Name	Register Number	Class



GREENRIDGE SECONDARY SCHOOL O LEVEL PRELIMINARY EXAMINATION 2019 Secondary 4 Express / 5 Normal Academic

SCIENCE (CHEMISTRY, BIOLOGY)

5078/01

Paper 1

3 September 2019 1 hour

Tuesday

Additional Materials: Multiple Choice Answer Sheet

GREENRIDGESECONDARYSCHOOL GREENRIDGESECONDAR

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.

Do not use staples, paper clips, highlighters, glue or correction fluid.

Write your name, register number and class on the question booklet and Answer Sheet in the spaces provided unless this has been done for you.

There are **forty** questions on this paper. Answer **all** questions. For each question there are four possible answers **A**, **B**, **C** and **D**.

Choose the **one** you consider correct and record your choice in **soft pencil** on the separate Multiple Choice Answer Sheet.

Read the instructions on the Answer Sheet very carefully.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.

Any rough working should be done in this booklet.

The total number of marks for this paper is 40.

A copy of the Data sheet is printed on page 9.

A copy of the Periodic Table is printed on page 10.

For Examiner's Use Only								
Total	/ 40							

- 1 Which apparatus is most suitable for measuring 25.0 cm³ of hydrochloric acid?
 - A beaker
 - **B** burette
 - **C** measuring cylinder
 - **D** pipette
- **2** A substance X has the following properties.
 - fixed melting point
 - conducts electricity when molten
 - does not conduct electricity when in solid state

Which row correctly describes substance X?

	element, compound or mixture	chemical bonding
Α	compound	covalent
В	compound	ionic
С	element	covalent
D	mixture	ionic

3 An unknown oxide M reacts with both sulfuric acid and sodium hydroxide solution to produce salt and water only.

Which oxide is M likely to be?

- A aluminium oxide
- **B** barium oxide
- **C** calcium oxide
- **D** magnesium oxide

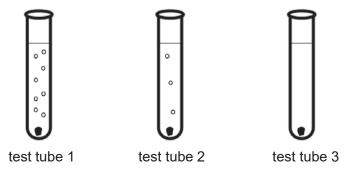
4 Ammonia gas can be produced by reacting nitrogen and hydrogen as shown in the equation below.

$$N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$$

What volume of ammonia is produced when 50 cm³ of nitrogen is reacted with 90 cm³ of hydrogen?

- **A** 60 cm³
- **B** 100 cm³
- **C** 140 cm³
- **D** 150 cm³

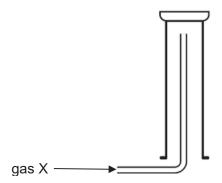
Test tubes labelled 1, 2 and 3 respectively were filled with equal volumes of dilute hydrochloric acid. Three different metal strips of same size and mass were added separately to test tubes 1, 2 and 3. The diagram below shows the observations obtained.



What could be the identities of the metals in each test tube?

	test tube 1	test tube 1 test tube 2					
Α	calcium	copper	iron				
В	calcium	zinc	copper				
С	copper	iron	zinc				
D	zinc	iron	copper				

6 The ideal method of collecting gas X is shown below.

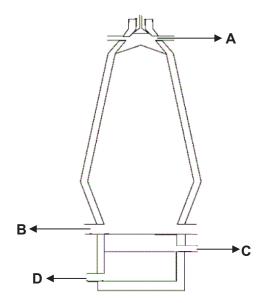


What can be deduced about the density and solubility of gas X in water?

	density of gas X	solubility of gas X in water
Α	denser than air	insoluble
В	denser than air	soluble
С	less dense than air	insoluble
D	less dense than air	soluble

7 Iron can be extracted from its ore using a blast furnace as shown below.

At which position will molten iron be obtained?



- 8 Which substance is used to reduce acidity in soil?
 - **A** barium sulfate
 - **B** calcium hydroxide
 - C potassium chloride
 - **D** sodium hydroxide
- **9** Which is the major component of air?
 - **A** argon
 - **B** carbon dioxide
 - **C** nitrogen
 - **D** oxygen
- **10** Which is true about covalent bonds?
 - A Covalent bonds are formed between metals.
 - **B** Covalent bonds are formed by sharing electrons.
 - **C** Covalent bonds are formed by transferring electrons.
 - **D** Covalent bonds are weak.
- 11 Which row matches the fraction of crude oil to its use?

