Centre No.						Paper Reference							Surname	Initial(s)
Candidate No.						6	2	4	1	/	0	1	Signature	

Paper Reference(s)

6241/01

Edexcel GCE

Chemistry

Advanced Subsidiary

Unit Test 1

Wednesday 8 June 2005 – Morning

Time: 1 hour

Examiner's use only

Team Leader's use only

Question Number	Leave Blank
1	
2	
3	
4	
5	
6	
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, initial(s) and signature.
Answer **ALL** the questions in the spaces provided in this question paper.
You may use a calculator. **Show all the steps in any calculations and state the units.**

Information for Candidates

The total mark for this paper is 60. The marks for individual questions and parts of questions are shown in round brackets: e.g. (**2**). There are 12 pages in this question paper. All blank pages are indicated.
A Periodic Table is printed on the back cover of this question paper.

Advice to Candidates

You are reminded of the importance of clear English and careful presentation in your answers.

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Turn over

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Leave blank

Answer ALL questions in the spaces provided.

1. Magnesium burns in oxygen to form magnesium oxide, MgO.

(a) Write the equation for the reaction.

.....

(1)

(b) Draw a dot and cross diagram of magnesium oxide. Show all the electrons.

(2)

(c) Describe the bonding in magnesium. Explain why it is a good conductor of electricity.

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(3)

Q1

(Total 6 marks)

Leave blank

2. (a) Complete the following table.

Element	Physical state at room temperature	Colour
chlorine		
bromine		
iodine		

(3)

(b) (i) Write the equation for the reaction between concentrated sulphuric acid and solid potassium chloride, KCl.

.....

(1)

(ii) When potassium bromide, KBr, reacts with concentrated sulphuric acid, bromine and sulphur dioxide are produced.

Give the oxidation numbers of bromine and sulphur in the reactants and products. Hence identify the oxidising agent, giving a reason for your choice.

KBr ..... H_2SO_4 .....

Br_2 ..... SO_2 .....

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(4)

Q2

(Total 8 marks)

Leave blank

3. (a) Complete the electronic configuration for calcium, Ca.

$1s^2$ .....

(1)

(b) (i) Define the term **first ionisation energy**.

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(3)

(ii) Explain why the first ionisation energy of calcium is lower than that of magnesium.

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(3)

(c) A sample of magnesium contains three isotopes of mass numbers 24, 25 and 26.

(i) In terms of sub-atomic particles, state ONE similarity and ONE difference between these isotopes.

Similarity .....

.....

Difference .....

.....

(2)

Leave blank

(ii) The following data were obtained from the mass spectrum of this sample of magnesium.

Peak at *m/e*	%
24.0	78.6
25.0	10.1
26.0	11.3

Calculate the relative atomic mass of this sample of magnesium. Give your answer to 3 significant figures.

(2)

Q3

(Total 11 marks)

Leave blank

4. (a) Sodium and chlorine react together in a redox reaction to form sodium chloride, NaCl.

(i) Write the half equation for

the oxidation of sodium, Na

.....

the reduction of chlorine, Cl_2.

.....

(2)

(ii) Write the equation for the reaction of sodium with chlorine.

.....

(1)

(b) (i) State the type of bonding in sodium chloride.

.....

(1)

(ii) Draw a diagram to show the three-dimensional arrangement of the particles in sodium chloride.

(2)

Leave blank

(c) Boron trichloride, BCl_3, is a compound whose molecules contain covalent bonds.

(i) Define the term **covalent bond**.

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(1)

(ii) Explain why the melting temperature of boron trichloride is much lower than that of sodium chloride.

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(4)

(Total 11 marks)

Q4

Leave blank

5. (a) Potassium reacts vigorously with water.

(i) Write an equation for the reaction, including state symbols.

.....

(2)

(ii) State TWO observations you could make during this reaction.

Observation 1 .....

Observation 2 .....

(2)

(b) (i) Potassium superoxide contains 54.9 % potassium by mass.
Show that the empirical formula of this compound is KO_2.

(3)

(ii) Give the oxidation number of oxygen in the compound KO_2.

.....

(1)

Leave blank

(c) Which of potassium nitrate or lithium nitrate has the higher thermal stability? Explain your answer.

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(3)

Q5

(Total 11 marks)

Leave blank

6. Silicon reacts with chlorine to produce silicon tetrachloride, as shown in the following equation

$$Si(s) + 2Cl_2(g) \rightarrow SiCl_4(l)$$

(a) (i) Calculate the mass of silicon tetrachloride obtained from 10.0 g of silicon.

(3)

(ii) Calculate the minimum volume of chlorine that would be required to react completely with 10.0 g of silicon.

[1 mol of gas occupies 24.0 dm^3 under the conditions of the experiment]

(2)

Leave blank

(b) Draw a silicon tetrachloride molecule, $SiCl_4$, showing its three-dimensional shape. Name the shape and state the bond angle. Explain why the molecule has this shape.

Diagram

Name of shape .....

Bond angle .....

Explanation of shape

.....

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(5)

(c) (i) Why are silicon-chlorine bonds polar?

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(1)

(ii) Explain why the silicon tetrachloride molecule has no permanent dipole.

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(2)

Q6

(Total 13 marks)

TOTAL FOR PAPER: 60 MARKS

END

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	65.4 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	85 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	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	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

Molar mass g mol^{-1}

Symbol

Name

Atomic number

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	163 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	(242) Pu Plutonium 94	(243) Am Americium 95	(247) Cm Curium 96	(245) Bk Berkelium 97	(251) Cf Californium 98	(254) Es Einsteinium 99	(253) Fm Fermium 100	(256) Md Mendelevium 101	(254) No Nobelium 102	(257) Lr Lawrencium 103