Centre No.						Paper Reference							Surname	Initial(s)
Candidate No.						4	4	3	7	/	2	F	Signature	

Paper Reference(s)

4437/2F

Examiner's use only

Team Leader's use only

London Examinations IGCSE

Science (Double Award)

Chemistry

Paper 2F

Foundation Tier

Monday 10 November 2008 – Afternoon

Time: 1 hour 15 minutes

Question Number	Leave Blank
1	
2	
3	
4	
5	
6	
7	
8	
9	
Total	

Materials required for examination
Nil

Items included with question papers
Nil

Instructions to Candidates

In the boxes above, write your centre number, candidate number, your surname, initial(s) and signature.
The paper reference is shown at the top of this page. Check that you have the correct question paper.
Answer ALL the questions. Write your answers in the spaces provided in this question paper.
Show all stages in any calculations and state the units. Calculators may be used.
Some questions must be answered with a cross in a box (☒). If you change your mind about an answer, put a line through the box (~~☒~~) and then mark your new answer with a cross (☒).

Information for Candidates

The total mark for this paper is 75. The marks for individual questions and the parts of questions are shown in round brackets: e.g. **(2)**.
There are 9 questions in this question paper.
There are 20 pages in this question paper. Any blank pages are indicated.
A Periodic Table is given on page 2.

Advice to Candidates

Write your answers neatly and in good English.

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THE PERIODIC TABLE

Period	1	2											3	4	5	6	7	0
	Group																	
1	1 H Hydrogen 1																	4 He Helium 2
2	7 Li Lithium 3	9 Be Beryllium 4											11 B Boron 5	12 C Carbon 6	14 N Nitrogen 7	16 O Oxygen 8	19 F Fluorine 9	20 Ne Neon 10
3	23 Na Sodium 11	24 Mg Magnesium 12											27 Al Aluminium 13	28 Si Silicon 14	31 P Phosphorus 15	32 S Sulphur 16	35.5 Cl Chlorine 17	40 Ar Argon 18
4	39 K Potassium 19	40 Ca Calcium 20	45 Sc Scandium 21	48 Ti Titanium 22	51 V Vanadium 23	52 Cr Chromium 24	55 Mn Manganese 25	56 Fe Iron 26	59 Co Cobalt 27	59 Ni Nickel 28	63.5 Cu Copper 29	65 Zn Zinc 30	70 Ga Gallium 31	73 Ge Germanium 32	75 As Arsenic 33	79 Se Selenium 34	80 Br Bromine 35	84 Kr Krypton 36
5	86 Rb Rubidium 37	88 Sr Strontium 38	89 Y Yttrium 39	91 Zr Zirconium 40	93 Nb Niobium 41	96 Mo Molybdenum 42	99 Tc Technetium 43	101 Ru Ruthenium 44	103 Rh Rhodium 45	106 Pd Palladium 46	108 Ag Silver 47	112 Cd Cadmium 48	115 In Indium 49	119 Sn Tin 50	122 Sb Antimony 51	128 Te Tellurium 52	127 I Iodine 53	131 Xe Xenon 54
6	133 Cs Caesium 55	137 Ba Barium 56	139 La Lanthanum 57	179 Hf Hafnium 72	181 Ta Tantalum 73	184 W Tungsten 74	186 Re Rhenium 75	190 Os Osmium 76	192 Ir Iridium 77	195 Pt Platinum 78	197 Au Gold 79	201 Hg Mercury 80	204 Tl Thallium 81	207 Pb Lead 82	209 Bi Bismuth 83	210 Po Polonium 84	210 At Astatine 85	222 Rn Radon 86
7	223 Fr Francium 87	226 Ra Radium 88	227 Ac Actinium 89															

Key

Relative atomic mass
Symbol
Name
Atomic number

Leave blank

SECTION A

1. Use the Periodic Table on page 2 to help you to answer this question.

(a) Give the name or symbol of the least reactive element in Group 1.

.....

(1)

(b) Give the name or symbol of the least reactive element in Period 3.

.....

(1)

(c) Give the name or symbol of an element whose atoms have one electron in the outer shell.

.....

(1)

(d) Give the names or symbols of **two** elements that have similar chemical properties.

.....

(1)

(e) Give the name or symbol of a metal which reacts with cold water to form an alkaline solution.

.....

