Write your name here						
Surname		Other names				
Edexcel GCE	Centre Number	Candidate Number				
Chemistry Advanced Subsidiary Unit 3B: Chemistry Laboratory Skills I Alternative						
Monday 10 January 2011 Time: 1 hour 15 minutes		Paper Reference 6CH07/01				
Candidates may use a salsul	ator.	Total Marks				
Candidates may use a calcul	ator.	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.





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

1 (a) Compound **X** is a white crystalline solid that dissolves easily in water to form a clear, colourless solution. **X** contains one cation and one anion. Complete the table below.

(5)

	Test	Observation	Inference
(i)	Warm solid X with dilute	A gas was evolved which turned damp red litmus paper blue.	Ammonia is formed so the ammonium ion is present.
(ii)	Add aqueous barium chloride to a solution of X .		X contains either sulfite (sulfate(IV)) or or
(iii)	Add dilute hydrochloric acid to the result of test (ii).	A gas was evolved which	Sulfite (sulfate(IV)) confirmed.

(iv) Describe a further chemical test, not involving indicators, that you could use to
confirm that ammonia is formed in part (i).

1 /	/	~
	1	- /

Test			
Result		 	

(b) Compound Y is a white solid that contains one cation and one anion.	Complete the
table below.	

(4)

	Test	Observation	Inference
(i)	Flame test	Brick red (yellow-red) flame.	The cation in Y is
(ii)	Gently heat a sample of Y in a test tube, testing any vapours evolved with cobalt chloride paper.	Vapour turned cobalt chloride paper from blue to	Water is produced. Y contains water of crystallization.
(iii)	Heat the sample of Y in the test tube.	Brown gas evolved.	Gas is
(iv)	Continue to heat the sample of Y .	Gas reignited a glowing splint.	Gas is

1	(T/)	Identify by	nama	or form	uila tha	onion	in	\mathbf{v}
((V	Identify, by	Hame	OI IOIII	iuia, iiie	amon	Ш	I.

(1)

(vi) Give the formula of Y (one mole of Y contains one mole of water of crystallization).

(2)

(Total for Question 1 = 14 marks)

2 (a)	The organic compounds propan-1-ol and propan-2-ol are isomers. Propan-1-ol has the structure CH ₃ CH ₂ CH ₂ OH and propan-2-ol has the structure (CH ₃) ₂ CHOH.	
	Describe a test and its expected result to confirm the presence of the –OH group in propan-1-ol or propan-2-ol.	(0)
		(2)
Test		
Resul	lt	
(b)) When propan-1-ol or propan-2-ol is heated to 170 °C with concentrated sulfuric acipropene is formed.	d,
	Name the type of reaction that has occurred in the reaction with sulfuric acid. Describe a test and its positive result to show the presence of the C=C bond in propene.	
		(3)
Туре	of reaction	
Test		
Resul	lt	
	(Total for Question $2 = 5$ m	arks)

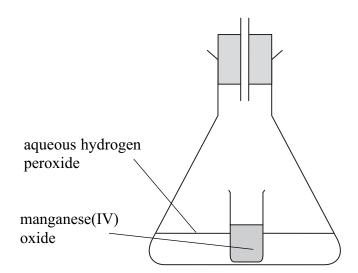
3 Aqueous hydrogen peroxide decomposes according to the following equation.

$$2H_2O_2(aq) \rightarrow 2H_2O(1) + O_2(g)$$

The decomposition is very slow under normal conditions but it is catalysed by a number of substances. The rate of the reaction using manganese(IV) oxide as the catalyst was investigated by measuring the volume of oxygen produced at various times as the reaction proceeded. Part of the apparatus used for the experiment is shown below. The manganese(IV) oxide was placed in the small glass container which was tipped over to start the reaction and a stop clock was started at the same time.

(a) Complete the diagram to show how the gas was collected **and** its volume measured.

(2)



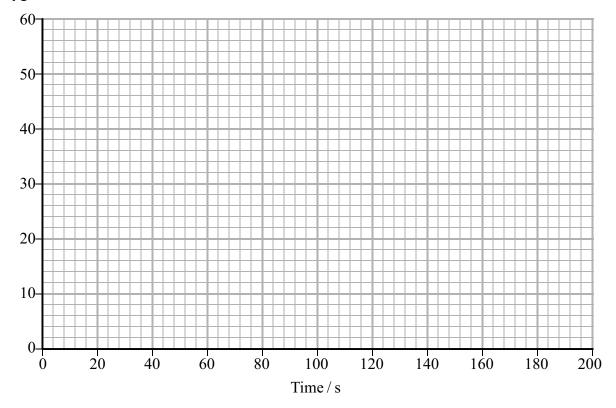
(b) In an experiment using 0.25 g of manganese(IV) oxide granules (small pieces) and 50 cm³ of aqueous hydrogen peroxide of concentration 0.080 mol dm⁻³, the following results were obtained.