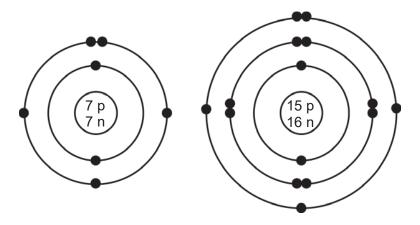
	fraction	use
Α	bitumen	to produce polishes
В	diesel	to pave roads
С	kerosene	to lubricate engines
D	naphtha	to make plastics

- Which equation represents a redox reaction?
 - A AgNO₃ (aq) + NaCI (aq) \rightarrow AgCI (s) + NaNO₃ (aq)
 - **B** Ca (s) + 2HCI (aq) \rightarrow CaC I_2 (aq) + H $_2$ (g)
 - C CuO (s) + H_2SO_4 (aq) \rightarrow CuSO₄ (aq) + H_2O (/)
 - **D** $MgCO_3(s) + H_2SO_4(aq) \rightarrow MgSO_4(aq) + H_2O(I)$

When an unknown gas X was bubbled into bromine solution, the solution was decolourised rapidly.

Which could be gas X?

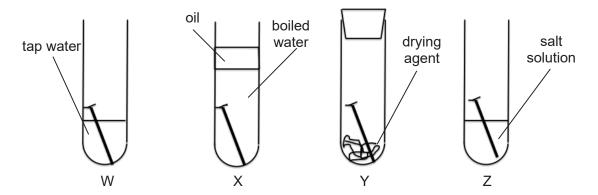
- A ethane
- **B** ethanoic acid
- **C** ethanol
- **D** ethene
- 14 The diagram below shows the structure of two atoms.



Which statement is true about the two atoms?

- A Both atoms are isotopes.
- **B** Both atoms are metals.
- **C** Both atoms belong to the same group.
- **D** Both atoms belong to the same period.
- 15 Moving from the left to the right side of the periodic table, elements
 - A become less metallic.
 - **B** become more metallic.
 - C decrease in mass.
 - **D** increase in reactivity.

16 Four set-ups containing iron nails are shown below.



In which order will the nail rust, from the fastest to the slowest?

- $\textbf{A} \qquad \textbf{W} \rightarrow \textbf{X} \rightarrow \textbf{Y} \rightarrow \textbf{Z}$
- $\textbf{B} \qquad \textbf{X} \rightarrow \textbf{Z} \rightarrow \textbf{Y} \rightarrow \textbf{W}$
- $\textbf{C} \qquad Y \to X \to Z \to W$
- $\textbf{D} \qquad Z \to W \to X \to Y$
- 17 As the number of carbon atoms in alkanes increases.
 - **A** their melting and boiling points decrease.
 - **B** they become more flammable.
 - C they become more reactive.
 - **D** they become more viscous.
- 18 Long chain alkanes can be cracked into smaller molecules to produce more useful products.

The equation below shows an example of such reactions.

$$C_{35}H_{72} \rightarrow 2C_3H_6 + 2C_4H_8 + C_{15}H_{30} + X$$

What is a possible identity of X?

- **A** C_6H_{12}
- **B** C₆H₁₄
- C C₂₃H₄₆
- $D C_{23}H_{48}$

19 An equation is shown below.

$$x$$
Fe + y C $I_2 \rightarrow z$ FeC I_3

Which numbers will correctly balance the equation?

	x	У	z
Α	1	1	1
В	1	2	1
С	2	2	3
D	2	3	2

Which substance will be made up of particles packed closely together in an orderly arrangement at room temperature?

	melting point / °C	boiling point / °C
Α	- 20	17
В	0	100
С	15	131
D	40	150

END OF PAPER

Colours of Some Common Metal Hydroxides

Calcium hydroxide	white
Copper(II) hydroxide	light blue
Iron(II) hydroxide	green
Iron(III) hydroxide	red-brown
Lead(II) hydroxide	white
Zinc hydroxide	white