(1)

Q1

(Total 5 marks)

Leave blank

2. Atoms contain electrons, neutrons and protons.

(a) Which of these particles

(i) has no electrical charge?

.....

(1)

(ii) has the lowest mass?

.....

(1)

(iii) orbits the nucleus?

.....

(1)

(b) The table below gives some information on two different atoms of lithium.

	Mass number	**Atomic number**
first atom	6	3
second atom	7	3

(i) What is the name given to two atoms with the same atomic number but different mass numbers?

.....

(1)

(ii) Complete the sentences by using numbers from the box. Each number may be used once, more than once or not at all.

3	4	6	7
9	10	12	13

All atoms of lithium contain ..... protons and ..... electrons.

Some atoms of lithium contain ..... neutrons while

others contain ..... neutrons.

(4)

Q2

(Total 8 marks)

Leave blank

3. (a) Anhydrous copper(II) sulphate can be used to show if a substance contains water. Describe the colour change seen when water is added to anhydrous copper(II) sulphate. Give the **name** of the product.

Colour change .....

.....

Name of product .....

(3)

(b) The product in (a) is heated until another colour change occurs. Give the final colour of the solid and state the type of reaction that occurs.

.....

.....

.....

(2)

Q3

(Total 5 marks)

Leave blank

4. (a) Aluminium, copper and iron are three important metals.
Complete the table by selecting from the boxes one use for each metal and the property on which this use depends.
Each use and property may be used once, more than once or not at all.

Uses			
aircraft bodies	railway tracks	solder	water pipes

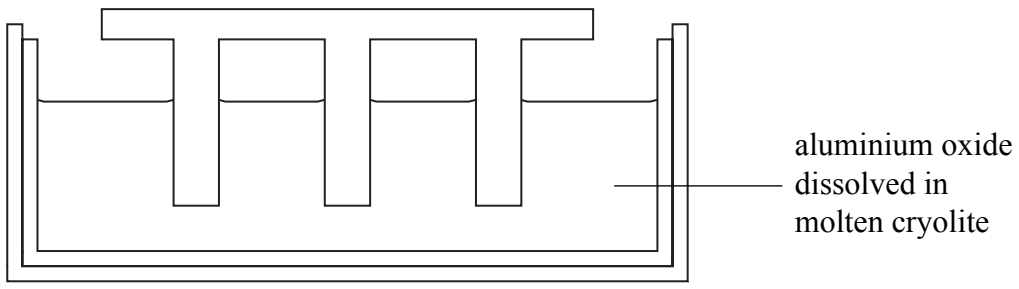
Properties	
good conductor of electricity	low density
resists corrosion	strong

Name of metal	**Use of metal**	**Property on which this use depends**
aluminium		
copper		
iron		

(6)

Leave blank

(b) Aluminium is extracted using electrolysis. The diagram shows part of an electrolysis cell.



During electrolysis, oxygen gas forms at the positive electrode.

(i) Explain why this electrode must be replaced at regular intervals.

.....

.....

(1)

(ii) The aluminium oxide is dissolved in molten cryolite.
Put a cross (☒) in **one** box to show the main reason for this.

Aluminium is extracted from cryolite. ☒

Cryolite is a compound of sodium, aluminium and fluorine. ☒

The solution has a lower melting point than pure aluminium oxide. ☒

(1)

(c) Iron is extracted from iron ore by reduction using carbon monoxide.

(i) Complete the word equation.

iron(III) oxide + carbon monoxide → ..... + ...

(1)

(ii) Explain why aluminium cannot be extracted from aluminium oxide using carbon monoxide.

.....

