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

6251/01 **Edexcel GCE Chemistry (Nuffield) Advanced Subsidiary**

Unit Test 1

Wednesday 6 June 2007 – Morning

Time: 1 hour 15 minutes

Materials required for examination	Items included with question papers
Nil	Nil

A calculator may be used.

Instructions	to	Can	4i4	1106

In the boxes above, write your centre number, candidate number, your surname, initial(s) and your

Answer **ALL** the questions. Write your answers in the spaces provided in this question paper. One question in Section A must be answered with a cross in a box (X). If you change your mind about an answer, put a line through the box (☒) and then mark your new answer with a cross (☒). 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.

N26041A W850/R6251/57570 7/7/7/5600





Turn over



Examiner's use only

Team Leader's use only

Question Number 1 2 3

4 5

6 7

8

Total

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

Leave blank

SECTION A

- 1. Calcium nitrate decomposes on strong heating.
 - (a) Balance the equation for the reaction which takes place.

$$Ca(NO_3)_2(s) \longrightarrow CaO(s) + NO_2(g) + O_2(g)$$
 (1)

(b) A little water is added to the solid product of this reaction and the mixture is tested with full-range pH indicator paper.

(i)	What colour will the	indicator paper turn?

	(1)

(ii) Write the formula of the ion responsible for turning the indicator paper this colour.

COIO	uı.									

Q1

(1)

(Total 3 marks)

2. Draw a 'dot and cross' diagram to show the ions in calcium oxide. Include ALL the electrons and charges.

Q2

(Total 2 marks)

3.	(a)	Fill in the table b hydride ion, H ⁻ , an			nber of protons	and electrons prese	1	Leave blank
		Use the Periodic T	able as a	source of data	ì.			
				Protons	Electrons			
			H-					
			Li ⁺					
							(2)	
	(b)	Which of these ion	s is large	er, H ⁻ or Li ⁺ ?				
		Use the numbers y	ou have	entered in the	table above to e	xplain your answer.		
							(2)	12
						(Total 4 x	(2) Q	
	(a)	What aslaur do lit	hivm oor	mnounda nrodi	vaa during a flar	(Total 4 i	narks)	J
4.	(a)	What colour do lith	mum con	npounds produ	ice during a mar	ne test?		
			•••••				(1)	
	(b)	In what way do the colour differ from				the production of a nise?	a flame	
							(1) Q	9 4
						(Total 2 i		

5.	(a)	25.0 cm ³ of a solution contains 0.020 mol of eth	nanoic acio	1.	blank
	•	Calculate its concentration in mol dm ⁻³ .			
		Calculate its concentration in moralin .			
				(1)	
	(b)	Which ONE of the following types of reaction ammonia is added to this solution of ethanoic actions and the solution of ethanoic actions are solutions.		e place when a solution of	
		Dut a grass in the box (\subseteq) of the correct engagement			
		Put a cross in the box (of the correct answer			
		Dehydration	×		
		Ionic precipitation	×		
		Neutralisation	×		
		Redox	×		
		Thermal decomposition	X		
			1	(1)	Q5
				(Total 2 marks)	
		ТОТ	AL FOR	SECTION A: 13 MARKS	

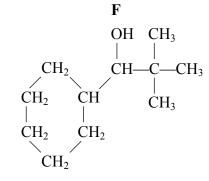
SECTION B

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6. This question concerns the following compounds, **A**–**F**, which have the formulae shown below.

A CH₃OH **B** CH₃CH₂CH₂CHO C CH₃CH₂CH=CH₂

D CH₃CH₂CH₂CH₂OH E CH₃COCH₂CH₃



(a) (i) What is meant by the term **isomers**?

(1)

(ii) Select a pair of isomers from the list above.

 	 •

(1)

(b) (i) Name compound **B**.

•	•	•	•	•	•	•	•	•	•	•	•	•	
									(·-	1)	

(ii) Which compound above can be oxidised to **B**?

	• •	• •	٠.	٠.	 ٠.	٠.	٠.	٠.	•		 ٠.	 		٠.	 ٠.	٠.	٠.	٠.	٠.	٠.	٠.	•	٠.	٠.		٠.		٠.	٠.	٠.	٠.	٠.



(iii) Give the names of the TWO chemicals which can be used together to carry out this oxidation.

