Centre No.						Paper Reference							Surname	Initial(s)
Candidate No.						6	2	5	1	/	0	1	Signature	

Paper Reference(s)

6251/01

Edexcel GCE

Chemistry (Nuffield)

Advanced Subsidiary

Unit Test 1

Wednesday 4 June 2008 – Morning

Time: 1 hour 15 minutes

Examiner's use only		

Team Leader's use only		

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

Materials required for examination
Nil

Items included with question papers
Nil

A calculator may be used.

Instructions to Candidates

In the boxes above, write your centre number, candidate number, your surname, initial(s) and your signature.
Answer **ALL** the questions. Write your answers in the spaces provided in this question paper.
Final answers to calculations should be given to an appropriate number of significant figures.

Information for Candidates

A Periodic Table is printed on the back cover of this paper.
The marks for individual questions and the parts of questions are shown in round brackets: e.g. **(2)**.
The total mark for this paper is 60. There are 16 pages in this paper. Any blank pages are indicated.

Advice to Candidates

You are advised to show all steps in any calculations.
You will be assessed on your ability to organise and present information, ideas, descriptions and arguments clearly and logically, taking account of your use of grammar, punctuation and spelling.

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Answer ALL the questions. Write your answers in the spaces provided.

SECTION A

1. The following ionic equation represents a reaction that occurs when zinc metal is warmed with 20 cm^3 of 0.10 mol dm^{-3} iron(III) sulphate solution.

$$Zn(s) + 2Fe^{3+}(aq) \rightarrow Zn^{2+}(aq) + 2Fe^{2+}(aq)$$

(a) Calculate the number of moles of iron(III) sulphate present.

(1)

(b) What type of reaction takes place? Justify your answer.

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(2) **Q1**

(Total 3 marks)

2. (a) Name the homologous series to which the compound CH_3CH_2CHO belongs.

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(1)

(b) Describe what you would **see** if a sample of CH_3CH_2CHO was warmed with Benedict's solution.

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(2) **Q2**

(Total 3 marks)

Leave blank

3. (a) A sample of the element osmium, atomic number 76, is made up of four isotopes. The sample has the following percentage composition.

Relative Atomic Mass of Isotope	% Composition
188	15.20
189	17.40
190	26.40
192	41.00

(i) What is the minimum number of neutrons present in any single atom of osmium in the sample?

.....

(1)

(ii) Calculate the average relative atomic mass of osmium in the sample. Give your answer to **four** significant figures.

(2)

(b) The element chlorine consists of two isotopes of relative atomic mass 35 and 37. How many peaks corresponding to Cl_2^+ ions would be seen in the mass spectrum of chlorine? Explain how you arrived at your answer.

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(2) **Q3**

(Total 5 marks)

TOTAL FOR SECTION A: 11 MARKS

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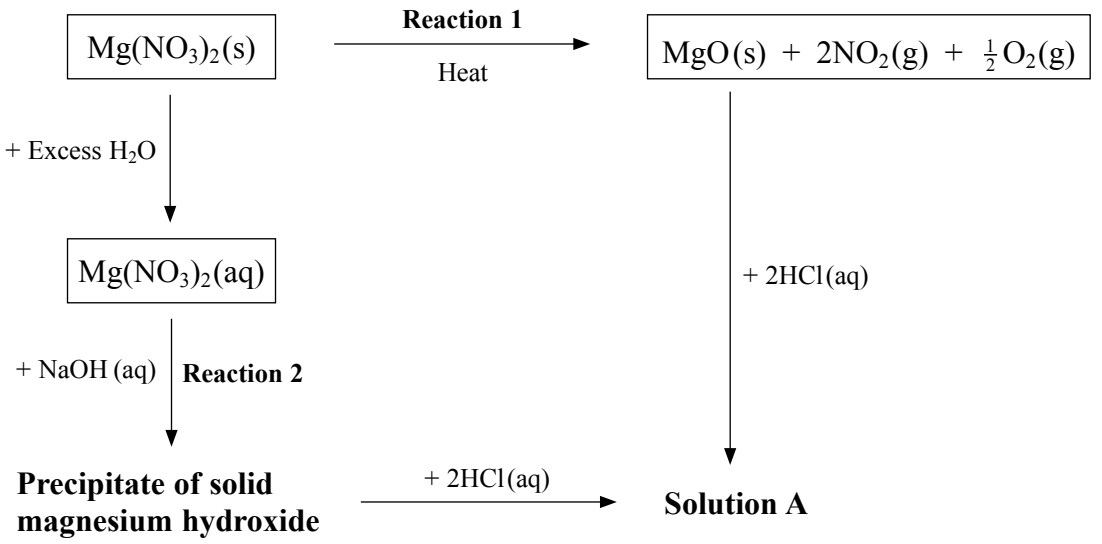
SECTION B

4. Look at the reaction scheme below and then answer the questions that follow.



(a) (i) What type of reaction is **Reaction 1**?