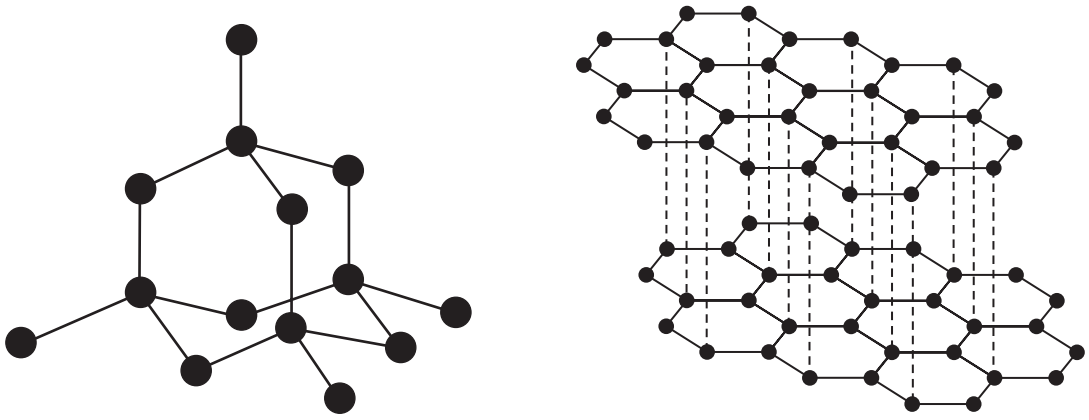
(1)

Q4

(Total 10 marks)

Leave blank

5. The diagrams show the structures of diamond and graphite.
They are different structural forms of the same element.



diamond

graphite

(a) Use words from the box to complete the sentences.
Each word may be used once, more than once or not at all.

allotropes	carbon	isomers
isotopes	silicon	sulphur

Different structural forms of the same element are called .....

Diamond and graphite are both forms of the element .....

(2)

(b) When graphite burns it forms carbon dioxide.

(i) Put a cross (☒) in **one** box to show the test for carbon dioxide and put a cross (☒) in **one** box to show the positive result.

Test		**Positive result**	
add carbonic acid	☒	bubbles	☒
add limewater	☒	turns milky	☒
add sodium hydroxide	☒	turns orange	☒

(2)

Leave blank

(ii) Carbon dioxide dissolves in water to form a very weakly acidic solution. Put a cross (☒) next to the most likely pH of a solution of carbon dioxide.

1 ☒

3 ☒

5 ☒

7 ☒

9 ☒

11 ☒

(1)

(iii) Complete the passage using words from the box.
Each word may be used once, more than once, or not at all.

atoms	high	low
molecules	strong	weak

Carbon dioxide has a ..... boiling point. This is because there

are ..... forces of attraction between its ..... .

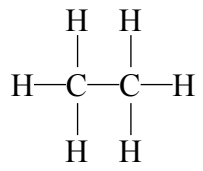
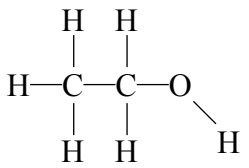
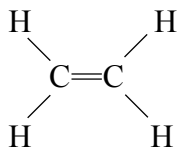
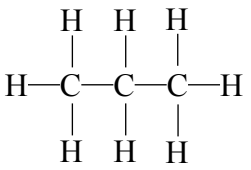
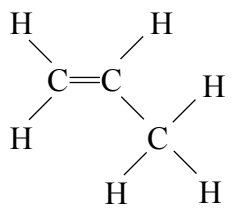
(3)

Q5

(Total 8 marks)

Leave blank

6. (a) The table shows the displayed formulae of some organic compounds.

Compound	Displayed formula
A	
B	
C	
D	
E	

(i) Select one compound from the table which is an alkene.

.....

(1)

(ii) Give the molecular formula of compound **C**.

.....

(1)

(iii) Give the general formula for the homologous series of which compound **D** is a member.

.....

(1)

Leave blank

(b) (i) Draw the displayed formula of butane.

(2)

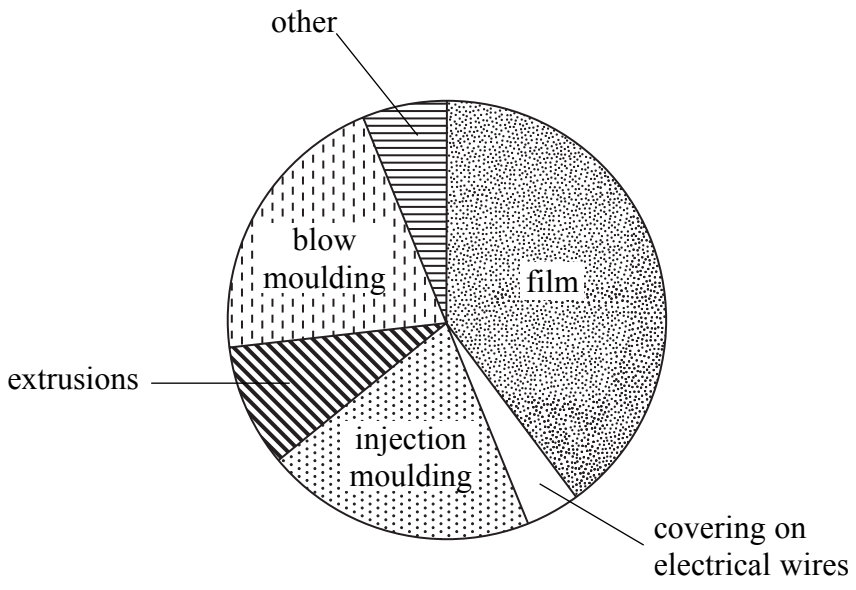
(ii) What colour change, if any, is seen when butane is bubbled through bromine water? Explain your answer.

