

Centre No.					
Candidate No.					

Paper Reference (complete below)					
			/		

Surname	Initial(s)
Signature	

Paper Reference(s)
6241/P.01
Edexcel GCE
Chemistry
Advanced/Advanced Subsidiary
Unit Test 1
Friday 11 January 2002 – Afternoon
Time: 1 hour 20 minutes

Examiner's use only

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Team Leader's use only

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Materials required for examination
 Nil

Items included with question papers
 Nil

Question Number	Leave Blank
1	
2	
3	
4	
5	
6	
7	
8	
Total	

Instructions to Candidates

In the boxes above, write your centre number, candidate number, your surname and initials, the paper reference and your signature. The paper reference is shown above. If more than one paper reference is shown, you should write the one for which you have been entered.
 Answer ALL questions in the spaces provided in this question paper.
 Show all the steps in any calculations and state the units. Calculators may be used.

Information for Candidates

A periodic table is printed on the back cover of this question paper.
 The marks for individual questions and the parts of questions are shown in round brackets: e.g. (2).
 There are eight questions in this question paper.
 The total mark for this paper is 75.

Advice to Candidates

You are reminded of the need to organise and present information, ideas, descriptions and arguments clearly and logically, taking account of your use of grammar, punctuation and spelling.

Turn over

Leave
blank

1. (a) Sodium reacts with cold water.

(i) What would you see as the reaction proceeds?

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.....
.....

(2)

(ii) Write the balanced chemical equation for this reaction.

.....

(2)

(b) Calculate the volume of gas produced if 3.0 g of sodium reacts with an excess of water.

(One mole of any gas at the temperature and pressure of the experiment occupies 24 dm³.)

(3)

Q1

(Total 7 marks)

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2. (a) (i) What is meant by the **mass number** of an atom?

Leave blank

.....

(1)

(ii) Define the term **relative atomic mass**.

.....

.....

(2)

(iii) What are isotopes?

.....

.....

(2)

(b) Magnesium has three isotopes. The mass spectrum of magnesium shows peaks at m/e 24 (78.60%), 25 (10.11%), and 26 (11.29%). Calculate the relative atomic mass of magnesium to 4 significant figures.

(2)

Q2

(Total 7 marks)

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3. (a) Define the term **first ionisation energy** for magnesium.

Leave blank

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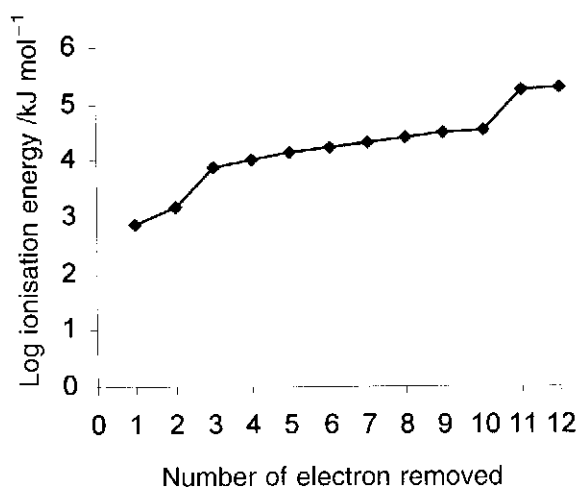
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(3)

(b) The logarithm of successive ionisation energies for magnesium is plotted in the graph below.



Explain what this graph tells you about the electron arrangement in the magnesium atom.

.....

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(3)

(c) (i) Give the full electronic configuration of magnesium using the s,p,d notation.

.....

(1)

(ii) Explain why all isotopes of magnesium have the **same** chemical properties.

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.....

(2)

Q3

(Total 9 marks)

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Leave blank

4. (a) Hydrogen chloride can be made from sodium chloride and concentrated sulphuric acid. Write a balanced chemical equation to represent this reaction.

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(1)

- (b) (i) How would you confirm that a solution said to be HCl(aq) contained chloride ions?

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.....
.....
(3)

- (ii) Hydrogen chloride is soluble in water. Explain why the solution is acidic.

.....
.....
(2)

- (c) (i) Give a chemical test for chlorine, stating what you would do and what you would see.

.....
.....
(2)

- (ii) Hydrogen chloride can be oxidised to chlorine by lead(IV) oxide, PbO₂. Write the oxidation numbers of lead and of chlorine in the boxes provided.



(2)

- (d) Sodium iodide reacts with concentrated sulphuric acid to give iodine, not hydrogen iodide. Explain why iodides react differently from chlorides in this case.

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(2)

(Total 12 marks)

Q4

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5. (a) Boron forms the chloride BCl_3 . Draw a dot-and-cross diagram for BCl_3 .

