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 16 November 2010 – 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 and initial(s) and your 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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2

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 answer this question.

(a) How many elements are in Period 1?

.....

(1)

(b) Identify an element that has a relative atomic mass of 40.

.....

.....

(1)

(c) Name an element that forms ions with a charge of –2.

.....

(1)

(d) Give the symbol of an element that does not react.

.....

(1)

(e) Identify the element which is in both Period 5 and Group 4.

.....

(1)

(f) Give the number of a group that contains elements which become more reactive down the group.

.....

(1) **Q1**

(Total 6 marks)

Leave blank

2. Complete the sentences by selecting words from the box.

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

different	**electrons**	**identical**
negative	**neutrons**	**nucleus**
positive	**protons**	**shells**

(a) Atoms are made up of protons, ... and electrons.

(1)

(b) Protons are found in the ..... of an atom.

(1)

(c) Electrons have a ..... charge.

(1)

(d) The mass number of an atom is the total number of ..... and ..... in the atom.

(1)

(e) Isotopes are atoms with the same number of protons but different numbers of ..... .

(1)

(f) Isotopes of the same element have ..... chemical properties.

(1)

(g) When two atoms form a covalent bond, they share a pair of ..... .

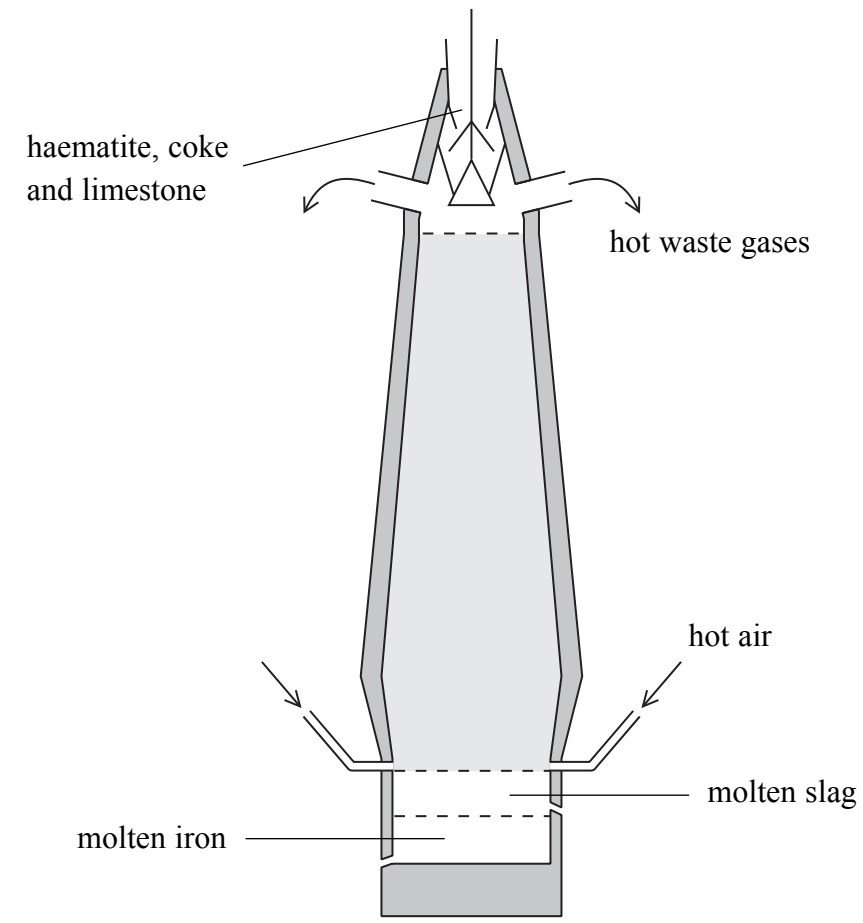
(1)

Q2

(Total 7 marks)

Leave blank

3. The diagram shows how iron is extracted from haematite, a form of iron(III) oxide.



(a) (i) During this extraction process, coke (a form of carbon) burns.
The reaction is exothermic.

Write the word equation for this reaction.

.....

(1)

(ii) The heat produced by the above reaction causes the calcium carbonate to decompose.