(2)

		•••••
		······(2)
c) Tł	ne alcohol D can be converted to the compound C .	
(i)		
(1)	Name compound C.	
		······· (1)
(ii) What type of reaction is taking place?	
(,	
		(1)
(ii	i) Name a solid reagent which could be used to carry out this conversion.	
		(1)
(iv	(y) Explain why the alcohol A cannot undergo the same type of reaction as D .	
`		

(ii) Classify the alcohol F as primary, secondary or tertiary. Explain how you arrived at your answer.	(1)
Explain how you arrived at your answer. (iii) Predict whether F is likely to be soluble in water.	
(iii) Predict whether F is likely to be soluble in water.	
	(2)
	(2)
	(2)
	(2)
	()
Olve a reason for your answer.	
	•••••
	(1)
(Total	16 marks)

(2)

7. Some of the ionisation energies of four elements, Q, R, S and T, with consecutive atomic numbers, are shown in the table below.

		Ionisation	Energies	/ kJ mol ⁻¹	
	1st	2nd	3rd	4th	5th
Q	2081	3952	6122	9370	12177
R	496	4563	6913	9544	13352
S	738	1451		10541	13629
Т					

(a)	To which group of the Periodic Table does R belong? Give a reason for your answer.
	(2)
(b)	Estimate values, in $kJ \text{ mol}^{-1}$, for the third ionisation energy of S , and the first ionisation energy of T , represented by the shaded gaps shown in the table above.
	S
	T(2)
(c)	Which element is least likely to form compounds? Give a reason for your answer.
	(1)
(d)	Write a balanced equation which represents the change that corresponds to the $third$ ionisation energy of \mathbf{R} .
	Use ${\bf R}$ as the symbol for the element and include state symbols in your answer.

for X than for R.	
	(1)
	(Total 8 marks)
	·

8.	Nickel	is one	of the	element	s in the	e d-block	of the	Periodic	Table

(a) Complete the electron configuration of a nickel atom using the s, p, d notation.

Use the Periodic Table as a source of data.

1s²(2)

(b) A sample of nickel consists of three isotopes. Their percentage abundances are shown in the table below.

Isotope	Percentage Abundance
⁵⁸ Ni	69.02
⁶⁰ Ni	27.32
⁶² Ni	3.66

Calculate the average relative atomic mass of nickel.

(2)

(c) Nickel reacts with carbon monoxide to give the compound nickel carbonyl, Ni(CO)₄.

$$Ni(s) + 4CO(g) \longrightarrow Ni(CO)_4(g)$$

Calculate the volume of carbon monoxide required to react completely with 5.9 g of nickel.

Use the Periodic Table as a source of data.

[The molar volume of a gas is 24 dm³ mol⁻¹ at room temperature and pressure.]

(2)

Leave	
blank	

l) Fin	kel(II) sulphate.
	$Ni(s) + H_2SO_4(aq) \longrightarrow NiSO_4(aq) + H_2(g)$
(i)	Re-write this equation in an ionic form, omitting the spectator ion. State symbols are not required.
	(1)
(ii)	Apart from the need to take care with the dilute sulphuric acid, which is corrosive, give ONE other hazard associated with this reaction. Explain what precaution you would take as a consequence.
	(2)
(iii)	(2) A sample of finely powdered nickel is added to a slight excess of dilute sulphuric acid.
(iii)) A sample of finely powdered nickel is added to a slight excess of dilute sulphuric
(iii)	A sample of finely powdered nickel is added to a slight excess of dilute sulphuric acid. Describe the practical steps you would take to obtain dry crystals of hydrated
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(iv) Calculate the maximum mass of hydrated nickel(II) sulphate, NiSO ₄ .7H ₂	О,	Leave blank
which could be formed from 2.95 g of nickel.		
	(2)	Q8
(Total 14 mark	(s)	

9. Calcium hydroxide decomposes on strong heating to form calcium oxide and water.

$$Ca(OH)_2(s) \longrightarrow CaO(s) + H_2O(l)$$

Two samples of calcium hydroxide were taken, each weighing exactly 1.00 g.

The first sample was cautiously added to 25.0 cm³ of dilute hydrochloric acid contained in a glass beaker. The temperature rise was measured and found to be 16.5 °C.

The other sample was heated for some time. It was then allowed to cool and then added to another 25.0 cm³ portion of hydrochloric acid as before. In this case the temperature rose by 25.5 °C.

In both cases, the acid used was an excess.

