



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Ordinary Level

CANDIDATE
NAME

CENTRE
NUMBER

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CANDIDATE
NUMBER

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SCIENCE

5124/03

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.



Section AAnswer **all** the questionsFor
Examiner's
Use

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.

For
Examiner's
Use

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]

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.

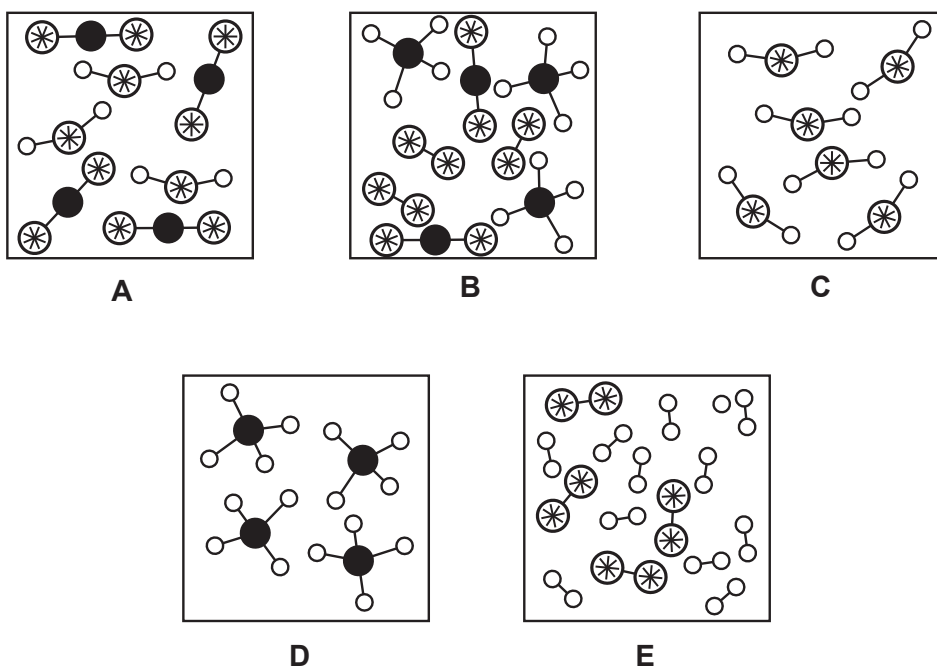


Fig. 3.1

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]

- 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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Use

