Write your name here Surname	Other nam	nes
Edexcel GCE	Centre Number	Candidate Number
Chemistr Advanced Unit 6B: Chemistry		I Alternative
Monday 16 January 2012 Time: 1 hour 15 minute		Paper Reference 6CH08/01
Candidates may use a calcu	ılator.	Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer all questions.
- Answer the questions in the spaces provided
 - there may be more space than you need.

Information

- The total mark for this paper is 50.
- The marks for **each** question are shown in brackets
 - use this as a guide as to how much time to spend on each question.
- You will be assessed on your ability to organise and present information, ideas, descriptions and arguments clearly and logically, including your use of grammar, punctuation and spelling.
- A Periodic Table is printed on the back cover of this paper.

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

P 3 5 9 8 8 A 0 1 1 6

Turn over ▶



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

- 1 Three compounds A, B and C are subjected to a series of chemical tests. Some information about these compounds is given below.
 - The three compounds are isomers with molecular formula C₃H₆O.
 - A and B contain only one functional group, but C contains two separate functional groups.
 - None of the three compounds contains a ring of atoms.
 - In each of the three compounds the oxygen atom is bonded to only one carbon atom.
 - (a) (i) **A** and **B** are tested separately with 2,4-dinitrophenylhydrazine solution and both give an orange precipitate.

When **A** and **B** are heated separately with a mixture of potassium dichromate(VI) and dilute sulfuric acid, the solution containing **B** turns from orange to green. The solution containing **A** remains orange.

Use these results and the information at the start of the question to deduce displayed formulae for A and B.

(2)

A

B



(ii)															
<u> </u>	9	1	8	1	7	6	T	5	1	4	1	3	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	M_ 1	(
			-		•			PPN	1	•		-	_	-	

State whether this is the nmr spectrum of $\bf A$ or $\bf B$. Justify your answer. Explain how the nmr spectrum of the other isomer will differ.



(2)

(b) (i	i)	C does not react with 2,4-dinitrophenylhydrazine.	
		When ${\bf C}$ is heated with acidified potassium dichromate(VI), the solution turns from orange to green.	
		When C is shaken with bromine water, the bromine water quickly turns colourless.	
		Name the two functional groups present in C .	(2)
(i	ii)	State two observations you would expect to make when a small piece of sodium is added to C .	(2)
(i	iii)	Draw two possible displayed formulae for C which are consistent with the above information.	(2)
		(Total for Question 1 = 10 mar	·ks)

	A green crystalline solid, D , dissolves in water to give a pale green solution.						
(a)	(a) When dilute sodium hydroxide is added to the solution of D , a green precipitate, E , is observed.						
	When ammonia solution is added to the solution of D , the same green precipitate, E , forms which does not dissolve in excess ammonia solution.						
	Identify, by name or formula, substance E.	(1)					
(b)) When a solution of D is warmed with dilute sodium hydroxide, a gas, F , which turns moist red litmus paper blue, is given off.						
	Identify, by name or formula, the gas F.	(1)					
(c)	When a solution of barium chloride is added to a solution of D , a white precipitate, G , forms which is insoluble in dilute hydrochloric acid.						
	Identify, by name or formula, the precipitate G.	(1)					
(d)	Deduce the formulae of the three ions present in the salt, D .	(3)					
	(Total for Question 2 = 6 mar	last.					



3 The equation for the reaction of iodine with propanone is

$$CH_3COCH_3(aq) + I_2(aq) \rightarrow CH_3COCH_2I(aq) + H^+(aq) + I^-(aq)$$

An experiment was carried out to find the order of reaction with respect to iodine.

50 cm³ of iodine solution, concentration 0.020 mol dm⁻³, was added to 25 cm³ of sulfuric acid, concentration 2.0 mol dm⁻³, in a conical flask.

25 cm³ of propanone solution, concentration 2.0 mol dm⁻³, was added to the mixture and a timer started.

A 10.0 cm³ sample was removed after one minute. Further 10.0 cm³ samples were removed every three minutes.

Immediately, each sample was added to $20\,\mathrm{cm^3}$ of sodium hydrogenearbonate solution (an excess). Each sample was then titrated with sodium thiosulfate solution, concentration $0.010\,\mathrm{mol}~\mathrm{dm^{-3}}$.

(a) (i) Show, by calculation of the number of moles, whether propanone or iodine was in excess.