.....

.....

(2)

(c) The pie chart shows some uses of poly(ethene).



(i) What is the main use of poly(ethene)?

.....

(1)

(ii) What property of poly(ethene) makes it suitable for use as a covering on electrical wires?

.....

(1)

Q6

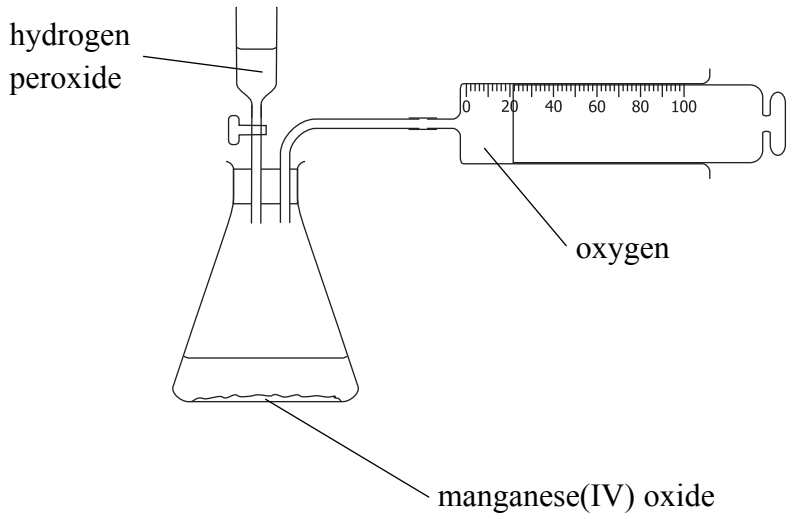
(Total 9 marks)

TOTAL FOR SECTION A: 45 MARKS

Leave blank

SECTION B

7. Oxygen gas can be prepared and collected in the laboratory using the apparatus shown in the diagram.



(a) Hydrogen peroxide decomposes very slowly to form water and oxygen.

(i) Write a word equation for this reaction.

.....

.....

(1)

(ii) The reaction is much faster if a small amount of manganese(IV) oxide is added. What type of substance is manganese(IV) oxide in this reaction?

.....

(1)

(b) The diagram shows oxygen gas being collected in a syringe. Suggest one other way to collect the gas.

.....

.....

(1)

(c) Describe the test for oxygen.

.....

.....

(1)

Leave blank

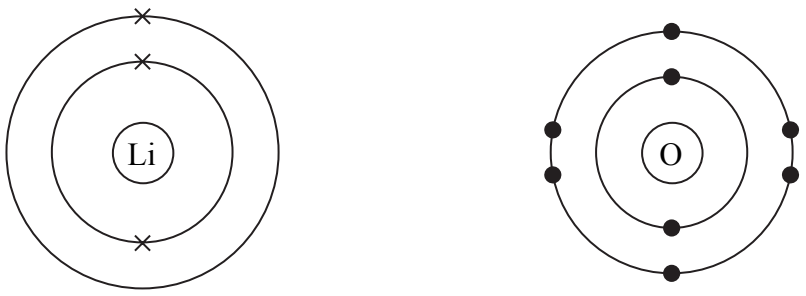
(d) Lithium burns in oxygen to form the ionic compound lithium oxide.

(i) State the colour of the flame when lithium burns.

.....

(1)

(ii) The diagrams show the electronic configurations of an atom of lithium and an atom of oxygen.



Describe what happens, in terms of electrons, when lithium reacts with oxygen.

.....

.....

.....