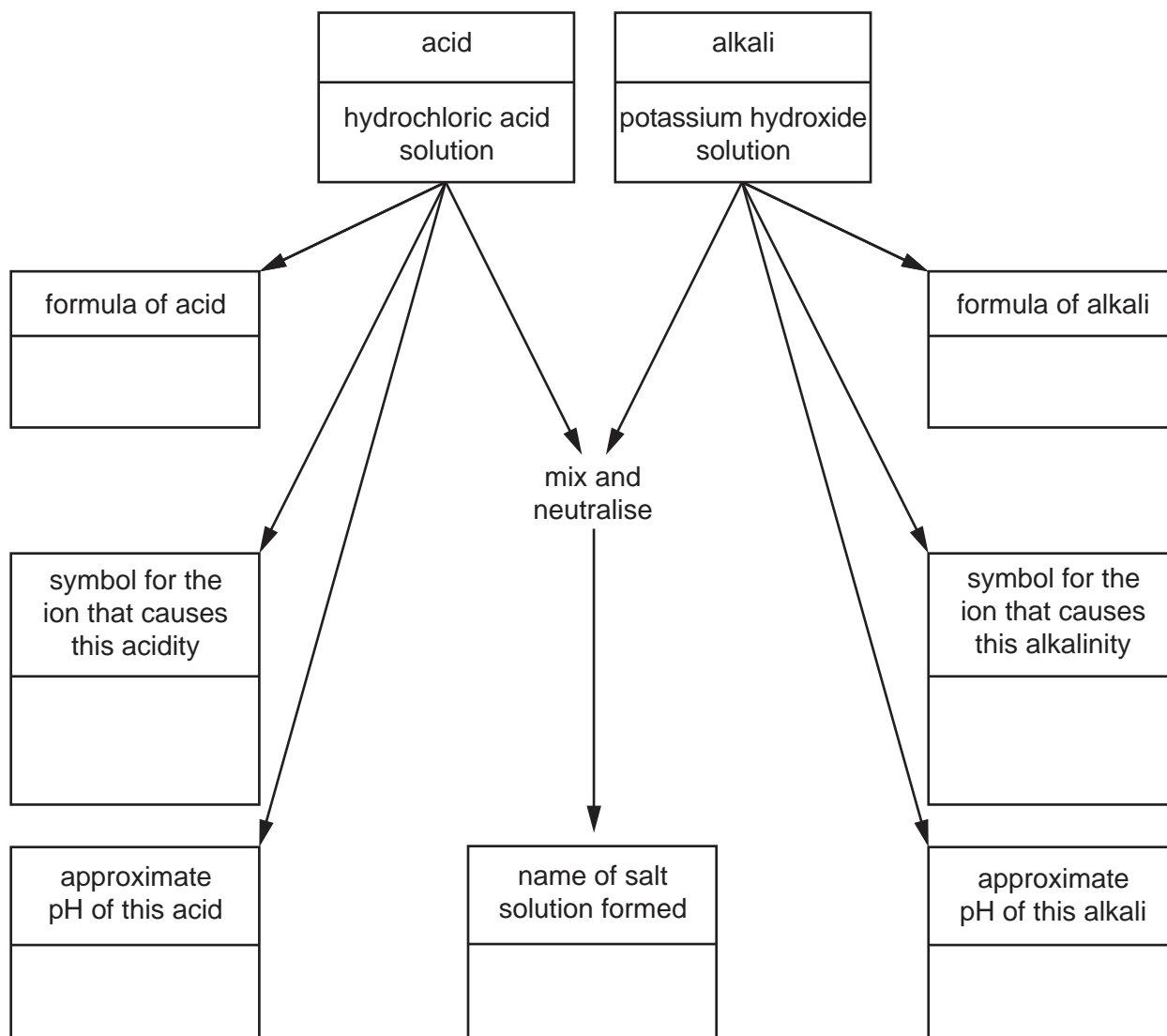


Fig. 5.1

[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 cm³ of a solution of 2.0 mol/dm³ hydrochloric acid?

.....
.....[1]

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

For
Examiner's
Use

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.

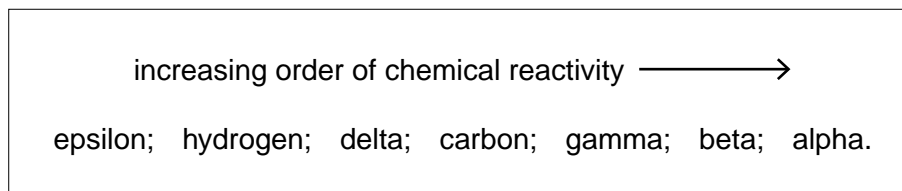


Fig. 7.1

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]

Section B

Answer any **two** questions.

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

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Use

- 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**.