Complete this word equation.

calcium carbonate → calcium oxide + ...

(1)

Turn over

Leave blank

(b) (i) Rust is hydrated iron(III) oxide.

Place crosses (☒) in **two** boxes to show what must be present for a sample of iron to rust.

carbon dioxide ☒

nitrogen ☒

oxygen ☒

salt ☒

water ☒

zinc ☒

(2)

(ii) Car bodies are often made from steel, an alloy of iron.

State **one** method used to prevent the rusting of car bodies.

.....

(1)

Leave blank

(c) Some cars do not rust because they have bodies made of aluminium.
Aluminium has many other uses.

The first box gives some uses of metals.

The second box gives some other properties of aluminium.

Complete the table by selecting **two** uses of aluminium from the first box and the properties on which these uses depend from the second box.

Uses of metals
aircraft bodies
cooking pans
knives
household wiring
overhead power cables
railway tracks

Properties of aluminium
good conductor of electricity
good conductor of heat
low density

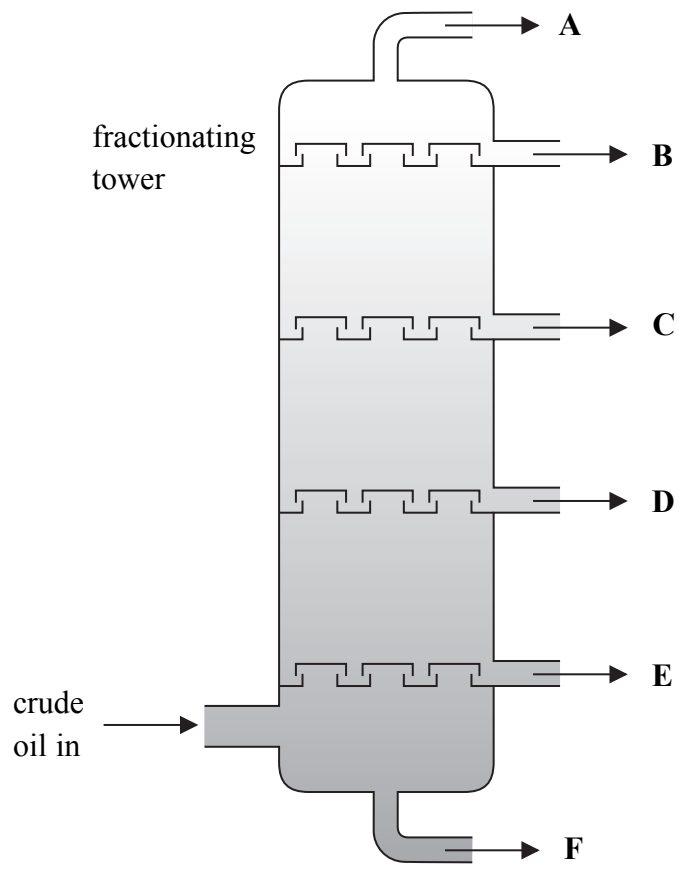
Use of aluminium	Property on which that use depends
car bodies	does not corrode

(4) **Q3**

(Total 9 marks)

Leave blank

4. Crude oil is a complex mixture of hydrocarbons.
It is separated into fractions by fractional distillation.
The diagram shows a fractionating tower.



(a) Place a cross (☒) in **one** box to show which statement is correct.

crude oil is heated before entering the fractionating tower ☒

each fraction obtained is a single compound ☒

the temperature is highest at the top of the fractionating tower ☒

(1)

Leave blank

(b) Use the letters **A** to **F** from the diagram to complete these statements.
Each letter may be used once, more than once or not at all.
Put a cross (☒) in the correct box.

(i) The fraction that does not condense in the fractionating tower is

A ☒ **B** ☒ **C** ☒ **D** ☒ **E** ☒ **F** ☒

(1)

(ii) The fraction with the highest boiling point is

A ☒ **B** ☒ **C** ☒ **D** ☒ **E** ☒ **F** ☒

(1)

(iii) The fraction called bitumen is

A ☒ **B** ☒ **C** ☒ **D** ☒ **E** ☒ **F** ☒

(1)

(iv) The liquid fraction with the shortest carbon chains is

A ☒ **B** ☒ **C** ☒ **D** ☒ **E** ☒ **F** ☒

(1)

(c) The fractions of crude oil have many uses.

