UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Ordinary Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

SCIENCE **5126/03**

Paper 3 Chemistry **October/November 2009**

1 hour 15 minutes

Candidates answer on the Question Paper

Additional Materials: Answer Paper

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use a soft pencil for any diagrams, graphs, tables or rough working.
Do not use staples, paper clips, highlighters, glue or correction fluid.
DO **NOT** WRITE ON ANY BARCODES.

Section A
Answer **all** questions.
Write your answers in the spaces provided on the question paper.

Section B
Answer any **two** questions.
Write your answers on the lined paper provided and, if necessary, continue on separate answer paper.

A copy of the Periodic Table is printed on page 16.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

For Examiner's Use	
Section A	
Section B	
Total	

This document consists of **11** printed pages and **5** lined pages.

UNIVERSITY of CAMBRIDGE International Examinations

Section A

For Examiner's Use

Answer **all** the questions

Write your answers in the spaces provided on the question paper.

1 Identify the five substances described below.

(a) A metal used to coat iron and so prevent it from rusting.

.....

(b) A gas that causes acid rain.

.....

(c) A gas that is burnt with oxygen to produce a high temperature flame for welding.

.....

(d) An allotrope of carbon that can be used to cut glass.

.....

(e) An organism that is used to ferment sugar solution and so form ethanol.

.....

[5]

2 **(a)** Hydrogen gas and molten potassium chloride both contain separate particles. Complete Fig. 2.1 to describe how the particles in these two substances differ in their movement, arrangement and attraction for one another.

how particles differ	hydrogen gas	molten potassium chloride
movement		
arrangement		
attraction for one another		

Fig. 2.1

[4]

(b) Explain why molten potassium chloride can conduct electricity.

.....

.....[2]

(c) Explain why liquid hydrogen boils at a very low temperature.

.....

.....[2]

[Turn over

3 Methane is a gaseous hydrocarbon that burns in oxygen.

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(a) Use a 'dot and cross' diagram to show the arrangement of electrons in a molecule of methane. Only the outer shells of electrons need to be shown.

[proton numbers: H,1; C,6.]

[3]

(b) In Fig. 3.1 are students' drawings of the particles in gases.

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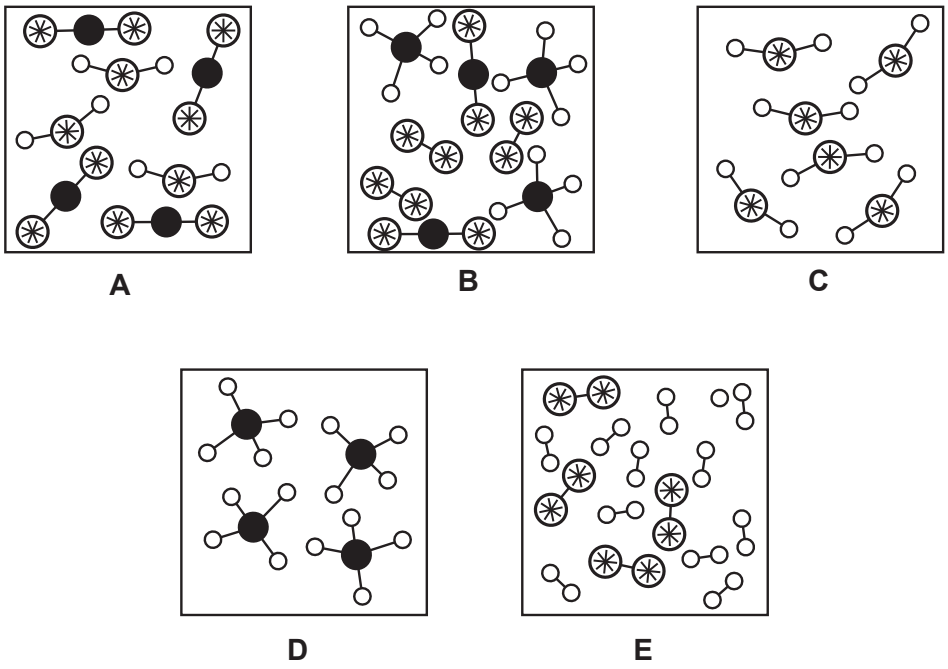

Fig. 3.1

Which of the students' drawings, **A**, **B**, **C**, **D** or **E**, best represents

(i) a mixture of elements,

.....