Time / s	0.0	20.0	30.0	40.0	60.0	80.0	100	120	150
Volume of O ₂ / cm ³	0	29	36	40	45	46	47	48	48

(i) Plot these results on the grid below and draw a best fit line through the points.

(3)

Volume of oxygen / cm³



(ii) The rate of reaction may be assumed to be approximately constant up to the first volume measurement (20.0 seconds in this experiment) and is called the initial rate. Use this approximation to calculate the initial rate of this reaction, giving your answer to **two** significant figures and stating the units.

(2)



(111)	In a second experiment, the manganese(IV) oxide granules were replaced by the same mass of the compound as a fine powder. The volume and concentration of the aqueous hydrogen peroxide were kept the same. On the grid in (b)(i), draw the line that you would expect to obtain in this experiment.	
	experiment.	(2)
(iv)	Explain any similarities in the lines you have drawn on the grid. Use the collision theory of reaction rates to explain any differences between the shapes of the lines.	
		(3)
that	alysts are not used up during a reaction. Outline an experiment to demonstrate the manganese(IV) oxide is not used up in the decomposition of hydrogen oxide (practical details of the experiment are not required).	(4)
that	the manganese(IV) oxide is not used up in the decomposition of hydrogen	(4)
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4 Bromoethane may be prepared by reacting ethanol with bromine and red phosphorus.

$$10C_2H_5OH(1) + 2P(s) + 5Br_2(1) \rightarrow 10C_2H_5Br(1) + 2H_3PO_4(aq) + 2H_2O(1)$$

The steps of the experimental procedure are as follows.

- 1. Measure 10.0 cm³ of ethanol into a round-bottom flask.
- 2. Add 1.5 g of red phosphorus to the ethanol.
- 3. Pre-cool 5 cm³ of liquid bromine in an ice bath, then slowly add it to the mixture of ethanol and red phosphorus, while cooling the flask under running water.
- 4. Gently reflux the mixture for about 10 minutes.
- 5. Rearrange the apparatus for distillation, immersing the receiver in ice-cold water and distil until no more bromoethane is formed.
- 6. Decant as much water as possible and then wash the product with dilute sodium carbonate solution and distilled water, decanting off the aqueous layer each time.
- 7. Transfer the washed product to a separating funnel and, from this, run off the organic layer into a small distillation flask.
- 8. Add anhydrous calcium chloride, stopper the flask and allow it to stand until the liquid turns clear.
- 9. Distil the bromoethane over a suitable temperature range, immersing the receiver in ice-cold water.

Data

Property	Ethanol	Bromoethane
Density / g cm ⁻³	0.789	1.47
Molar mass / g mol ⁻¹	46.0	109
Boiling temperature / °C	78.4	38.4

(a)	Suggest the	apparatus 1	most suitable	for meas	suring the	volume of	ethanol to a	n
	accuracy of	$\pm 0.1 \text{ cm}^3$	(step 1).					

(1)

(b) Explain why it is necessary to pre-cool the bromine (step 3).

(1)



(c) Suggest why it is also necessary to cool the mixture while adding the bromine (step 3).	(1)
	(1)
(d) Draw a labelled diagram of the apparatus that you would use to heat the mixture under reflux (step 4).	
	(3)
(e) Suggest why, in both the distillations, the receiver is immersed in ice-cold water	
(steps 5 and 9).	(1)
	(-)

(f) St	ate the purpose of the following in this procedure:	
(i) St		
(1)	washing the product with anate southin europhate solution (step o).	(1)
	Adding anhydrous coloisms chloride to the engenic leven (stan 9)	
(II) Adding anhydrous calcium chloride to the organic layer (step 8).	(1)
(g) Sı	aggest a suitable temperature range for the collection of the product in the final	
	stillation (step 9), giving the temperatures in whole numbers.	(1)
From		(1)
(h) (i)	Calculate the number of moles of ethanol used in the preparation.	(1)
(ii) Given that one mole of ethanol forms one mole of bromoethane, calculate the	
(11)	maximum mass, in grams, of bromoethane that may be prepared using 10 cm ³ of ethanol.	
	of ethanor.	(1)

(iv) Suggest why the yield is calculated in relation to the ethanol rather than the bromine. (1) (v) Suggest one reason, other than volatility of the reactants or products, why the preparation does not produce a 100 % yield. (1)
bromine.



