Rewarding Learning

Centre Number

71	

Candidate Number

General Certificate of Secondary Education
2011

Science: Chemistry

Paper 2
Foundation Tier

G1402

[G1402]

TUESDAY 7 JUNE, AFTERNOON

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	
Total Marks	

Examiner Only	
Marks	Remark

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]

(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

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.

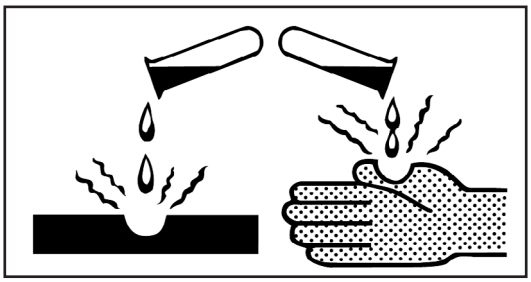
2. Dip a glass rod into concentrated hydrochloric acid.

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.



Name this hazard symbol.

_____ [1]

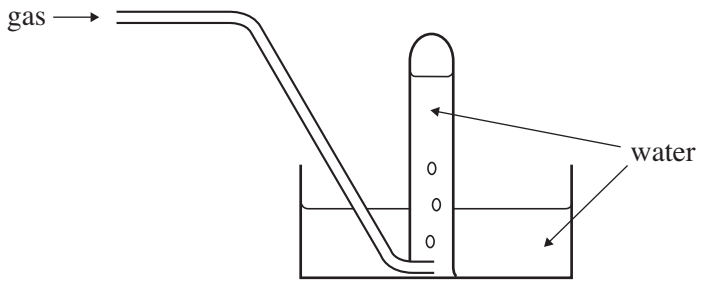
(iii) Apart from wearing safety glasses, state one safety precaution you should take when carrying out this test.

_____ [1]

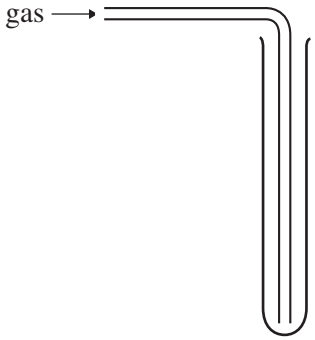
(d) The collection of gases prepared in the laboratory depends on their solubility in water and their density compared to air.

Examiner Only | Marks | Remark

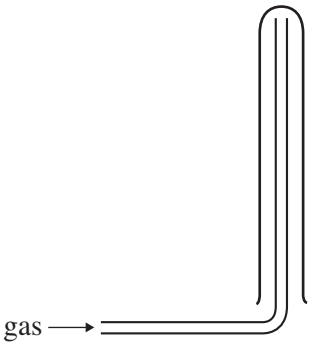
METHOD 1



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]

Examiner Only	
Marks	Remark

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.

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

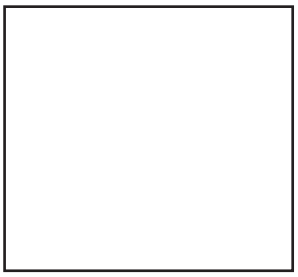
(a) (i) What is the meaning of the term solution?

_____

_____ [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]

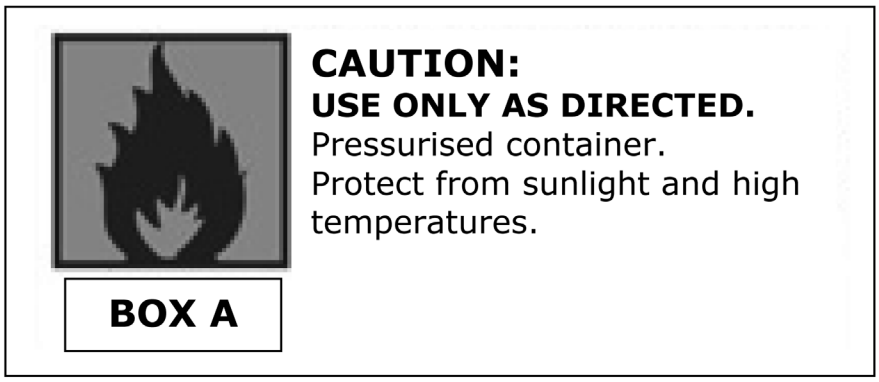
(iii) How does the volume of a gas change if the pressure is increased?

_____ [1]

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

_____ [1]

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



(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?