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(1)

(ii) For **each** of the gaseous products of **Reaction 1**, describe a test which would suggest its presence and the expected result.

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(2)

Leave blank

(iii) Calculate the volume of $NO_2(g)$ at room temperature and pressure, which is produced from 14.8 g of $Mg(NO_3)_2(s)$. Assume that **Reaction 1** has a 100% yield.

Use the Periodic Table as a source of data.

[The molar volume of a gas is 24 000 $cm^3 mol^{-1}$ at room temperature and pressure]

(3)

(b) (i) Write an ionic equation, including state symbols, for **Reaction 2**.

(1)

(ii) What would be the colour of the precipitate of magnesium hydroxide?

.....

(1)

Leave blank

(c) (i) What is the formula of the magnesium compound present in **Solution A**?

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(1)

(ii) Describe how you could obtain a dry sample of hydrated crystals from **Solution A**.

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(3)

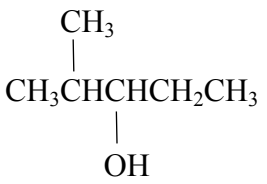
Q4

(Total 12 marks)

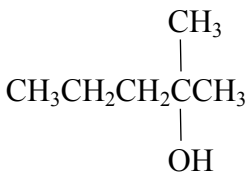
Leave blank

5. This question is about the alcohols labelled **A – F** and some of their reactions.

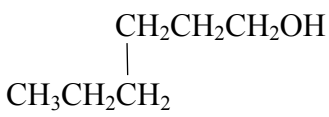
A



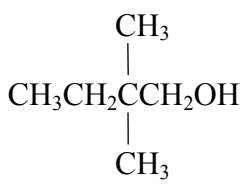
B



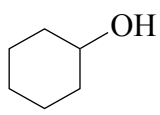
C



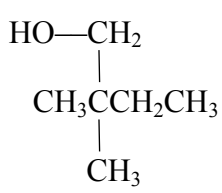
D



E



F



(a) (i) Two of the formulae **A – F** represent the same compound. Identify them by letter and give the systematic name of this compound.

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.....

Systematic name .....

(2)

(ii) Select from **A – F** any tertiary alcohols. Explain how you would recognise a tertiary alcohol from its structure.

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(2)

(iii) Five of the alcohols **A – F** are isomers. Explain what is meant by **isomers**.

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(2)

Leave blank

(b) (i) Give the letters of **all** the alcohols that would form carboxylic acids when refluxed with acidified sodium dichromate(VI).

.....

(1)

(ii) What type of reaction takes place during the formation of the carboxylic acids?

.....

(1)

(iii) What colour change would you expect to accompany the reaction?

From ..... to .....

(1)

(c) (i) Alcohol **E** can be converted to a liquid alkene in a reaction with concentrated phosphoric acid. Draw and label suitable apparatus to carry out this reaction and collect the alkene formed.

(3)

Leave blank

(ii) 15.0 g of alcohol **E** formed 9.84 g of the alkene cyclohexene, after purification. Calculate the percentage yield of the reaction.

[Relative molecular mass, M_r, of alcohol **E** = 100, M_r of cyclohexene = 82]

(2) **Q5**

(Total 14 marks)

