UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Ordinary Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

2066537112

SCIENCE **5126/03**

Paper 3 Chemistry **October/November 2011**

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 IN 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 12.

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 **9** printed pages and **3** lined pages.

Section A

For Examiner's Use

Answer **all** the questions.

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

1 Complete Table 1.1 to list the uses of five materials and the reasons why each is chosen for this use. One row has been completed for you as an example.

Table 1.1

material	use	reason for choice
silver salts	photography	turn black in sunlight
aluminium		
calcium carbonate		
diamond		
helium		

[8]

2 **Name** the substances formed when the following changes take place.

(a) fermenting sugar

..... [1]

(b) melting zinc with copper

..... [1]

(c) reacting nitrogen and hydrogen

..... [1]

(d) adding chloride ions to silver nitrate solution

..... [1]

(e) removing an electron from a sodium atom

..... [1]

3 Name the pieces of apparatus best used to carry out the following procedures.

(a) Separate a precipitate from the solution in which it has formed.

..... [1]

(b) Determine the volume of a liquid.

..... [1]

(c) Change a vapour to a liquid.

..... [1]

(d) Add 17.3 cm^3 of solution to a flask.

..... [1]

[Turn over

4 Fig. 4.1 describes the results of tests on four unlabelled metals, **A**, **B**, **C** and **D**.

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Metal **A** Reacts explosively with water.	Metal **B** Reacts with steam only when very hot and with dilute hydrochloric acid.
Metal **C** Reacts steadily with cold water.	Metal **D** Does not react with dilute hydrochloric acid.

Fig. 4.1

(a) Place the metals **A**, **B**, **C** and **D** in order of reactivity.

most reactive .....

.....

.....

least reactive .....

[2]

(b) Suggest a possible name for any three of the metals.

	letter of metal	name of metal
(i)		
(ii)		
(iii)		

[3]

5 Complete Table 5.1 with details of two homologous series.

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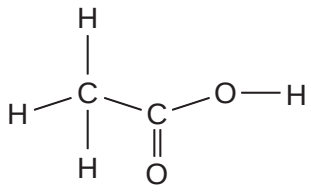
Table 5.1

name of homologous series	name of example	structural formula	characteristic group of atoms
	ethanol		**–OH**
carboxylic acids			

[4]

6 **(a)** Write the name and chemical formula for

(i) an acid,

name ..... chemical formula .....

(ii) an alkali.

name ..... chemical formula .....
[2]

(b) Name the products of the reaction between the acid and alkali you have written in **(a)**.

..... and .....[2]

(c) A substance forms ions when dissolved in water. Explain how the ions formed determine whether the solution can act as an acid or an alkali.

.....

.....[3]

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7 An atom has an atomic number of 17 and a relative atomic mass of 35.

(a) Determine the number of protons and of neutrons in the nucleus of this atom.

protons ..... neutrons ..... [2]

(b) When atoms of this element form chemical bonds they form a stable electronic structure. This can happen in **two** different ways. Describe each way.

1 .....

.....

2 .....

.....[4]

8 Vanadium, V, is extracted from a mineral called vanadinite. The chemical formula of vanadinite is shown below.

$$Pb_5(VO_4)_3Cl$$

(a) **(i)** Calculate the relative molecular mass of vanadinite.
[Relative atomic masses: A_r: O, 16; C*l*, 35.5; V, 51; Pb, 207]

relative molecular mass = ...

(ii) Calculate the percentage by mass of vanadium in vanadinite.

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percentage by mass = ...
[3]

(b) In the extraction process, vanadinite is converted into vanadium(III) chloride, VCl_3. This is reduced at a very high temperature by magnesium to form metallic vanadium and magnesium chloride, $MgCl_2$.

(i) Balance this equation for the reduction of vanadium(III) chloride by magnesium.

$$\ldots\ldots Mg + \ldots\ldots VCl_3 \rightarrow \ldots\ldots V + \ldots\ldots MgCl_2$$

(ii) Calculate the mass of magnesium needed to produce 5 kg of vanadium.
[Relative atomic masses: A_r: Mg, 24; V, 51]

mass of magnesium = ... kg
[3]

Section B

Answer any **two** questions.

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

9 **(a)** Fig. 9.1 describes reactions of a metal salt **E**.

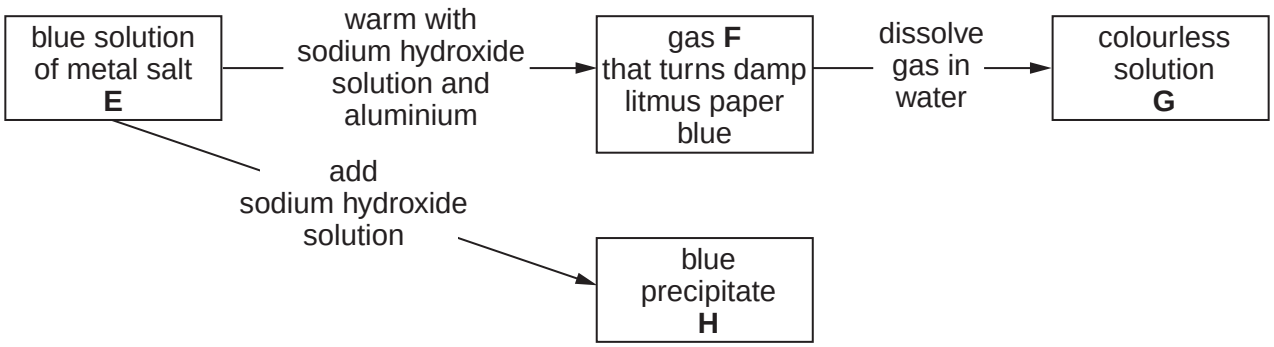

Fig. 9.1

(i) Identify **E**, **F**, **G** and **H**.

(ii) Write an equation for any of the changes described in Fig. 9.1.

[6]

(b) Describe how pure crystals of **E** could be obtained from a dilute solution of **E**. [4]

10 **(a)** Alkenes can be manufactured from alkanes obtained from petroleum. Briefly describe this manufacturing process. [4]

(b) Describe a laboratory test to distinguish between alkanes and alkenes. [3]

(c) What volume of oxygen is needed to burn completely 10 dm^3 of methane to carbon dioxide and water? Show your working. All volumes are measured at room temperature and pressure. [3]

11 The Periodic Table on page 12 contains an element with proton number 3 and another element with proton number 11.

(a) Identify these **two** elements and the group of the Periodic Table in which they are positioned. [3]

(b) Give the electronic structures of these **two** elements. Use these to explain why both elements appear in the same group of the Periodic Table. [3]

(c) Another element, with the proton number 19, is in the same group of the Periodic Table as the two elements in parts **(a)** and **(b)**. For these three elements, suggest **two** similarities in their properties and **two** trends in their properties. [4]

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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	209 Po Polonium 84	210 At Astatine 85	222 Rn Radon 86
223 Fr Francium 87	226 Ra Radium 88	227 Ac Actinium 89 †															

140 Ce Cerium 58	141 Pr Praseodymium 59	144 Nd Neodymium 60	147 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	231 Pa Protactinium 91	238 U Uranium 92	237 Np Neptunium 93	244 Pu Plutonium 94	243 Am Americium 95	247 Cm Curium 96	247 Bk Berkelium 97	251 Cf Californium 98	252 Es Einsteinium 99	257 Fm Fermium 100	258 Md Mendelevium 101	259 No Nobelium 102	260 Lr Lawrencium 103

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

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

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