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

Tuesday 6 November 2007 – Morning

Time: 1 hour 15 minutes

Question Number	Leave Blank
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
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 and initial(s) and your signature.
Answer ALL questions in the spaces provided in this book.
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 marks for individual questions are shown in round brackets: e.g. **(2)**.
There are 11 questions in this question paper. The total mark for this paper is 75.
There are 16 pages in this question paper. All blank pages are indicated.

Advice to Candidates

Write your answers neatly and in good English.

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THE PERIODIC TABLE

Period	1	2	Group										3	4	5	6	7	0
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. Look at the Periodic Table on page 2.

(a) How many elements are there in Period 2?

.....

(1)

(b) How many noble gases are there?

.....

(1)

(c) Give the symbol of the element whose atoms each contain 14 protons.

.....

(1)

(d) Give the symbol of the element that has a relative atomic mass of 14.

.....

(1)

(e) Which group contains elements that form ions with a 2– charge?

.....

(1)

Q1

(Total 5 marks)

Leave blank

2. Use words from the box to complete the sentences.

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

allotropes	carbon	compounds	electrons
elements	hydrogen	neutrons	protons

(a) Atoms of the same element always contain the same number of

.....

(1)

(b) Isotopes are atoms of the same element which contain different numbers of

.....

(1)

(c) Substances containing only one type of atom are .....

(1)

(d) Substances whose molecules contain more than one element are

.....

(1)

(e) The negatively-charged particles in an atom are .....

(1)

(f) In the definition of relative atomic mass, the mass of an atom is compared to the mass of an atom of .....

(1)

Q2

(Total 6 marks)

Leave blank

3. The Group 1 elements all react with water to form hydrogen and an alkaline solution. In the following equation, the letter **M** represents one of the Group 1 elements.

$$2M(.....) + 2H_2O(.....) \rightarrow 2MOH(.....) + H_2(.....)$$

(a) Complete the equation using the correct state symbols (aq, g, l, s).
Each state symbol may be used once, more than once or not at all.

(2)

(b) Describe **two** observations you would make when a small piece of sodium is added to a trough of water.

1 .....

.....

2 .....

.....

(2)

(c) Describe a test to show that the solution formed is alkaline.

Test .....

Result .....

(2)

Q3

(Total 6 marks)

Leave blank

4. A student left a piece of iron in the open air for one week. At the end of the week he noticed a colour change which showed that rust had formed on the iron.

(a) What colour shows that rust had formed?

.....

(1)

(b) Name the **two** substances needed for iron to rust.

1 .....

2 .....

(2)

(c) What is the chemical name of rust?

.....

(1)

(d) What type of reaction does the iron undergo when it rusts?

Put a cross (☒) in the correct box.

combustion ☒

decomposition ☒

oxidation ☒

reduction ☒

(1)

(e) Rust does not form on iron that is coated with zinc. Name this method of rust prevention.

.....

(1)

(f) State **one** other way to prevent iron from rusting.

.....

(1)

Q4

(Total 7 marks)

Leave blank

5. A student adds a solution to solid samples of two different sodium compounds.

The equations for the reactions occurring are:

Reaction **1** $Na_2CO_3 + 2HCl \rightarrow 2NaCl + H_2O + CO_2$

Reaction **2** $Na_2SO_3 + 2HCl \rightarrow 2NaCl + H_2O + SO_2$

(a) Name the solution she adds to each sample.

.....

(1)

(b) Describe **one** observation the student could make in Reaction **1**.

.....

.....

(1)

(c) Describe a test for the carbon dioxide that forms in Reaction **1**.

Test .....

Result .....

(2)

(d) Sulphur dioxide produced in Reaction **2** contributes to acid rain in the atmosphere.

Describe **two** effects of acid rain on the environment.

1 .....

.....

2 .....

.....

(2)

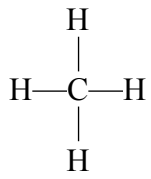
(Total 6 marks)

Q5

Leave blank

6. The alkanes are a homologous series of saturated hydrocarbons.

The displayed formula of the first member of this series is



(a) Draw the displayed formula of the second member of this series.

(1)

(b) Give the molecular formula of the alkane with three carbon atoms.

.....

(1)

(c) Draw a ring round the general formula for alkanes.

C_nH_{n+3} C_nH_{2n+2} C_nH_{3n} C_nH_{4n}

(1)

(d) Write a word equation for the complete combustion of butane.

.....