(ii) molecules of methane,

.....

(iii) molecules of water,

.....

(iv) a mixture of compounds and an element,

.....

(v) the compounds formed when methane is burnt completely in oxygen?

.....

[5]

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4 **(a)** **(i)** An element has eleven electrons in each atom. Why should this element be placed in Group I of the Periodic Table of elements?

.....

.....

(ii) Use the data on page 16 of this paper to name and give the number of each sub-atomic particle in a nucleus of this element.

.....

.....

(iii) Suggest how the nucleus of an atom of another isotope of this element may differ.

.....

.....[4]

(b) Francium, Fr, is also a member of Group I. Predict three of the properties of francium.

property 1

.....

property 2

.....

property 3

.....[3]

(c) Write the formula of the compound that is formed between francium and

(i) an element from Group VI,

.....

(ii) an element from Group VII.

.....

[2]

5 Fig. 5.1 describes some of the properties and reactions of an acid and of an alkali. Fill in the empty boxes.

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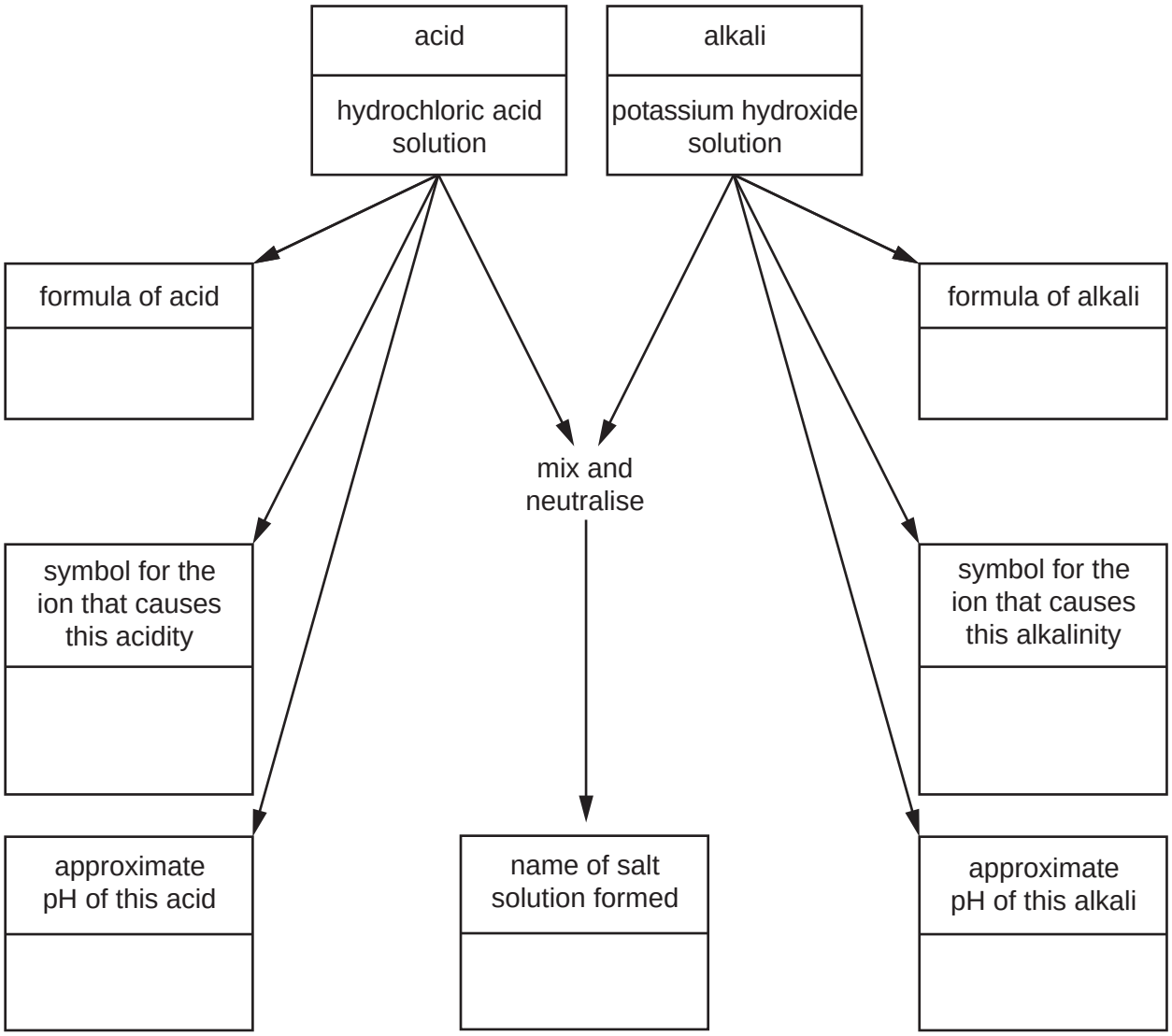