Complete the table.

Name of fraction	Use
gasoline	
	aviation fuel
bitumen	

(3)

Leave blank

(d) (i) Complete the word equation for the incomplete combustion of gasoline.

gasoline + ... → carbon monoxide + ...

(2)

(ii) Place a cross (☒) in **one** box to show which statement about carbon monoxide is correct.

it causes acid rain ☒

it has a pungent smell ☒

it is poisonous ☒

it is the gas mainly responsible for global warming ☒

(1)

(Total 11 marks)

Q4

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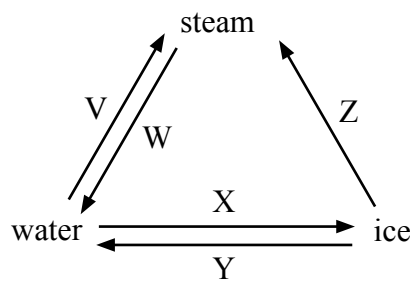
Turn over for Question 5

Leave blank

5. The three states of matter are solid, liquid and gas.

The diagram shows the relationships between ice, water and steam.



(a) (i) What is the name given to the change of state indicated by **Y**?

.....

(1)

(ii) Which letter indicates sublimation?

.....

(1)

(iii) What must be provided for the change of state indicated by **V** to occur?

.....

(1)

(b) In which state are water molecules **not** free to move around?

.....

(1)

(c) Water can be represented by the formula $H_2O(l)$.

Give the formula, including state symbols, of:

(i) ice

.....

(1)

(ii) steam.

.....

(1)

Leave blank

(d) Water can be obtained from an aqueous solution of sodium chloride by distillation.

(i) Which state symbol is used to show that sodium chloride is aqueous?

.....

(1)

(ii) Name the **two** changes of state that occur during this distillation.

First change of state .....

Second change of state .....

(2)

(e) Water can be reacted with a metal to form hydrogen.

(i) Complete this word equation.

..... + water → sodium hydroxide + hydrogen

(1)

(ii) The hydrogen gas was collected in a test tube.

What happens when a burning splint is placed at the mouth of the test tube?

.....

.....

(1)

(iii) What colour is universal indicator in sodium hydroxide solution?

.....

(1)

Q5

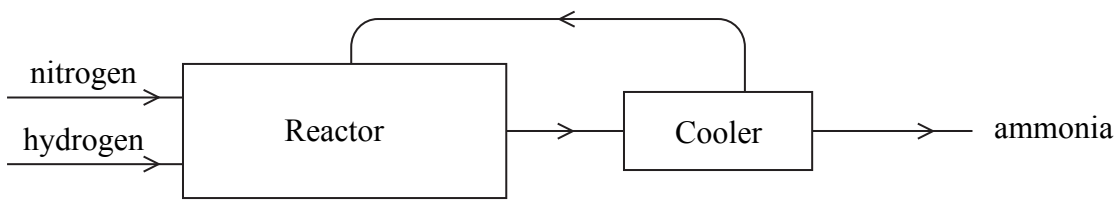
(Total 12 marks)

TOTAL FOR SECTION A: 45 MARKS

Leave blank

SECTION B

6. The flow diagram represents the manufacture of ammonia by the Haber process.



(a) State **three** conditions used in the reactor.

1 .....

2 .....

3 .....

(3)

(b) What change of state does the ammonia undergo in the cooler?

.....

(1)

(c) Some of the ammonia formed in the Haber process is reacted with nitric acid to form ammonium nitrate.

(i) Write a chemical equation for this reaction.

.....

(2)

(ii) Give **one** major use of ammonium nitrate.

.....

(1)

Q6

(Total 7 marks)

BLANK PAGE

Turn over for Question 7

Leave blank

7. Copper, iron and zinc can be reactants or products in displacement reactions.
These metals have different reactivities.

The table shows the observations made when a student added a small amount of each metal to a solution of the sulphate of one of the other metals.