The Periodic Table of Elements

	0	5 또	helium 4	10	Se	neon	20	18	Ā	argon	40	36	궃	krypton	84	54	Xe	хепоп 131	98	を	radon	ı				
	IIV			o	ш	fluorine	19	17	õ	chlorine	35.5	35	ă	bromine	80	53	Ι	iodine 127	85	¥	astatine	1				
				80	0	oxygen	16	16	ဟ	sulfur	32	34	Se	selenium	79	25	<u>е</u>	tellurium 128	8	8	polonium	1	116	_	ivermorium	-
	>			7	z	nitrogen	14	15	۵	sphosphorus	31	33	As	arsenic	75	51	Sp	antimony 122	83	ä	bismuth	509				
	2			9	O	carbon	12	14	S	silicon	28	32	g	germanium	73	20	S	tin 119	82	<u>е</u>	lead	207	114	F/	flerovium	-
	=			2	Ф	poron	1	13	ΑΊ	aluminium	27	31	ga	gallium	20	49	I	indium 115	81	1	thallium	204				
												30	Z	zinc	92	48	8	cadmium 112	80	윤	mercury	201	112	5	n copernicium	1
												59	రె	copper	64	47	Ag	silver 108	79	Ρn	plog	197	111	ß	pentgenium	1
dn																		palladium 106								
Group																		rhodium 103								
		- I	hydrogen 1									56	Pe	iron	26	44	Z.	ruthenium 101	9/	SO	osmium	190	108	£	hassium	-
				J								25	M	manganese	22	43	ပ	technetium	75	æ	rhenium	186	107	뮵	pohrium	1
				umber	ō		nass											molybdenum 96								1
			Key	proton (atomic) number	atomic symbol	name	relative atomic mass					23	>	Ę	21			niobium 93					105		dubnium	-
				proton	ato		relativ					22	F	titanium	48	40	ZĽ	zirconium 91	72	Ξ	hafnium	178	104	፟ጅ	Rutherfordium	1
												21	တ္တ	scandium	45	39	>	Mthium 89	57 - 71	lanthanoids			89 - 103	actinoids		
	=			4	æ	peryllium	တ	12	Mg	magnesium	24	20	Ö	calcium	40	38	ര്	strontium 88	56	Ba	parium				radium	'
	_			ო	:=	lithium	7	7	Na	sodium	23	19	エ	potassium	39	37	&	rubidium 85	55	ပိ	caesium	133	87	<u>ن</u>	francium	-

				_			
71	ŋ	lutetium	175	103	۲	lawrencium	ı
70	ΥÞ	ytterbium	173	102	ž	nobelium	ı
69	Ē	thulium	169	101	ΡW	mendelevium	ı
89	ш	erbinm	167	100	F	fermium	1
29	운	holmium	165	66	ű	einsteinium	ı
99	ò	dysprosium	163	86	ರ	californium	J
65	2	terbium	159	6	益	berkelium	ı
64	В	gadolinium	157	96	ő	curium	ı
83	Ш	europium	152	95	Am	americium	1
62	Sm	samarium	150	94	P	plutonium	ı
61	Pm	promethium	1	93	ď	neptunium	ı
		Пе			⊃	_	
29	፵	praseodymium	141	91	Ра	protactinium	231
28	ဗ	cerium	140	06	£	thorium	232
57	Га	nthanum	139	68	Ac	actinium	ı

lanthanoids

actinoids

The volume of one mole of any gas is 24 dm³ at room temperature and pressure (r.t.p.).

Name	Register Number	Class



GREENRIDGE SECONDARY SCHOOL O LEVEL PRELIMINARY EXAMINATION 2019 Secondary 4 Express / 5 Normal Academic

SCIENCE 5076/5078/03

Paper 3 Chemistry

30 August 2019 1 hour 15 minutes

Friday

Additional Materials: Nil

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READ THESE INSTRUCTIONS FIRST

Write your name, register number and class on this cover and all the work you hand in. Write in blue pen or black pen.

You may use a soft pencil for any diagrams, graphs or rough working.

Do not use staples, paper clips, glue or correction fluid.

The use of an approved scientific calculator is expected, where appropriate.

Section A

Answer all questions in the spaces provided.

Section B

Answer any two questions.

Write your answers in the spaces provided on the Question Paper.

The total number of marks for this paper is 65.

A copy of the Data sheet is printed on page **14**. A copy of the Periodic Table is printed on page **15**.

For Examiner's Use Only		
Section A	/ 45	
Section B	/ 20	
Total	/ 65	

Section A [45 marks]
Answer all the questions in this section in the spaces provided.