The Periodic Table of Elements

0 (8)

9

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		Т			_			_							_			1					
(18) 4.0 He	helium 2	20.2	R	neou 10	39.9	Αr	argon 18	83.8		krypton	36	131.3	Xe	xenon 54	[222]	R	radon 86		ted				
	(17)	19.0	Ŀ	fluorine 9	35.5	ರ	chlorine 17	6.62	В	bromine	35	126.9	_	iodine 53	[210]	Αt	astatine 85		oeen repor				
	(16)	16.0		0	32.1	S	sulfur 16	79.0	Se	selenium	34	127.6	<u>L</u>	tellurium 52	[506]	8	polonium 84		116 have I	nticated			
	(15)	14.0	z	nitrogen 7	31.0	۵	phosphorus 15	74.9	As		33	121.8	Sb	antimony 51	209.0	Bi	bismuth 83		mbers 112	ully auther			
	(14)	12.0	U	carbon 6		Si		72.6	g	germanium	32	118.7	Sn	£i 20	207.2	Pp	lead 82		Elements with atomic numbers 112-116 have been reported but not fully authenticated				
	(13)	10.8	മ	boron 5	27.0	¥	aluminium 13	2.69	g	gallium	34	114.8	드	indium 49	204.4	F	thallium 81		nents with				
							(12)	65.4	Zu	zinc	200	112.4	5	cadmium 48	200.6	Ŧ	mercury 80						
							(11)	63.5	J	copper	29	107.9	Ag	silver 47	197.0	Αu	gold 79	[272]	Rg	roentgenium 111			
							(10)	58.7	Έ	nickel	28	106.4	Pd	palladium 46	195.1	Ŧ	platinum 78	[271]	Ds	m meitnerium damstadtium roentgenium 109 110 111			
							(6)	58.9	ප	cobalt	27	102.9	묎	rhodium 45	192.2	<u>_</u>	iridium 77	[368]	₩	meitnerium 109			
1.0 H ydrogen	hydrogen 1						(8)	55.8	Fe	iron	76	101.1	Ru	ruthenium 44	190.2	o	osmium 76	[277]	Hs	hassium 108			
							(2)	54.9	٧	manganese	25	[86]	2	technetium 43	186.2	Re	rhenium 75	[264]	Bh	bohrium 107			
		mass	poq	umber			(9)	52.0	ъ	chromium manganese	24	95.9	Wo	molybdenum technetium 42 43	183.8	>	tungsten 74	[596]	Sg	n seaborgium bo			
	Key	relative atomic mass	atomic symbol	name atomic (proton) number			(5)	6.03	>	vanadium	23	92.9	Q	niobium 41	180.9	Ta	tantalum 73	[292]	B	dubniur 105			
		relati	ato	atomic			4)	47.9	ï	titanium	22	91.2	Zr	zirconium 40	178.5	Ħ	hafnium 72	[261]	Ř	rutherfordium 104			
							(3)	45.0	Sc	scandium	21	88.9	>	yttrium 39	138.9	La*	lanthanum 57	[227]		actinium 89			
	(2)	9.0	Be	beryllium 4	24.3	Mg	magnesium 12	40.1	S	calcium	20	87.6	Ş	strontium 38	137.3	Ba	barium 56	[326]	Ra	radium 88			
	(1)	6.9	:5	lithium 3	23.0	Na	_	39.1	×	potassium	19	85.5	&	rubidium 37	132.9	ప	caesium 55	[223]	占	francium 87			

^[257] **Lr**lawrencium
103 175 **Lu** lutetium 173 **Yb** ytterbium Tm thulium 69 [253] **Fm** fermium 100 167 **Er** erbium 89 [254] **Es**einsteinium
99 165 **Ho** holmium 29 163 **Dy** dysprosium 66 [251]
Cf
californium 159 **Tb**terbium
65
[245] **Bk**berketium
97 157 **Gd** gadolinium 64 (247) **Cm** curium 96 144 Nd neodymium 238 **U** uranium 92 Pr prasecolymium n. 59 Pa protactinium 140 **Ce** cerium 58 232 **Th** thorium 90

* Lanthanide series * Actinide series