Fig. 5.1

[7]

6 **(a)** The relative molecular mass of hydrochloric acid is 36.5.

Explain what is meant by the term *relative molecular mass.*

.....

.....[2]

(b) Calculate the relative molecular mass of potassium hydroxide.

[Relative atomic masses: A_r : H, 1; O,16; K, 39.]

.....

.....[1]

(c) What mass of hydrochloric acid is present in 250 cm^3 of a solution of 2.0 mol/dm^3 hydrochloric acid?

.....

.....[1]

7 A story describes a country where metallic elements are represented by unusual code names.

The story gives the chemical reactivity series for five of these metals, but includes the non-metals hydrogen and carbon. The series, including code names, is given in Fig. 7.1.

increasing order of chemical reactivity ⟶
epsilon; hydrogen; delta; carbon; gamma; beta; alpha.

Fig. 7.1

Use any of the names in Fig. 7.1 to answer the questions that follow.

(a) Which metal will **not** corrode in moist air?

..... [1]

(b) Which element when heated strongly with beta oxide will produce beta metal?

..... [1]

(c) Which metal will react most slowly with hydrochloric acid, forming hydrogen gas?

..... [1]

(d) Which of the code names is most likely to represent 'copper'?

..... [1]

[Turn over

Section B

For Examiner's Use

Answer any **two** questions.

Write your answers on the lined pages provided and, if necessary, continue on separate answer paper.

8 **(a)** In a blast furnace limestone, coke and iron(III) oxide are heated in air to form iron. Describe how carbon dioxide, carbon monoxide and iron are formed in the furnace. Include suitable chemical equations in your answer. [6]

(b) Fig. 8.1 describes some of the reactions of an aqueous iron(II) salt, **I**.

