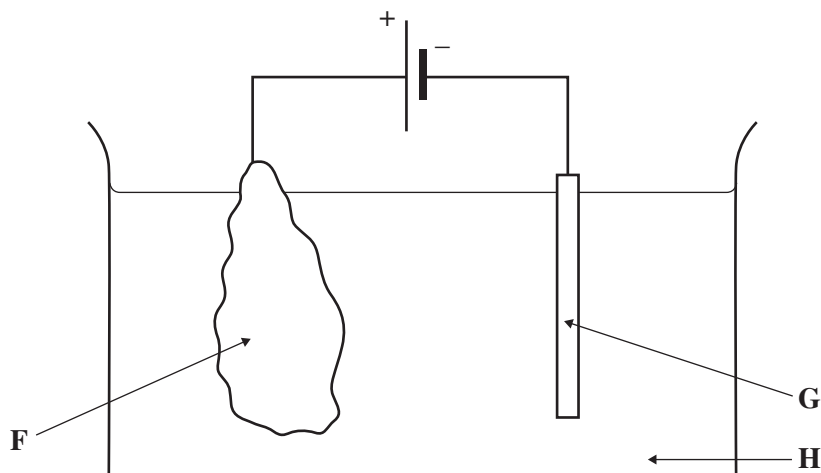
[5]

Examiner Only

Marks Remark



(b) Copper metal is a good conductor of electricity and is often used in electrical wires. Impure copper is not used to make wires because the impurities greatly reduce the conductivity. Impure copper is refined by electrolysis as shown in the diagram below.



(i) State the name of the materials which are used to make electrodes **F** and **G**.

**F** \_\_\_\_\_

**G** \_\_\_\_\_ [2]

(ii) Name the electrolyte **H** which is used in this electrolysis.

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

(iii) Apart from electrical conductivity, state one other physical property of copper which makes it suitable for use in electrical wiring.

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

Examiner Only

Marks Remark

- 4 (a) Five solutions were tested to find their pH. The results are recorded in the table below.

| Solution         | pH value |
|------------------|----------|
| Soap solution    | 10       |
| Sulphuric acid   | 1        |
| Water            | 7        |
| Sodium hydroxide | 14       |
| Lemon juice      | 5        |

- (i) Describe the method the student should use to determine the pH of each solution.

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

- (ii) Using only the solutions given in the table above, state an example of each of the following:

A weak acid \_\_\_\_\_  
A strong alkali \_\_\_\_\_  
Neutral \_\_\_\_\_ [3]

- (iii) Hydrogen ions are found in all acidic solutions. Write the symbol for a hydrogen ion including its charge.

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

- (iv) The ion found in all alkalis is  $\text{OH}^-$ . Name this ion.

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

Examiner Only

Marks Remark

(v) Name the salt produced when sulphuric acid reacts with sodium hydroxide solution.

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

(vi) Write a balanced symbol equation for the reaction between sulphuric acid and sodium hydroxide solution.

\_\_\_\_\_ [3]

(b) Lead(II) iodide,  $\text{PbI}_2$ , is a toxic yellow solid used as a pigment by painters in the nineteenth century. It is insoluble in water.

(i) Name two solutions which would react together to form insoluble lead(II) iodide.

Solution 1: \_\_\_\_\_

Solution 2: \_\_\_\_\_ [2]

(ii) Draw a labelled diagram of the assembled apparatus used to recover the lead(II) iodide when the reaction is finished.

[3]

(iii) Suggest how the solid lead(II) iodide should be dried.

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

Examiner Only

Marks Remark

- (iv) The bonding in lead(II) iodide is ionic. Write the symbols for the lead(II) ion and the iodide ion. You may use your Data Leaflet to help answer this answer.

Lead(II) ion \_\_\_\_\_

Iodide ion \_\_\_\_\_ [2]

- (v) Using your Data Leaflet, write the formula of another insoluble lead compound.

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

Examiner Only

Marks Remark

- 5 (a) Coal is a fossil fuel. It consists mainly of the element carbon but with some hydrogen, nitrogen and sulphur.



© From the Collections of Bolton Library & Museum Services, Bolton Council.

When coal burns, the elements it contains undergo combustion. The scheme below gives some details of this combustion.

|                   |                |                  |                 |                |
|-------------------|----------------|------------------|-----------------|----------------|
| <b>Reactants</b>  | <b>Name</b>    |                  | Sulphur         |                |
|                   | <b>Formula</b> | N <sub>2</sub>   | S               | C              |
| <b>Combustion</b> |                |                  |                 |                |
| <b>Products</b>   | <b>Name</b>    | Nitrogen dioxide |                 | Carbon dioxide |
|                   | <b>Formula</b> |                  | SO <sub>2</sub> |                |

- (i) Complete the scheme above, filling in the missing names and formulae. [5]

- (ii) What is meant by the term combustion?

---



---



---

[3]

Examiner Only

Marks Remark





- (ii) Complete the table below indicating whether the hydrocarbon materials shown are solid, liquid or gas. Place **one** tick (✓) in each row.

| Material    | Solid | Liquid | Gas |
|-------------|-------|--------|-----|
| Polystyrene |       |        |     |
| Petrol      |       |        |     |
| Polythene   |       |        |     |
| Methane     |       |        |     |
| Candle wax  |       |        |     |

[5]

- (iii) Write a balanced symbol equation for the complete combustion of methane, CH<sub>4</sub>.

\_\_\_\_\_ [3]

- (iv) When hydrocarbons burn in a limited supply of air a toxic gas is produced. Name this toxic gas.

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

| Examiner Only |        |
|---------------|--------|
| Marks         | Remark |
|               |        |

6 Chemical reactions are either exothermic or endothermic.

(a) What do you understand by the term exothermic?

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

(b) The table below gives the word equations for several exothermic reactions.

| Reaction | Word Equation                                                              |
|----------|----------------------------------------------------------------------------|
| A        | hydrogen + oxygen $\rightarrow$ water                                      |
| B        | sodium hydroxide + hydrochloric acid $\rightarrow$ sodium chloride + water |
| C        | magnesium + carbon dioxide $\rightarrow$ magnesium oxide + carbon          |
| D        | copper(II) oxide + magnesium $\rightarrow$ magnesium oxide + copper        |

(i) Name the type of reaction represented by A and B.

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

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

(ii) Write a balanced symbol equation for Reaction A.

\_\_\_\_\_ [3]

Examiner Only

Marks Remark

(c) In reaction C, a piece of burning magnesium metal is lowered into a gas jar of carbon dioxide gas.

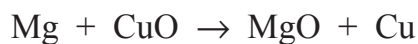
(i) Write a balanced symbol equation for the reaction between magnesium and carbon dioxide.

\_\_\_\_\_ [3]

(ii) Describe what would be observed during this reaction.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_ [3]

(d) Reaction D is described as a redox reaction as both oxidation and reduction are occurring at the same time. The balanced symbol equation for the reaction is given below.



(i) Explain why magnesium is described as being oxidised in this reaction.

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

(ii) Explain why copper is described as being reduced in this reaction.

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

(iii) What colour is copper(II) oxide?

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

| Examiner Only |        |
|---------------|--------|
| Marks         | Remark |
|               |        |

---

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

---





Permission to reproduce all copyright material has been applied for.  
In some cases, efforts to contact copyright holders may have been unsuccessful and CCEA  
will be happy to rectify any omissions of acknowledgement in future if notified.