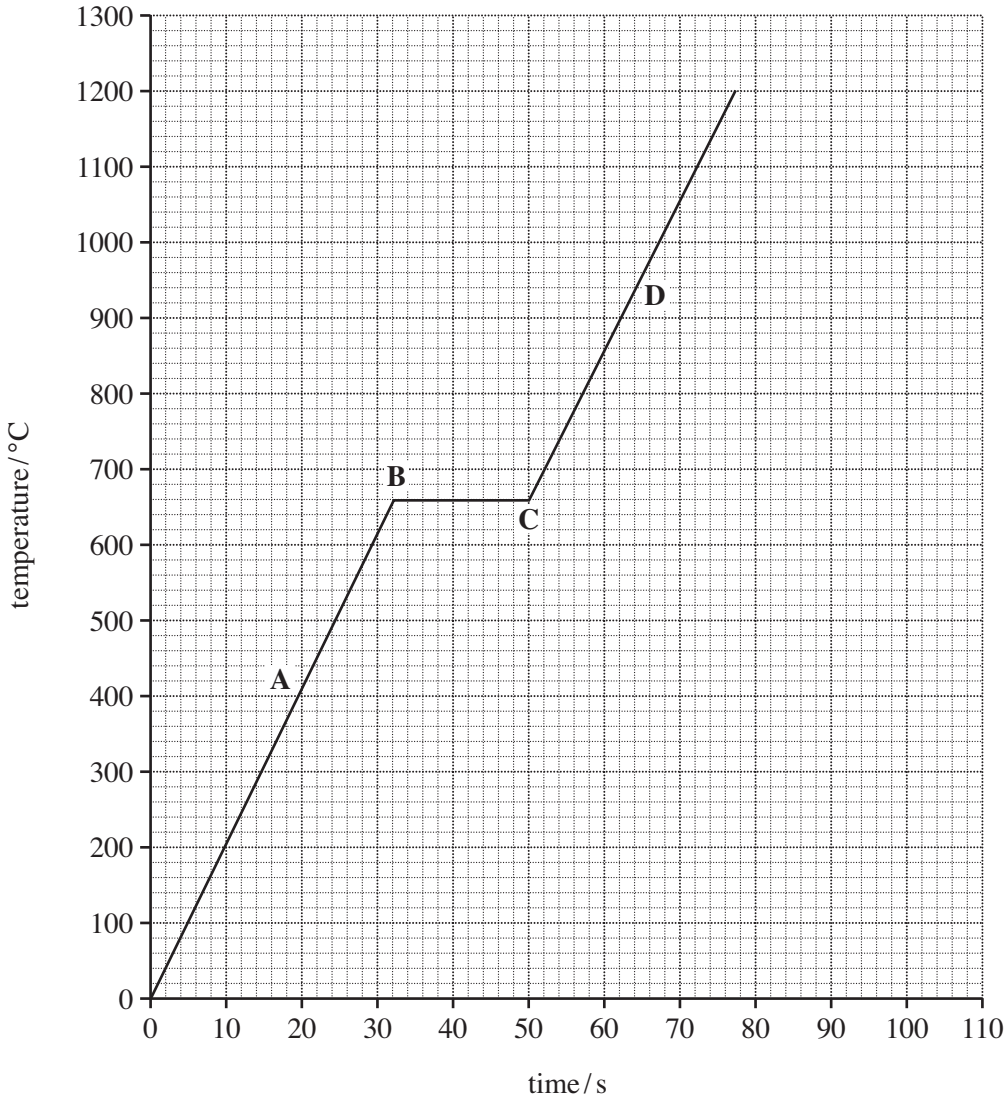
_____

_____ [2]

Examiner Only	
Marks	Remark

(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

(i) Which letter, A, B, C or D shows when aluminium is beginning to melt?

_____ [1]

(ii) What is the melting point of aluminium?

_____ [1]

(iii) Complete the passage below about changes of state using only the words given in the box

solid	**liquid**	**gas**

Each word may be used once, more than once or not at all.

Evaporation is the change of state from _____ to _____

Sublimation is the change of state from _____

to _____ on heating.

