

Centre No.					
Candidate No.					

Paper Reference (complete below)					
				/	

Surname	Initial(s)
Signature	

Paper Reference(s)

6241/P.01

Edexcel GCE

Chemistry

Advanced Level/Advanced Subsidiary

Unit Test 1

Monday 4 June 2001 – 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, the paper reference, your signature, surname and initials.

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.

Final answers to calculations should be given to an appropriate number of significant figures.

Include diagrams in your answers where these are helpful.

Additional answer sheets 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

1. (a) When the Group 2 element calcium is added to water, calcium hydroxide and hydrogen are produced.

Leave
blank

Write an equation for the reaction.

.....
(1)

- (b) State the trend in solubility of the hydroxides of the Group 2 elements as the atomic mass of the metal increases.

.....
(1)

- (c) (i) Define the term **first ionisation energy**, and write an equation to represent the change occurring when the first ionisation energy of calcium is measured.

.....
.....
.....
.....
.....
.....
(4)

- (ii) State and explain the trend in the first ionisation energy of the Group 2 elements.

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

Q1

(Total 9 marks)

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2. (a) (i) Complete the electronic configuration of a sulphur atom.

1s²..... (1)

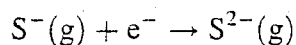
(ii) Deduce the number of neutrons in the nucleus of an atom of ³²S.

..... (1)

(b) (i) Define the term **first electron affinity**.

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

(ii) The following equation represents the change occurring when the **second** electron affinity of sulphur is measured.



Explain why the **second** electron affinity of an element is endothermic.

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

(2)

Q2

(Total 7 marks)

--

3. (a) When a sample of copper is analysed using a mass spectrometer, its atoms are ionised and then accelerated.

Leave blank

(i) Explain how the atoms of the sample are ionised.

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

(2)

(ii) State how the resulting ions are then accelerated.

.....
.....

(1)

(b) For a particular sample of copper two peaks were obtained in the mass spectrum.

Peak at m/e	Relative abundance
63	69.1
65	30.9

(i) Give the formula of the species responsible for the peak at $m/e = 65$.

.....

(1)

(ii) State why **two** peaks, at m/e values of 63 and 65, were obtained in the mass spectrum.

.....

(1)

(iii) Calculate the relative atomic mass of this sample of copper, using the table of results above.

(2) Q3

(Total 7 marks)

--

Leave
blank

4. (a) Compound A, consisting of carbon and hydrogen only, was found to contain 80.0% carbon by mass.

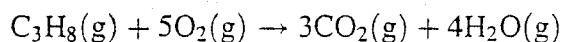
(i) Calculate the empirical formula of compound A, using the data above and the periodic table.

(3)

(ii) The relative molecular mass of compound A was found to be 30. Use this information to deduce the molecular formula of compound A.

(1)

(b) Propane has the molecular formula C_3H_8 . Propane burns completely in oxygen to form carbon dioxide and water as shown in the equation.



(i) Calculate the mass of water produced when 110 g of propane burns completely in oxygen.

(3)

(ii) Calculate the volume of oxygen required to completely burn 110 g of propane. (1 mole of gas has a volume of 24 dm^3 under the conditions of the experiment.)

(2)

Q4

(Total 9 marks)

5. Deduce and draw the shapes of the following molecules or ions. Suggest a value for the bond angle in each case. Give a brief explanation of why each has the shape you give.

Leave blank

(a) SF_6

.....
.....

(3)

(b) PH_3

.....
.....

(3)

(c) PF_4^+

.....
.....

(3)

Q5

(Total 9 marks)

--

6. (a) The compounds lithium chloride, sodium bromide and potassium iodide can be distinguished from one another by the use of flame tests.

Leave blank

(i) Complete the following table.

Compound	Flame colour
Lithium chloride	
Sodium bromide	
Potassium iodide	

(3)

(ii) Explain the origin of the colours in flame tests.

.....
.....

(2)

(b) These compounds can also be distinguished from one another by the use of concentrated sulphuric acid.

(i) State what would be seen when concentrated sulphuric acid is added to separate solid samples of each of these compounds.

Lithium chloride

.....

Sodium bromide.....

.....

Potassium iodide

.....

(4)

(ii) Write an equation, including the state symbols, for the reaction between solid lithium chloride and concentrated sulphuric acid.

.....

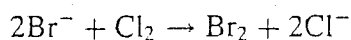
(2)

(Total 11 marks)

Q6

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7. (a) Seawater contains aqueous bromide ions. During the manufacture of bromine, seawater is treated with chlorine gas and the following reaction occurs:



Leave
blank

- (i) Explain the term **oxidation** in terms of electron transfer.

.....
.....

(1)

- (ii) Explain the term **oxidising agent** in terms of electron transfer.

.....
.....

(1)

- (iii) State which of the elements chlorine or bromine is the stronger oxidising agent and explain the importance of this in the extraction of bromine from seawater, as represented in the equation above.

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

(2)

- (b) When sodium chlorate(I), NaClO , is heated, sodium chlorate(V) and sodium chloride are formed.

- (i) Write the **ionic** equation for this reaction.

.....

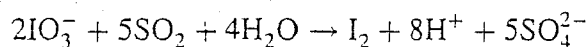
(2)

- (ii) What type of reaction is this?

.....

(1)

(c) During one process for the manufacture of iodine the following reaction occurs:



Leave
blank

(i) Deduce the oxidation number of sulphur in:

SO_2

SO_4^{2-}

(2)

(ii) Use your answers to part (c)(i) to explain whether SO_2 has been oxidised or reduced in the above reaction.

.....

.....

(1)

(iii) Name a reagent that could be used to confirm that a solution contains iodine, and state what would be seen.

.....

.....

(2)

(Total 12 marks)

Q7

8. (a) Explain the following observations. Include details of the **bonding** in and the **structure** of each substance.

Leave blank

(i) The melting temperature of diamond is much higher than that of iodine.

.....

.....

.....

.....

.....

.....

(5)

(ii) Sodium chloride has a high melting temperature (approximately 800 °C).

.....

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(3)

(b) Explain why aluminium metal is a good conductor of electricity.

.....

.....

.....

.....

(3)

Q8

(Total 11 marks)

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TOTAL FOR PAPER: 75 MARKS

END

THE PERIODIC TABLE

1 2 Group 3 4 5 6 7 0

Period

1	<table border="1"> <tr> <td>1</td> <td>H Hydrogen 1</td> </tr> </table>		1	H Hydrogen 1	<table border="1"> <tr> <th colspan="2">Key</th> </tr> <tr> <td>Molar mass g mol⁻¹</td> <td></td> </tr> <tr> <td>Symbol</td> <td></td> </tr> <tr> <td>Name</td> <td></td> </tr> <tr> <td>Atomic number</td> <td></td> </tr> </table>																Key		Molar mass g mol ⁻¹		Symbol		Name		Atomic number		<table border="1"> <tr> <td>4</td> <td>He Helium 2</td> </tr> </table>		4	He Helium 2			
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140	141	144	(147)	150	152	157	159	163	165	167	169	173	175
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	(231)	238	(237)	(242)	(243)	(247)	(245)	(251)	(254)	(253)	(256)	(254)	(257)
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