A1 Some substances are listed below.

		air steel	carbon dioxide sulfur dioxide	iodine water	lithium iron	
	Match	n the substance(s) to	the descriptions given	below.		
	(a)	A gas that dissolves	in water and turns Un	iversal Indicator red	d.	
						[1]
	(b)	A mixture of elemen	its and compounds.			
						[1]
	(c)	A transition metal.				
						[1]
	(d)		sublimes when heated.			
	011					[1]
42	Chlor	ine and fluorine both	belong to the same gro	oup in the Periodic	l able.	
	(a)	State the name give	n to this group of elem	ents.		
						[1]
	(b)	Explain why chloring	e and fluorine are place	ed in the same grou	ıp in the Periodic Table.	
						[1]
	(c)	An element D was of Table.	liscovered by scientists	and placed benea	th astatine in the Periodic	
		Predict the state of astatine.	the element at room	temperature and	ts reactivity compared to	
		state at room tempe	erature:			
		reactivity compared	to astatine:			[2]

A3 Fig. 3.1 shows the chromatogram of food products 1, 2 and 3 and permitted food dyes A, B and C.

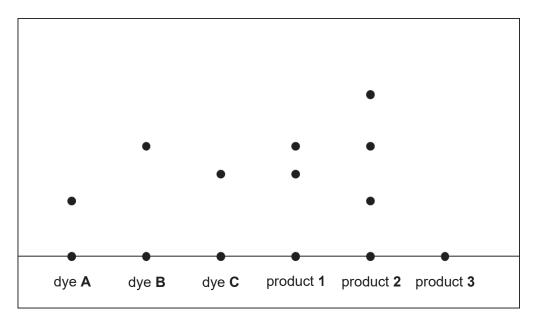


Fig. 3.1

(a)	State and explain which food product(s) are safe for consumption.	
		[2]
(b)	Explain why the sample of product 3 did not separate into different spots.	
		[1]

A 4	Λ I ! !	:_		£	:4-				:-
A4	Aluminium	IS	extracted	trom	IIS	ore i	ov e	ectroiv	/SIS.

The equation given below represents the process of extraction of aluminium from its ore.

$$2AI_2O_3 \rightarrow 4AI + 3O_2$$

(a)	Explain why aluminium cannot be extracted from its ore by heating with carbon.	
		[2]
(b)	State and explain whether the process of extracting aluminium is a redox reaction.	
		[2]
(c)	Suggest why aluminium is widely recycled in many countries rather than being extracted.	
		Γ 1 .

A5 Table 5.1 shows some information about the atoms of elements **E**, **F**, **G** and **H**.

Table 5.1

element	proton	neutron	electron	mass
E	6	6		12
F		20	19	
G			6	14
Н	18		18	40

	(a)	Comp	lete Table 5.1.	[3]
	(b)	State	which element(s) is/are	
		(i)	noble gas(es),	
				[1]
		(ii)	isotopes.	
				[1]
A 6			are operated in an enclosed area, carbon monoxide may be produced, which can health.	
	(a)	Expla area.	in how carbon monoxide is produced when stoves are operated in an enclosed	
				[1]
	(b)	Descr	ibe the effects of carbon monoxide on human beings.	
				[2]

A7 When yeast is added to hydrogen peroxide, it decomposes into water and oxygen as shown by the chemical equation below.

$$2H_2O_2 \rightarrow 2H_2O + O_2$$

Fig. 7.1 shows the graph of the volume of oxygen gas collected against time when $50~\text{cm}^3$ of hydrogen peroxide with concentration of $0.50~\text{mol/dm}^3$ is allowed to decompose in the presence of yeast.

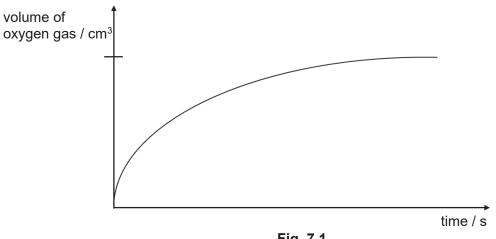


Fig. 7.1

(a)	Explain why the volume of oxygen stops rising after some time.							
			[1]					
(b)	(i)	On Fig. 7.1, sketch a curve of what would happen if the concentration of hydrogen peroxide was decreased to 0.25 mol/dm ³ .	[1]					
	(ii)	Using your knowledge of collision theory, explain your answer in (b)(i) .						
			[2]					

A8 Potassium hydroxide solution was slowly added to 40 cm³ of nitric acid with a concentration of 1.00 mol/dm³ and the temperature of the solution was measured and plotted on Fig. 8.1.