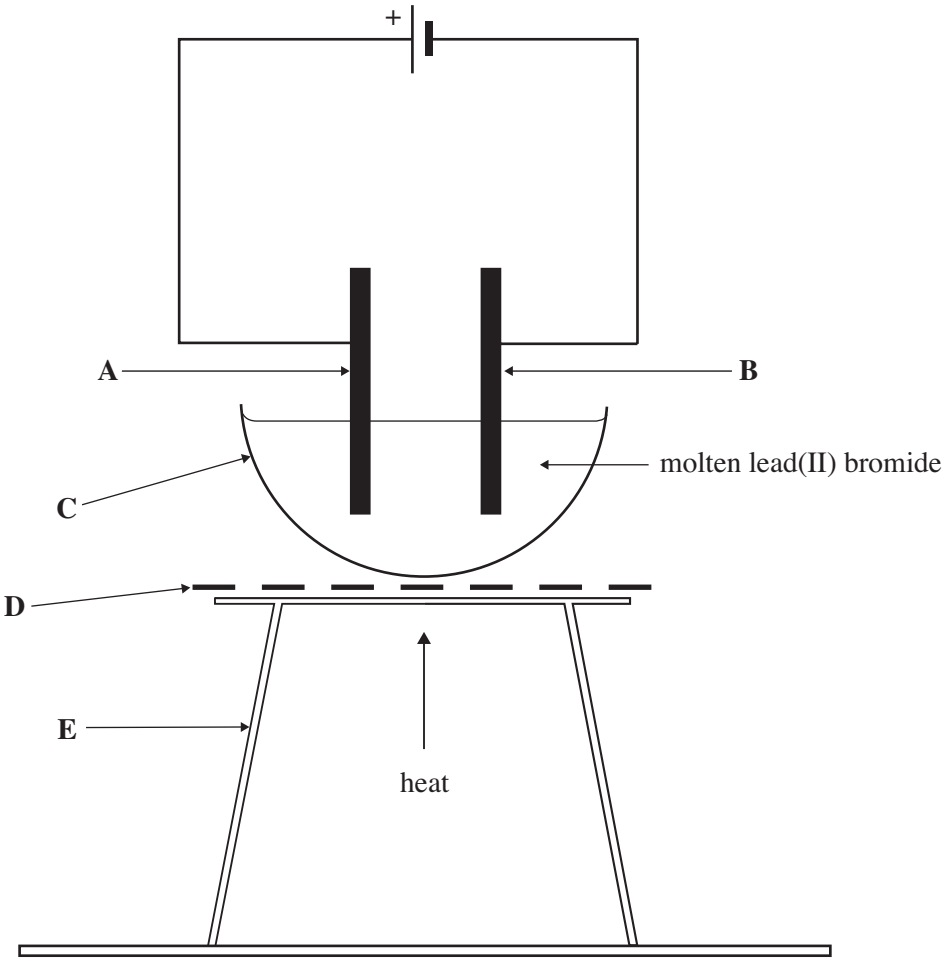
Condensation is the change of state from _____

to _____ [6]

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

(ii) Name a piece of apparatus which could be connected in the circuit to show that an electric current is flowing through the molten lead(II) bromide.

_____ [1]

(iii) What is meant by the term electrolysis?

_____

_____ [2]

(iv) State the name of the charged particles that allow the electric current to flow in molten lead(II) bromide.

_____ [1]

(v) Complete the table to state the observations at electrode A, and the name of the product at each electrode.

Electrode	Observations	Name of Product
A		
B	silvery grey bead	

[4]

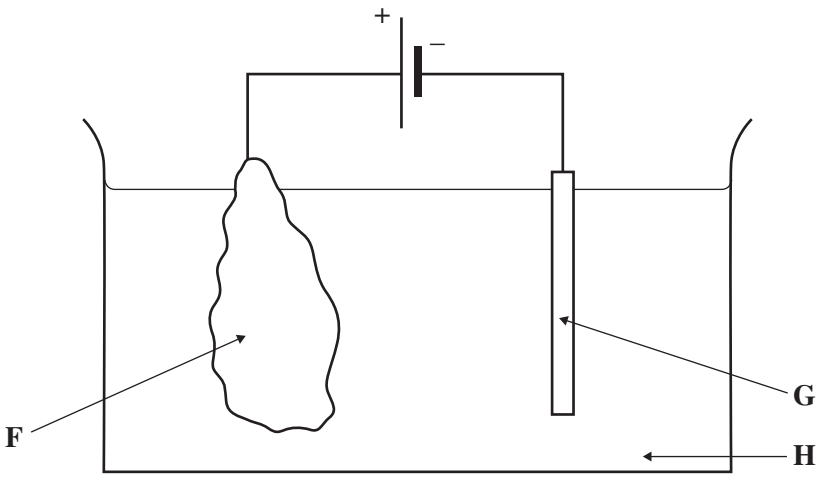
(vi) Why does this electrolysis need to be carried out in a fume cupboard?

_____

_____ [1]

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 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, 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]

(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

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.

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

Reactants	**Name**		Sulphur	
	Formula	N_2	S	C
Combustion		↓	↓	↓
Products	**Name**	Nitrogen dioxide		Carbon dioxide
	Formula		SO_2	

(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

(iii) Which element in coal is responsible for its distinctive colour?

_____ [1]

(iv) What is the common name for the oxide of hydrogen?

_____ [1]

(v) Describe how fossil fuels are formed.

_____

_____

_____

_____

_____ [3]

Quality of Written Communication [2]

(b) The objects listed below are all made from materials which are hydrocarbons. Hydrocarbons can be solids, liquids or gases.

Polystyrene **Petrol** **Polythene** **Methane** **Candle wax**

(i) What is a hydrocarbon?

_____

_____ [2]

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_4.

_____ [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 → water
B	sodium hydroxide + hydrochloric acid → sodium chloride + water
C	magnesium + carbon dioxide → magnesium oxide + carbon
D	copper(II) oxide + magnesium → 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.

$$Mg + CuO \rightarrow MgO + Cu$$

(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]

THIS IS THE END OF THE QUESTION PAPER