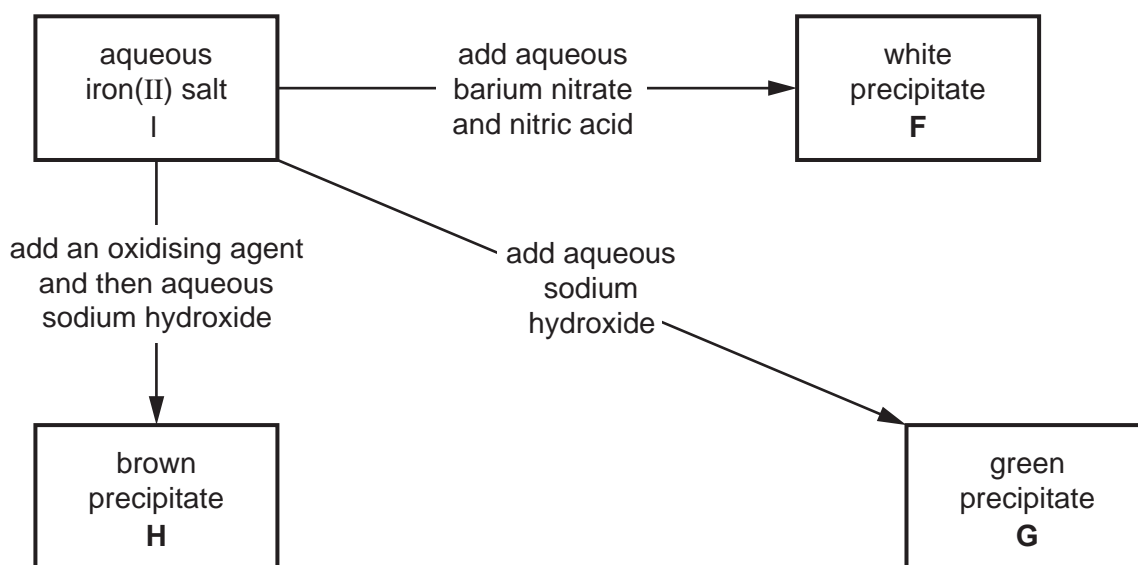


Fig. 8.1

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]

DATA SHEET
The Periodic Table of the Elements

		Group																																																																																													
I	II	III	IV	V	VI	VII	0																																																																																								
7 Li Lithium 3	9 Be Beryllium 4	1 H Hydrogen 1	11 B Boron 5	12 C Carbon 6	13 Al Aluminium 13	14 N Nitrogen 7	15 O Oxygen 8	16 F Fluorine 9	17 Ne Neon 10	18 Ar Argon 18	19 Cl Chlorine 17	20 Sc Scandium 21	21 K Potassium 19	22 Ca Calcium 20	23 V Vanadium 23	24 Cr Chromium 24	25 Mn Manganese 25	26 Fe Iron 26	27 Co Cobalt 27	28 Ni Nickel 28	29 Cu Copper 29	30 Zn Zinc 30	31 Ga Gallium 31	32 Ge Germanium 32	33 As Arsenic 33	34 Se Selenium 34	35 Br Bromine 35	36 Kr Krypton 36	37 Rb Rubidium 37	38 Sr Strontium 38	39 Y Yttrium 39	40 Zr Zirconium 40	41 Nb Niobium 41	42 Mo Molybdenum 42	43 Tc Technetium 43	44 Ru Ruthenium 44	45 Rh Rhodium 45	46 Pd Palladium 46	47 Ag Silver 47	48 Cd Cadmium 48	49 In Indium 49	50 Sn Tin 50	51 Sb Antimony 51	52 Te Tellurium 52	53 I Iodine 53	54 Xe Xenon 54	55 Cs Caesium 55	56 Ba Barium 56	57 La Lanthanum 57	58 Ce Cerium 58	59 Pr Praseodymium 59	60 Nd Neodymium 60	61 Pm Promethium 61	62 Sm Samarium 62	63 Eu Europium 63	64 Gd Gadolinium 64	65 Tb Terbium 65	66 Dy Dysprosium 66	67 Ho Holmium 67	68 Er Erbium 68	69 Tm Thulium 69	70 Yb Ytterbium 70	71 Lu Lutetium 71	72 Hf Hafnium 72	73 Ta Tantalum 73	74 W Tungsten 74	75 Re Rhenium 75	76 Os Osmium 76	77 Ir Iridium 77	78 Pt Platinum 78	79 Au Gold 79	80 Hg Mercury 80	81 Tl Thallium 81	82 Pb Lead 82	83 Bi Bismuth 83	84 Po Polonium 84	85 At Astatine 85	86 Rn Radon 86	87 Fr Francium 87	88 Ra Radium 88	89 Ac Actinium 89	90 Th Thorium 90	91 Pa Protactinium 91	92 U Uranium 92	93 Np Neptunium 93	94 Pu Plutonium 94	95 Am Americium 95	96 Cm Curium 96	97 Bk Berkelium 97	98 Cf Californium 98	99 Es Einsteinium 99	100 Fm Fermium 100	101 Md Mendelevium 101	102 No Nobelium 102	103 Lr Lawrencium 103

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

a = relative atomic mass
X = atomic symbol
b = proton (atomic) number

The volume of one mole of any gas is 24 dm³ at room temperature and pressure (r.t.p.)