(2)

(ii) What would be the most suitable piece of apparatus for removing a 10.0 cm³ sample from the mixture?

(1)

(iii) What would be the most suitable piece of apparatus for measuring 20 cm³ of the sodium hydrogencarbonate solution?

(1)



(iv)	Suggest why each sample was added to sodium hydrogencarbonate solution. Explain your answer.	(2)
	What colour change would you expect to see as the reaction takes place?	(2)
	to	
(11)	To make the end-point of the titration easier to see, an indicator can be added.	
	Name the indicator and state the colour change you would expect to see.	(2)
ndicator		
Colour cha	nge from to	
(iii)	At what stage in the titration should this indicator be added?	(1)



(1)

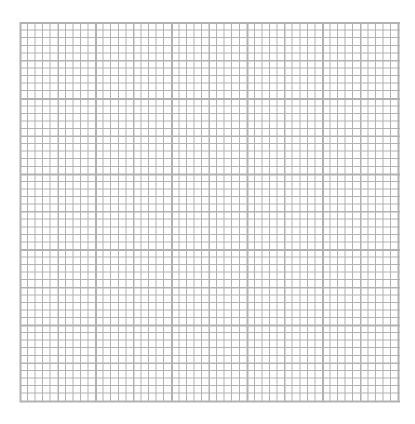
(c) The following results were obtained in the experiment.

Time / min	Volume of sodium thiosulfate solution / cm ³
1	19.1
4	15.9
7	13.0
10	9.9
13	7.1
16	3.9
19	1.0

(i)	Explain why these results can be used to determine the order of the reaction
	directly, without calculating the corresponding concentrations of iodine in the
	solution.

(ii)	Plot a graph of the volume of sodium thiosulfate solution on the vertical axis
	against time on the horizontal axis.

(2)



(iii) Use your graph to deduce the order of the reaction with respect to iodine.

Explain how you arrived at your answer.

(2)

(d) The following rate-determining step for the reaction between propanone and iodine
is suggested.

Explain why your order of reaction with respect to iodine is consistent with this rate-determining step.

(1)

(Total for Question 3 = 17 marks)



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4	wh	ethanoylaminobenzoic acid, C ₉ H ₉ NO ₃ , is a compound which emits flashes of light nen its crystals are crushed or scraped. It is prepared under strictly supervised nditions.	
	Th	ne steps of the experimental procedure are as follows.	
	1.	Place 3.5 g of 2-aminobenzoic acid, C ₇ H ₇ NO ₂ , in a dry 50 cm ³ flask fitted with a reflux condenser.	
	2.	Add 7.0 cm ³ of ethanoyl chloride (an excess) by pouring it carefully down the condenser.	
	3.	Heat slowly to boiling and reflux for 15 minutes.	
	4.	Allow to cool and then add 5 cm ³ of water.	
	5.	Bring the solution back to boiling by heating slowly.	
	6.	Allow the solution to cool slowly at room temperature.	
	7.	Collect the crystals of 2-ethanoylaminobenzoic acid by suction filtration.	
	8.	Recrystallize the 2-ethanoylaminobenzoic acid from a 50% ethanoic acid/water mixture.	
	(a)	Explain how the process of heating under reflux works and why it is often necessary to heat under reflux, as in step 3 .	
			(3)



(b) (i) S	Suggest why water was added (step 4).	(1)
(ii) S	Suggest why the mixture was cooled before the water was added (step 4).	(1)
(c) (i) I	Draw a fully labelled diagram of the apparatus used for suction filtration (step 7).	(3)
	Suggest two advantages of suction filtration over normal filtration.	(2)
Second adva	antage	



(d) (i)	Draw a fully labelled diagram of the apparatus you would use to determine the melting temperature of the 2-ethanoylaminobenzoic acid crystals.	
		(2)
(ii)	Give two aspects of the melting temperature determination that would indicate the crystals were pure.	
	the crystals were pure.	(2)



(e) In the equation for this reaction, the mole ratio of 2-aminobenzoic acid, $C_7H_7NO_2$, and 2-ethanoylaminobenzoic acid, $C_9H_9NO_3$, is 1:1.	
In an experiment, 3.5 g of 2-aminobenzoic acid produced 2.35 g of recrystallized 2-ethanoylaminobenzoic acid.	
Calculate the percentage yield of the product for this reaction.	
	(3)
(Total for Question 4 = 17 m	narks)
(Total for Question 4 = 17 m TOTAL FOR PAPER = 50 MA	