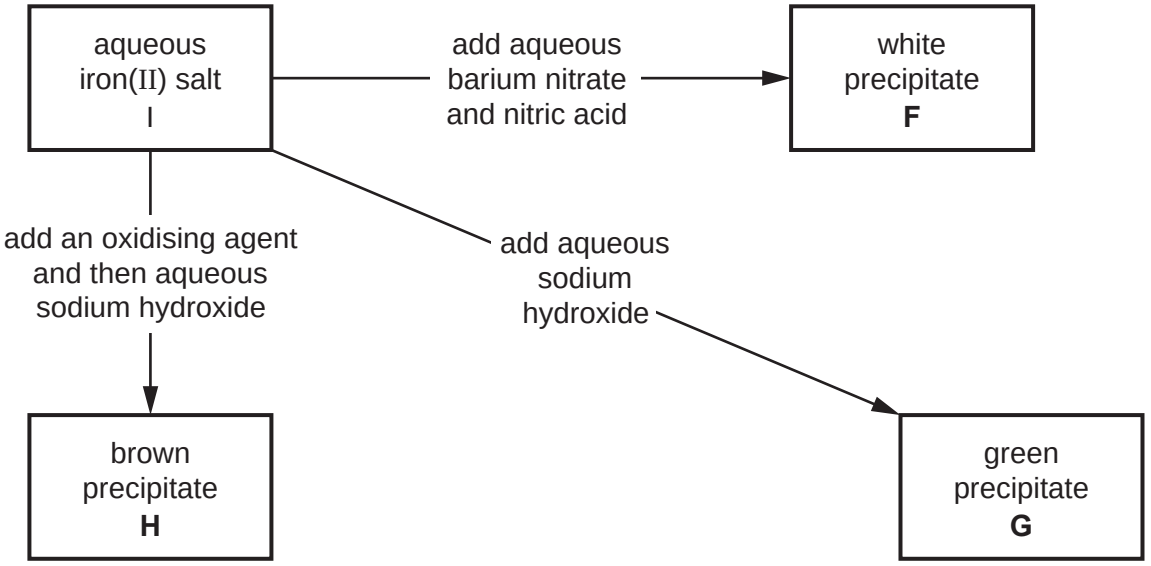

Fig. 8.1

Name substances **F**, **G**, **H** and **I**. [4]

9 **(a)** Calcium carbonate reacts with dilute hydrochloric acid to produce carbon dioxide gas. Outline how the rate of this reaction depends upon the particle size of calcium carbonate and upon the temperature of the acid. [2]

(b) Briefly describe an experiment to measure the rate of this reaction. Include a description of how you would display your results. [5]

(c) Explain how you could extend this experiment to show that the concentration of the acid also affects the rate of this reaction. [3]

10 **(a)** Describe how petroleum is separated into useful substances. Name **two** of these substances and give a use for each. [7]

(b) Ethene, C_2H_4, is made from one of these useful substances. Ethene can be polymerised to poly(ethene).
Give the structural formula of ethene and use this structure to show why it can be polymerised. [3]

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DATA SHEET
The Periodic Table of the Elements

Group																	
I	II										III	IV	V	VI	VII	0
							1 H Hydrogen 1									4 He Helium 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
23 Na Sodium 11	24 Mg Magnesium 12										27 Al Aluminium 13	28 Si Silicon 14	31 P Phosphorus 15	32 S Sulfur 16	35.5 Cl Chlorine 17	40 Ar Argon 18
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	64 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
85 Rb Rubidium 37	88 Sr Strontium 38	89 Y Yttrium 39	91 Zr Zirconium 40	93 Nb Niobium 41	96 Mo Molybdenum 42	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
133 Cs Caesium 55	137 Ba Barium 56	139 La Lanthanum 57 *	178 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	Po Polonium 84	At Astatine 85	Rn Radon 86
Fr Francium 87	226 Ra Radius 88	227 Ac Actinium 89 †															

140 Ce Cerium 58	141 Pr Praseodymium 59	144 Nd Neodymium 60	Pm Promethium 61	150 Sm Samarium 62	152 Eu Europium 63	157 Gd Gadolinium 64	159 Tb Terbium 65	162 Dy Dysprosium 66	165 Ho Holmium 67	167 Er Erbium 68	169 Tm Thulium 69	173 Yb Ytterbium 70	175 Lu Lutetium 71
232 Th Thorium 90	Pa Protactinium 91	238 U Uranium 92	Np Neptunium 93	Pu Plutonium 94	Am Americium 95	Cm Curium 96	Bk Berkelium 97	Cf Californium 98	Es Einsteinium 99	Fm Fermium 100	Md Mendelevium 101	No Nobelium 102	Lr Lawrencium 103

*58-71 Lanthanoid series
†90-103 Actinoid series

Key: a = relative atomic mass; **X** = atomic symbol; b = proton (atomic) number

The volume of one mole of any gas is 24 dm^3 at room temperature and pressure (r.t.p.)