Experiment	Reagents	Observations
1	copper + iron(II) sulphate	no change
2	copper + zinc sulphate	no change
3	iron + copper(II) sulphate	solution turns from blue to pale green solid turns from dark grey to pink-brown
4	iron + zinc sulphate	no change
5	zinc + copper(II) sulphate	solution turns from blue to colourless solid turns from light grey to pink-brown
6	zinc + iron(II) sulphate	solution turns from pale green to colourless solid turns from light grey to dark grey

(a) In Experiment 1, why was there no reaction?

.....

.....

(1)

(b) In Experiment 3, which ion is responsible for the blue colour?

.....

(1)

(c) In Experiment 5, what is the pink-brown solid?

.....

(1)

(d) In Experiment 6, why does the solid turn from light grey to dark grey?

.....

.....

(1)

Leave blank

(e) Which of the three metals is the most reactive?

.....

(1)

(f) When preparing for these experiments, the student found a bottle labelled "iron sulphate solution". To find out whether the solution contained iron(II) sulphate or iron(III) sulphate he tested it by adding sodium hydroxide solution.

State the observation made, and identify the substance responsible for the observation, if the bottle contained iron(II) sulphate solution.

Observation .....

Substance responsible .....

(2)

Q7

(Total 7 marks)

Leave blank

8. The formulae C_2H_6 and C_3H_8 represent two organic compounds.

(a) The compounds C_2H_6 and C_3H_8 are members of the same homologous series.

(i) What is the name of this homologous series?

.....

(1)

(ii) What is the general formula of this homologous series?

.....

.....

(1)

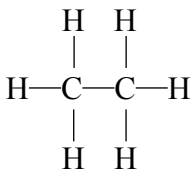
(iii) Other than having the same general formula, state **two** other characteristics of members of the same homologous series.

1 .....

2 .....

(2)

(b) The displayed formula of C_2H_6 is



Draw the displayed formula of C_3H_8.

(1)

Leave blank

(c) Compounds with the molecular formula C_4H_{10} are also members of this homologous series.

There are two isomers with this molecular formula.

(i) What is meant by the term **isomers**?

.....

.....

(2)

(ii) Name **one** of these isomers and draw its displayed formula.

Name .....

Displayed formula

(2)

(d) Methane is another member of this homologous series.

Write a word equation for the complete combustion of methane.

.....

.....

(2)

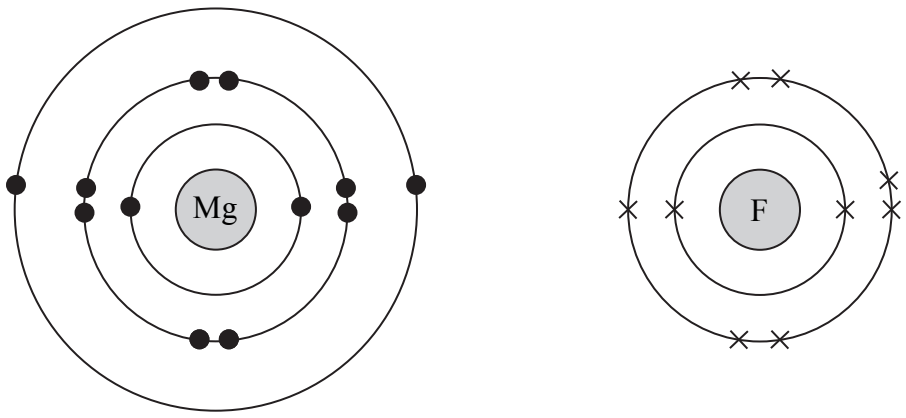
Q8

(Total 11 marks)

Leave blank

9. Magnesium and fluorine react to form the ionic compound magnesium fluoride.

(a) The diagrams show the electron arrangement in an atom of magnesium and in an atom of fluorine.



Describe what happens, in terms of electrons, when magnesium reacts with fluorine.

.....

.....

.....

.....

.....

.....

(3)

(b) Give the formula of each of the ions in magnesium fluoride.

.....

.....

(2)

Q9

(Total 5 marks)

TOTAL FOR SECTION B: 30 MARKS

TOTAL FOR PAPER: 75 MARKS

END