(2) **Q6**

(Total 5 marks)

BLANK PAGE

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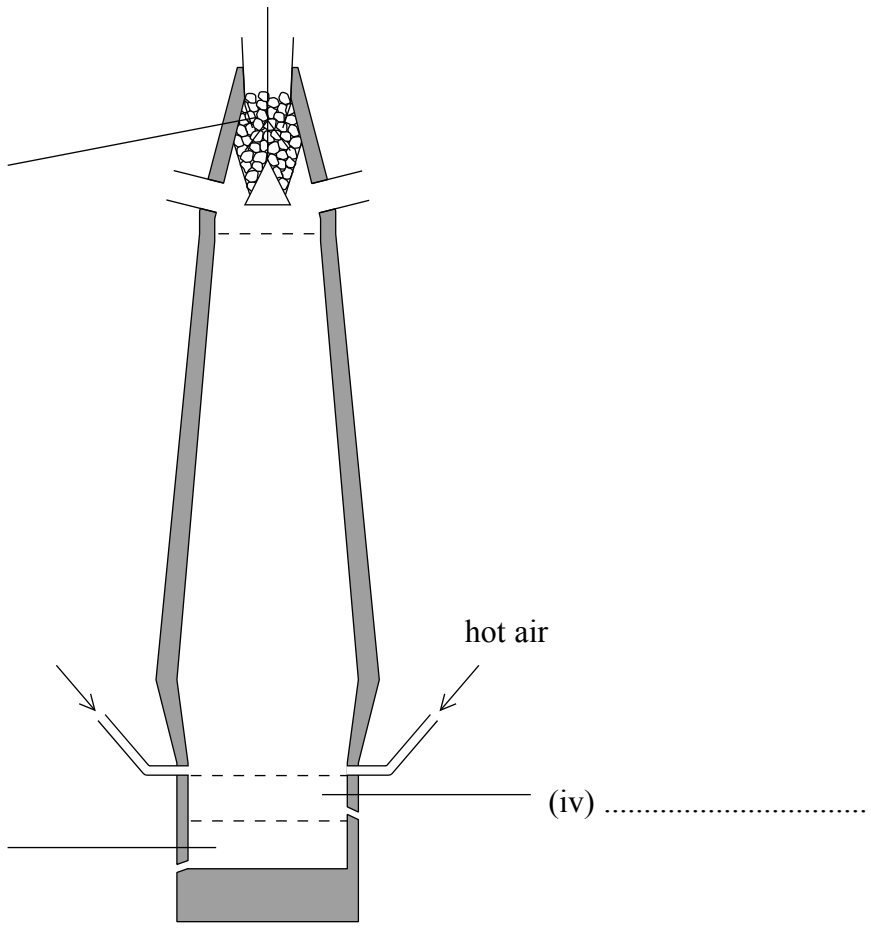
7. The diagram shows a blast furnace used to extract iron from its ore.
The name of one of the raw materials is shown.

(i) .....

(ii) .....

(iii) .....



(a) Complete the labelling of the diagram using the names or formulae of the substances.

(5)

Leave blank

(b) The word equations for two reactions occurring in the blast furnace are:

Reaction **1** carbon + oxygen → carbon dioxide

Reaction **2** carbon dioxide + carbon → carbon monoxide

(i) Which of these reactions (**1** or **2**) produces a high temperature in the blast furnace?

.....

(1)

(ii) State, with a reason, which substance in Reaction **2** undergoes reduction.

Substance .....

Reason .....

.....

(2)

(c) Why is it important that carbon monoxide is **not** released into the atmosphere?

.....

.....

(1)

(d) Why is aluminium not extracted from its ore using a blast furnace?

.....

.....

(1)

Q7

(Total 10 marks)

TOTAL FOR SECTION A: 45 MARKS

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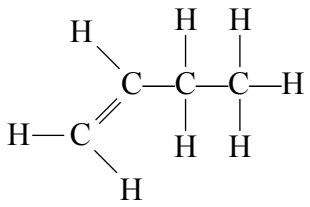
SECTION B

8. These are the structures of six hydrocarbons.

A



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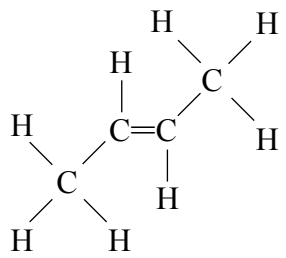