(3)

(iii) Write the formula of each of the ions in lithium oxide.

Lithium ion .....

Oxide ion .....

(2)

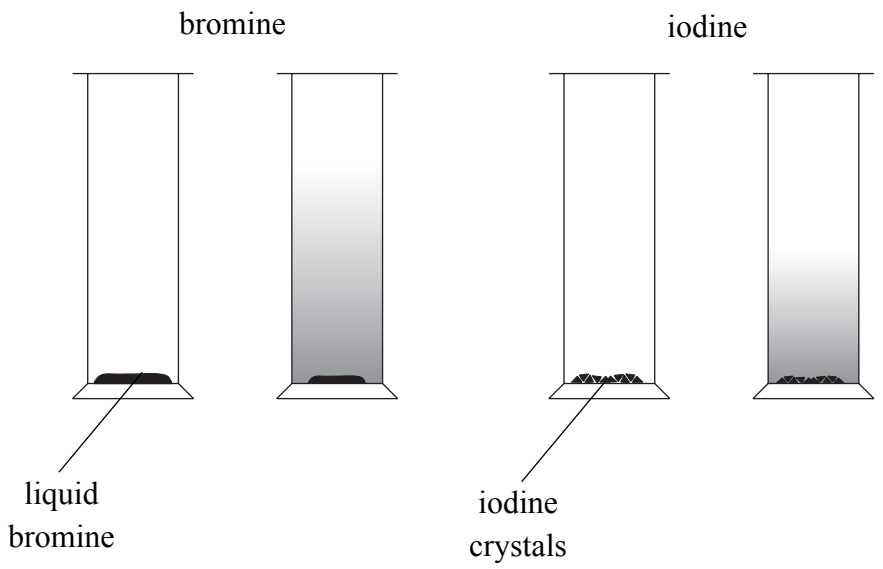
(Total 10 marks)

Q7

Leave blank

8. A few drops of liquid bromine and a few crystals of solid iodine are placed in the bottom of separate gas jars and the open ends covered with lids. The jars are left for some time under the same conditions.

The diagrams show the jars just after the bromine and iodine are added, and after some time.



(a) State the colour of

liquid bromine.....

solid iodine .....

(2)

(b) The diagrams show that the particles of bromine and iodine spread out in the jars.

(i) What is the name of this process?

.....

(1)

(ii) The iodine changes into a gas before this process occurs.
The chemical equation for this change is

$$I_2(s) \rightarrow I_2(g)$$

The change involving bromine is called evaporation.
Write a chemical equation, including state symbols, for this change.

.....

(2)

Leave blank

(iii) Describe how the movement and spacing of the particles in $I_2(g)$ is different from that in $I_2(s)$.

Movement .....

Spacing .....

(2)

(c) The gases chlorine and hydrogen react together to form hydrogen chloride gas. Hydrogen chloride gas dissolves in water to form hydrochloric acid.

Bromine reacts in a similar way to chlorine.

(i) Write a word equation for the reaction between bromine and hydrogen.

.....

.....

(1)

(ii) Suggest the name of the acid formed when the product in (c)(i) dissolves in water.

.....

(1)

Q8

(Total 9 marks)

Leave blank

9. (a) Potassium hydroxide solution reacts with dilute nitric acid to form the salt potassium nitrate.

(i) State the type of reaction that occurs.

.....

(1)

(ii) Write a chemical equation for the reaction.

.....

(2)

(b) A titration is carried out to find the volume of dilute nitric acid that must be added to 25.0 cm^3 of potassium hydroxide solution for complete reaction.

(i) Which piece of apparatus is used to add the dilute nitric acid?

.....

(1)

(ii) Before the acid is added, a few drops of phenolphthalein are mixed with the potassium hydroxide solution. State the colour change of the phenolphthalein at the end point of the titration.

.....

.....

(2)

Leave blank

(c) 35.00 cm^3 of dilute nitric acid reacted completely with 25.0 cm^3 of potassium hydroxide solution. Use this information to describe how you could obtain pure dry crystals of potassium nitrate, starting from the solutions of nitric acid and potassium hydroxide.

.....

.....

.....

.....

.....

.....

.....

.....

(5)

Q9

(Total 11 marks)

TOTAL FOR SECTION B: 30 MARKS

TOTAL FOR PAPER: 75 MARKS

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