Leave
blank

(b) (i) Draw the shape of the BCl_3 molecule.

(1)

(ii) Explain why BCl_3 has this shape.

(1)

.....
.....
.....

(2)

(c) (i) The B—Cl bond is polar due to the different electronegativity of the atoms. Explain what is meant by the term **electronegativity**.

.....
.....

(2)

(ii) The B—Cl bond is polar. Explain why BCl_3 is **not** a polar molecule.

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(2)

Q5

(Total 8 marks)

Leave blank

6. (a) A compound of sodium, chlorine and oxygen contains, by mass, 21.6% Na, 33.3% Cl and 45.1% O. Show that this is consistent with the formula NaClO₃.

(2)

(b) NaClO₃ can be obtained from NaOCl(aq) by a disproportionation reaction on heating.

(i) Give the **ionic** equation for this disproportionation reaction.

(2)

(ii) By a consideration of the oxidation numbers of the **chlorine** in the various species, show why the reaction in (i) is disproportionation.

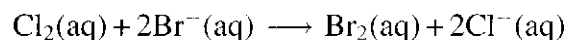
(4)

(c) Chlorine is used in the extraction of bromine from seawater.

(i) Give the half-equation for the reduction of chlorine.

(1)

(ii) Give the half-equation for the oxidation that is occurring given that the overall equation for the reaction is:



(1)

Q6

(Total 10 marks)

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7. The table below shows the melting temperatures of the elements of period 3.

Leave blank

	Na	Mg	Al	Si	P	S	Cl	Ar
m.p./°C:	98	650	660	1410	44	119	-101	-189
Structural type								

(a) Write **in the spaces in the table** the structural type for these elements. (2)

(b) Explain why the melting temperature of sodium is so much lower than that of magnesium or of aluminium.

.....
.....
.....

(3)

(c) (i) Explain the very low melting temperature of argon.

.....
.....

(1)

(ii) Phosphorus exists as P₄, sulphur as S₈. Explain the difference in the melting temperature of these substances.

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(2)

Q7

(Total 8 marks)

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blank

8. (a) (i) State how a flame test would distinguish between samples of calcium nitrate, $\text{Ca}(\text{NO}_3)_2$ and barium nitrate, $\text{Ba}(\text{NO}_3)_2$.

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.....

(2)

- (ii) Explain the origin of the flame colour.

.....

.....

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(3)

- (b) Write the equation for the action of heat on barium nitrate.

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(2)

- (c) (i) What is meant by the term **polarising power** as applied to cations?

.....

.....

.....

(2)

- (ii) Give **two** factors which affect the polarising power of cations.

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(2)

(iii) Use this information to explain why it is easier to decompose magnesium nitrate than barium nitrate by heating.

Leave blank

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(3) Q8

(Total 14 marks)

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TOTAL FOR PAPER: 75 MARKS

END

THE PERIODIC TABLE

1 2 3 4 5 6 7 0

Period

1	H
	Hydrogen 1

Molar mass g mol ⁻¹
Symbol
Name
Atomic number

4	He
	Helium 2

7	Li	Be											B	C	N	O	F	Ne
	Lithium 3	Beryllium 4											Boron 5	Carbon 6	Nitrogen 7	Oxygen 8	Fluorine 9	Neon 10
3	Na	Mg											Al	Si	P	S	Cl	Ar
	Sodium 11	Magnesium 12											Aluminium 13	Silicon 14	Phosphorus 15	Sulphur 16	Chlorine 17	Argon 18
4	K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
	Potassium 19	Calcium 20	Scandium 21	Titanium 22	Vanadium 23	Chromium 24	Manganese 25	Iron 26	Cobalt 27	Nickel 28	Copper 29	Zinc 30	Gallium 31	Germanium 32	Arsenic 33	Selenium 34	Bromine 35	Krypton 36
5	Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
	Rubidium 37	Strontium 38	Yttrium 39	Zirconium 40	Niobium 41	Molybdenum 42	Technetium 43	Ruthenium 44	Rhodium 45	Palladium 46	Silver 47	Cadmium 48	Indium 49	Tin 50	Antimony 51	Tellurium 52	Iodine 53	Xenon 54
6	Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn
	Caesium 55	Barium 56	Lanthanum 57	Hafnium 72	Tantalum 73	Tungsten 74	Rhenium 75	Osmium 76	Iridium 77	Platinum 78	Gold 79	Mercury 80	Thallium 81	Lead 82	Bismuth 83	Polonium 84	Astatine 85	Radon 86
7	Fr	Ra	Ac															
	Francium 87	Radium 88	Actinium 89															

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