(a) (i) Calculate the energy produced by the reaction of each solid with the acid.

Use the relationship

Energy produced = mass of solution
$$\times$$
 4.2 \times temperature rise / J $^{\circ}$ C $^{-1}$ g $^{-1}$ / $^{\circ}$ C

You may assume that 1.0 cm³ of solution has a mass of 1.0 g. Ignore the mass of the solid.

For the solid calcium hydroxide

For the solid calcium oxide

(1)

Leave blank

(ii)	How many moles of calcium hydroxide were used in each experiment?
	[Molar mass of $Ca(OH)_2 = 74.0 \text{ g mol}^{-1}$]

(1)

(iii) Using your answers to (a)(i) and (ii), calculate the enthalpy changes for each reaction.

Give your answers to **two significant figures**. Include the sign and units for each answer

For the solid calcium hydroxide, ΔH_1

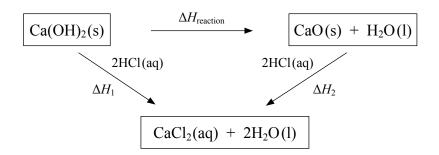
For the solid calcium oxide, ΔH_2

(2)



Leave blank

(b) A Hess cycle for all these reactions is shown below.



(i) Use this Hess cycle and your answers in (a)(iii) to calculate $\Delta H_{\text{reaction}}$. Include a sign and units.

(2)

TWO other potential sources of error which are likely to affect the the results.	accuracy of
	(2)
(iii) Suggest why $\Delta H_{\text{reaction}}$ is difficult to determine directly by experiment	nt.

(ii) Apart from the approximations involved in using the equation given in (a)(i), give

Q9

(1)

(Total 9 marks)

TOTAL FOR SECTION B: 47 MARKS TOTAL FOR PAPER: 60 MARKS

END

Period		8					Gr Gr	THE PE Group	THE PERIODIC TABLE Group	C TABI			m	4	വ	ဖ		0 2
-	Hydrogen 1		_				Atomic Number Symbol Name Molar mass in	Number bol ne iass in ol 1		,	v .							Helium 4
7	3 Li Lithium 7	Beryllium											5 Boron 11	6 Carbon	7 Nitrogen 14	8 O Oxygen 16	9 Fluorine 19	Neon C
က	Na Sodium 23	12 Mg Magnesium 24											13 AI Aluminium 27	Silicon 28	15 P Phosphorus 31	16 Sulphur 32	17 CI Chlorine 35.5	18 Argon 40
4	19 K Potassium 39	20 Ca Calcium 40	21 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 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 Selenium 79	35 Br Bromine 80	36 Krypton 84
ស	37 Rb Rubidium 85	38 Sr Strontium 88	39 Yttrium 89	40 Zrconium 91	A1 Niobium 93	42 Mo Molybdenum 96	43 TC Technetium (99)	Ru Ruthenium	45 Rh Rhodium 103	46 Pd Palladium 106	47 Ag Silver 108	48 Cd Cadmium 112	49 Indium 115	SO Tin 119	51 Sb Antimony 122	52 Te Tellurium 128	53 	Xenon
ဖ	55 Cs Caesium 133	56 Barium 137	57 La La Lanthanum 139	72 Hf Hafnium 178	73 Ta Tantalum 181	74 W Tungsten 184		76 Os 0smium 190		78 Pt Platinum 195		80 Hg Mercury 201	81 TI Thallium 204	82 Pb Lead 207		84 Po Potonium (210)		86 Radon (222)
7	87 Fr Francium (223)	Ra Radium (226)	Actinium (227)	Unq Unni- quadium (261)	Unnil- Pentium (262)	Unth Until- Hexium (263)									i		1	
	► Lani elen	► Lanthanide elements		S8 Cerium 140	59 Pr Praseo- dymium	60 Nd Neodymium 144	61 Pm Promethium (147)	Samarium	63 Eu Europium	64 Gd Gadolinium 157	55 Tb Terbium	66 Dy Dysprosium 163	HO Holmium	68 Erbium 167	TT Thullium	70 Yb Ytterbium	71 Lu Lutetium 175	
	►► Actinide elements	Actinide elements	_	90 Th Thorium 232	91 Pa Protactinium (231)	92 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 Einsteinium (254)	100 Frn Fermium (253)	101 Md Mendelevium (256)	NO Nobelium (254)	103 Lr Lawrencium (257)	