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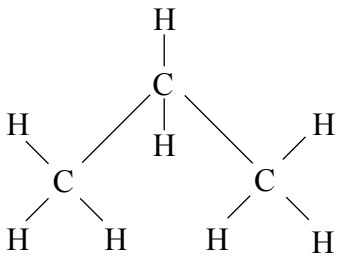

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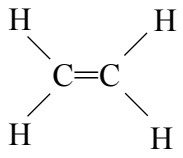

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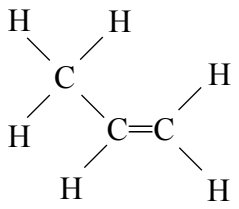

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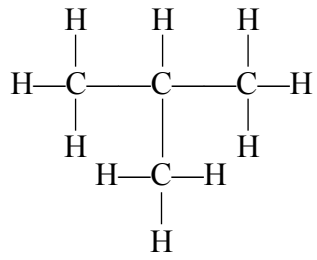


(a) Use the letters of the hydrocarbons to answer these questions.

(i) Give the letter of a hydrocarbon which is **not** an alkene. .....

(1)

(ii) Which structure is propene? .....

(1)

(b) Hydrocarbon **D** forms a polymer. Draw a diagram to represent the structure of the polymer.

Structure of polymer

(2) **Q8**

(Total 4 marks)

Leave blank

9. (a) Atoms contain smaller particles. Complete the table to show the relative mass and relative charge of each particle.

Particle	Relative mass	Relative charge
electron		
neutron	1	
proton		+1

(4)

(b) Use the Periodic Table on page 2 to name an element whose atoms

(i) contain equal numbers of protons and neutrons .....

(1)

(ii) have the electronic configuration 2.8.4 .....

(1)

(iii) have no neutrons. .....

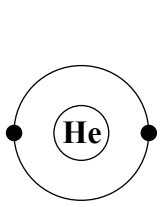
(1)

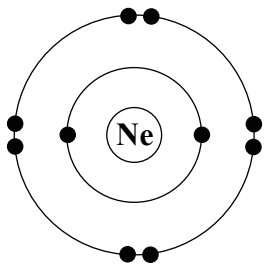
(c) Scientists think they will soon make an element that will go directly below astatine in the Periodic Table. Suggest how many electrons an atom of this element would have in its outer electron shell.

.....

(1)

(d) The diagrams show the electronic configuration of helium and of neon.





(i) What is the similarity in the outer electron shells of these two atoms?

.....

(1)

(ii) What effect does this similarity have on the chemical reactivity of helium and neon?

.....

(1)

Q9

(Total 10 marks)

Leave blank

10. Use information from the table to answer this question.

	Name of metal	Colour of solid metal	Colour of a solution of the metal(II) sulphate
↑ **increasing reactivity**	magnesium	grey	colourless
	zinc	grey	colourless
	iron	dark grey	green
	copper	pink-brown	blue

(a) When zinc is added to magnesium sulphate solution, no reaction occurs. Explain why.

.....

.....

(1)

(b) When iron filings are added to copper(II) sulphate solution, a reaction takes place.

(i) Write a chemical equation for this reaction.

.....

(2)

(ii) Describe the colour changes during this reaction.

Colour change of solid .....

.....

Colour change of solution .....

.....

(4)

(c) When copper is added to dilute sulphuric acid, no reaction occurs. When iron is added to dilute sulphuric acid, hydrogen gas and iron(II) sulphate solution are formed. What does this show about the reactivity of hydrogen compared to the reactivity of copper and the reactivity of iron?

.....

.....

.....

(2) **Q10**

(Total 9 marks)

Leave blank

11. Hydrogen chloride, HCl, is a covalent compound. It is a colourless gas and is soluble in a number of solvents.

(a) (i) Draw a dot and cross diagram to show the covalent bonding in a molecule of hydrogen chloride. Show outer shell electrons only.

(2)

(ii) Hydrogen chloride has a low boiling point. Put a cross (☒) in the correct box to show the reason for this.

The covalent bonds are strong ☐

The covalent bonds are weak ☐

There are weak forces between the ions ☐

There are weak forces between the molecules ☐

(1)

(b) Chlorine exists as two isotopes. Why do these isotopes have identical chemical properties?

.....

(1)

(c) Iron forms two chlorides, iron(II) chloride and iron(III) chloride. Describe a chemical test that you could use to distinguish between these compounds.

Test .....

.....

Result with iron(II) chloride .....

Result with iron(III) chloride .....

(3) Q11

(Total 7 marks)

TOTAL FOR SECTION B: 30 MARKS

TOTAL FOR PAPER: 75 MARKS

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