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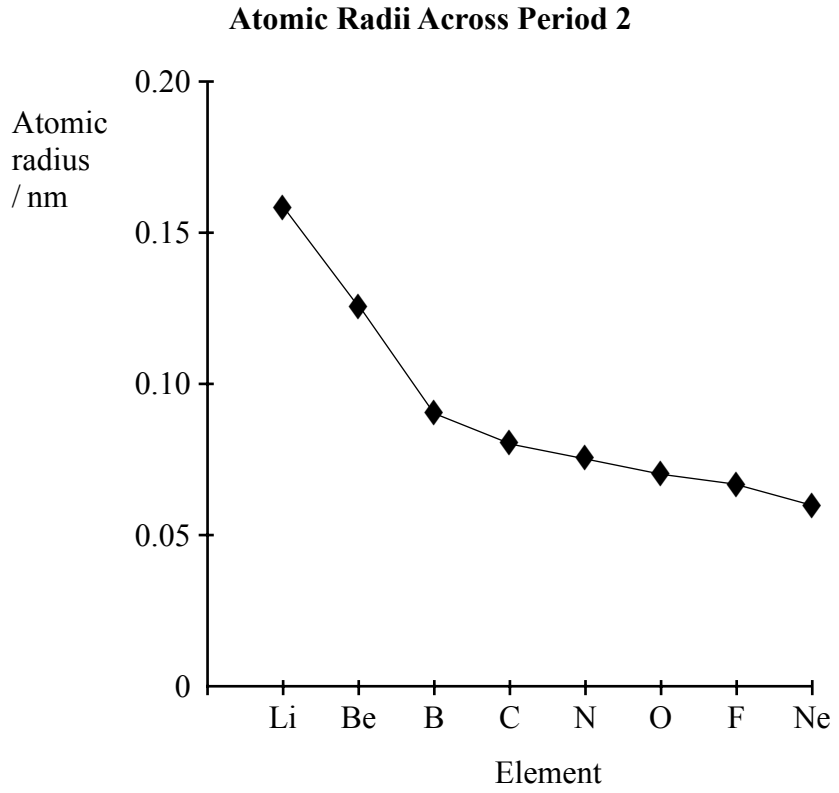
6. The graph shows the trend in atomic radii across Period 2.



(a) (i) Explain this trend.

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(2)

(ii) On the graph above, sketch a line to show the trend of atomic radii across Period 3. Justify any differences and similarities with the trend across Period 2.

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(3)

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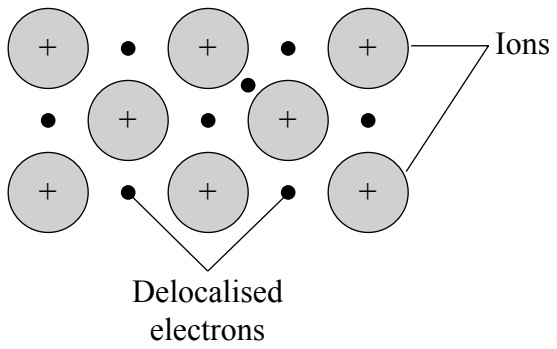
(b) The diagram shows the type of bonding present in the elements lithium and sodium in the solid state.



(i) What name is given to this type of bonding?

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(1)

(ii) Suggest why the melting point of lithium is greater than that of sodium.

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(2)

Leave blank

(c) Lithium can react with chlorine to produce lithium chloride. When a sample of lithium chloride is heated in a Bunsen flame, a red colour is seen.

(i) Draw a 'dot and cross' diagram of lithium chloride showing **all** the electrons. Indicate the charges clearly on your diagram.

(2)

(ii) Describe the changes that occur within the lithium ion to produce the flame colour.

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(2)

(iii) Name ONE other metallic element whose compounds produce a red coloured flame.

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(1)

Q6

(Total 13 marks)

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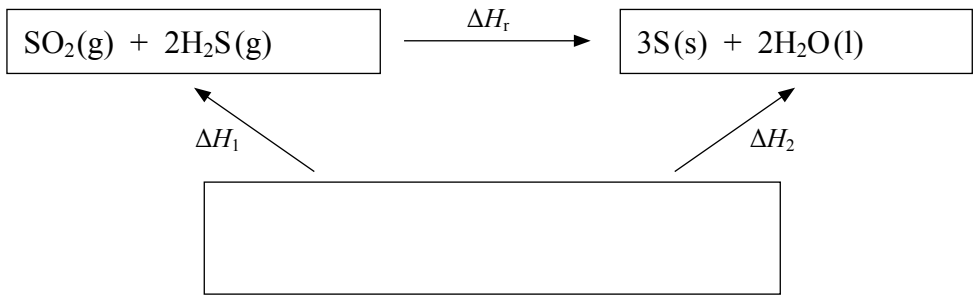
7. The Hess cycle below can be used to find the enthalpy change, ΔH_r, for the reaction between hydrogen sulphide and sulphur dioxide, using standard enthalpy changes of formation.



(a) (i) Complete the cycle by filling in the empty box.