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0 (8)	4.0 He helium 2	20.2 Ne	10	Ar Argon	18	83.8	궃	krypton 36	131.3	Xe	xenon 54	[222]	R	radon 86		ted		_
7	(17)	19.0 F	9	C. C. dipolity	17	6.62	Я	bromine 35	126.9	-	iodine 53	[210]	Αt	astatine 85		oeen repor		175
9	(16)	16.0 O oxygen	8	S. I	16	79.0	Se	selenium 34	127.6	Тe	tellurium 52	[509]	8	polonium 84		116 have	וווכשופח	173
2	(15)	14.0 N	7	O.1.c	15	74.9	As	arsenic 33	121.8	Sb	antimony 51	209.0	Bi	bismuth 83		nbers 112-	טטר ווטר ועווץ מענוופוונוכמנפט	169
4	(14)	12.0 C	9 4	Si Si		72.6	g	germanium 32	118.7	Sn	ti 20	207.2	Ъ	lead 82		atomic nur	חר ווסר וו	167
ю	(13)	10.8 B boron	5	AI AI	13	69.7	Ga	gallium 31	114.8	드	indium 49	204.4	F	thallium 81		Elements with atomic numbers 112-116 have been reported		165
	,				(12)	65.4	Zu	zinc 30	112.4	5	cadmium 48	200.6	Η	mercury 80		Elem		163
					(11)	63.5	J	copper 29	107.9	Ag	silver 47	197.0	Ρη	gold 79	[272]	Rg	oenigenium 111	159
					(10)	58.7	'n	nickel 28	106.4	Pd	palladium 46	195.1	ፚ	platinum 78	[271]	Mt Ds Rg	narmstadtium 110	157
					(6)	58.9	ვ	cobalt 27	102.9	윤	rhodium 45	192.2	<u></u>	iridium 77	[368]	Wt	109	152
	1.0 H hydrogen				(8)	55.8	Fe	iron 26	101.1	æ	ruthenium 44	190.2	o	osmium 76			108	150
					(2)	54.9	۸	nanganese 25	[86]	卢	technetium 43	186.2	Re	rhenium 75	_	B.	107	[147]
		nass ool	ımper		(9)	52.0	ბ	vanadium chromium manganese 23 24 25	95.9	Wo	molybdenum technetium ruthenium	183.8	>	tungsten 74	[397]	Sg	seaborgium 106	144
	Key	relative atomic mass atomic symbol	atomic (proton) number		(2)	50.9	>	vanadium 23	92.9		niobium 41	180.9		tantalum 73	[292]	6	105 1	141
		relativ ato i	atomic		(4)	47.9	F	titanium 22	91.2	ZL	zirconium 40	178.5	Ŧ	hafnium 72	[791]	' ዱ	rutherfordium 104	140
					(3)	45.0	Sc	scandium 21	6.88		yttrium 39	138.9	La*	lanthanum 57	[227]		actinium 89	•
7	(2)	9.0 Be beryllium	4 5	Mg	12	40.1	S	calcium 20	97.8	٦	strontium 38	137.3		barium 56	[326]	Ra	88	
-	(1)	6.9 Li	3	Na Na		39.1	¥	potassium 19	85.5		rubidium 37	132.9	ర	caesium 55	[223]	Ŀ	17 87	
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^{*} Lanthanide series

^{*} Actinide series

140	141	144	[147]	150	152	157	159	163	165	167	169	173	175
g	4	P	Pm	Sm	Eu	В	4	ð	운	Ü	Ē	Υp	3
cerium	praseodymium	neodymium	promethium	samarium	europium	gadolinium	terbium	dysprosium	holmium	erbium	thulium	ytterbium	lutetium
28	59	9	61	62	63	64	65	99	29	89	69	70	71
232	[231]	238	[237]	[242]	[243]	[247]	[245]	[251]	[254]	[253]	[256]	[254]	[257]
f	Pa	_	å	Pu	Am	క్ర	쓞	ซ	E	F	PW	ž	۲
thorium	protactinium	uranium	neptunium	plutonium	americium	curium	berkelium	californium	einsteinium	fermium	mendelevium	nobelium	lawrencium
06	91	92	93	94	95	%	46	86	66	100	101	102	103