(2)

(ii) What is meant by the **standard enthalpy change of formation**, $\Delta H_f^{\ominus}$, of a compound?

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(3)

(iii) Use the cycle and the data below to calculate the enthalpy change of the reaction, ΔH_r.

	$\Delta H_f^{\ominus}$ / kJ mol^{-1}
$SO_2(g)$	–296.8
$H_2S(g)$	–20.6
$H_2O(l)$	–285.8

(2)

Leave blank

(b) Hydrogen sulphide gas can behave as a weak acid.

(i) Describe a test you could carry out to confirm a gas is acidic. Give the result of your test.

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(2)

(ii) Explain what is meant by **weak** when used to describe an acid.

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(1)

Q7

(Total 10 marks)

TOTAL FOR SECTION B: 49 MARKS

TOTAL FOR PAPER: 60 MARKS

END

THE PERIODIC TABLE

Period	1	2	Group										3	4	5	6	7	0
1	1 H Hydrogen 1																	2 He Helium 4
2	3 Li Lithium 7	4 Be Beryllium 9											5 B Boron 11	6 C Carbon 12	7 N Nitrogen 14	8 O Oxygen 16	9 F Fluorine 19	10 Ne Neon 20
3	11 Na Sodium 23	12 Mg Magnesium 24											13 Al Aluminium 27	14 Si Silicon 28	15 P Phosphorus 31	16 S Sulphur 32	17 Cl Chlorine 35.5	18 Ar Argon 40
4	19 K Potassium 39	20 Ca Calcium 40	21 Sc Scandium 45	22 Ti Titanium 48	23 V Vanadium 51	24 Cr Chromium 52	25 Mn Manganese 55	26 Fe Iron 56	27 Co Cobalt 59	28 Ni Nickel 59	29 Cu Copper 63.5	30 Zn Zinc 65.4	31 Ga Gallium 70	32 Ge Germanium 73	33 As Arsenic 75	34 Se Selenium 79	35 Br Bromine 80	36 Kr Krypton 84
5	37 Rb Rubidium 85	38 Sr Strontium 88	39 Y Yttrium 89	40 Zr Zirconium 91	41 Nb Niobium 93	42 Mo Molybdenum 96	43 Tc Technetium (99)	44 Ru Ruthenium 101	45 Rh Rhodium 103	46 Pd Palladium 106	47 Ag Silver 108	48 Cd Cadmium 112	49 In Indium 115	50 Sn Tin 119	51 Sb Antimony 122	52 Te Tellurium 128	53 I Iodine 127	54 Xe Xenon 131
6	55 Cs Caesium 133	56 Ba Barium 137	57 ► La Lanthanum 139	72 Hf Hafnium 178	73 Ta Tantalum 181	74 W Tungsten 184	75 Re Rhenium 186	76 Os Osmium 190	77 Ir Iridium 192	78 Pt Platinum 195	79 Au Gold 197	80 Hg Mercury 201	81 Tl Thallium 204	82 Pb Lead 207	83 Bi Bismuth 209	84 Po Polonium (210)	85 At Astatine (210)	86 Rn Radon (222)
7	87 Fr Francium (223)	88 Ra Radium (226)	89 ►► Ac Actinium (227)	104 Unq Unnil-quadium (261)	105 Unp Unnil-pentium (262)	106 Unh Unnil-hexium (263)												

Key

Atomic Number
Symbol
Name
Molar mass in g mol^{-1}

► Lanthanide elements	58 Ce Cerium 140	59 Pr Praseo-dymium 141	60 Nd Neodymium 144	61 Pm Promethium (147)	62 Sm Samarium 150	63 Eu Europium 152	64 Gd Gadolinium 157	65 Tb Terbium 159	66 Dy Dysprosium 163	67 Ho Holmium 165	68 Er Erbium 167	69 Tm Thulium 169	70 Yb Ytterbium 173	71 Lu Lutetium 175
►► Actinide elements	90 Th Thorium 232	91 Pa Protactinium (231)	92 U Uranium 238	93 Np Neptunium (237)	94 Pu Plutonium (242)	95 Am Americium (243)	96 Cm Curium (247)	97 Bk Berkelium (245)	98 Cf Californium (251)	99 Es Einsteinium (254)	100 Fm Fermium (253)	101 Md Mendelevium (256)	102 No Nobelium (254)	103 Lr Lawrencium (257)