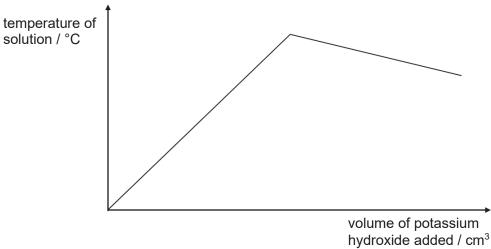


Fig. 8.1

The reaction between potassium hydroxide and nitric acid can be represented by the equation below.

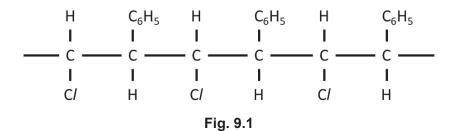
$$KOH + HNO_3 \rightarrow KNO_3 + H_2O$$

(a)	Name the type of reaction between potassium hydroxide and nitric acid.	
		[1]
(b)	State whether the reaction is exothermic or endothermic. Explain your answer using Fig. 8.1.	

(c) Given that 30 cm³ of potassium hydroxide was required to react with 40 cm³ of nitric acid, find the concentration of the potassium hydroxide solution.

[2]

A9 (a) Fig. 9.1 shows part of the structure of an addition polymer.



(a) Draw the structural formula of the monomer that makes up the polymer in Fig. 9.1.

(b) Poly(ethene) is an example of an addition polymer that is widely used.				
	(i)	State the condition(s) required for poly(ethene) to be formed from its monomer.		
			[1]	
	(ii)	State one common use of poly(ethene).		
			[1]	
(c)	Dispo	sal of polymers by burying them in landfills causes land pollution to occur.		
	Expla	in why polymers cause land pollution when buried.		
			[1]	

[1]

A10 Fig. 10.1 describes some properties and reactions of several substances.

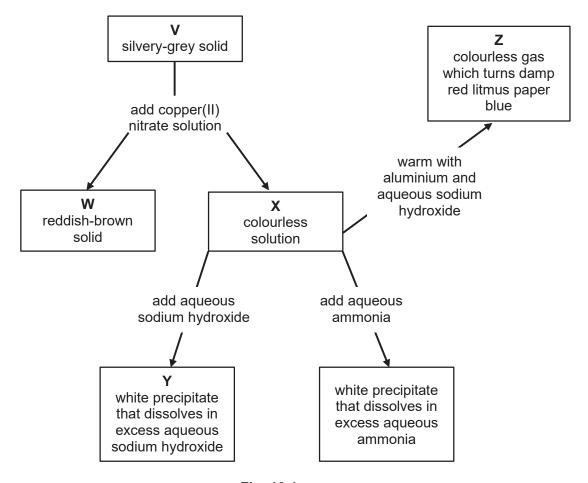


Fig. 10.1

(a)

Name V, W, X, Y and Z.

.....

[2]

Section B [20 marks]
Answer any two questions.

311	(a)	Alkan	es can react with halog	ens to produce other organic compounds.	
		(i)	State the condition(s)	required for halogens to react with alkanes.	
					[1]
		(ii)		cted with chlorine, hydrogen chloride is produced. t of the reaction and show its structural formula.	
				name:	
				structural formula:	
					[0]
					[2]
		(iii)	Write a balanced che oxygen.	mical equation to describe the reaction of methane with	
					[2]

Another hydrocarbon, ethene, has the chemical formula C_2H_4 .

Draw the 'dot-and-cross' diagram of ethene.

(b)

(i)

		[2]
(ii)	Explain, using your knowledge of chemical bonding, why ethene is a gas at roctemperature and pressure.	mc
		[2]
(iii)	Explain why ethene is classified as an unsaturated hydrocarbon.	
		[1]

B12	(a)	Describe, in terms of the arrangement and movement of particles, the process of ice melti	ng.
			[4]
	(b)	Water can be formed by the reaction between hydrogen and oxygen. The reaction can described by the equation below.	be
		$2H_2 + O_2 \rightarrow 2H_2O$	
		Find the mass of oxygen required to react with 32.0 cm ³ of hydrogen.	
			[0]
		mass of oxygen required: g	[3]
	(c)	With the aid of a diagram, explain why alloys are harder and stronger than pure metals.	
			[2]

B13	(a)		ribe how you can prepare a pure dry sample of copper(II) chloride. You may use ving information to help you.	the
			 copper(II) chloride is soluble in water copper metal does not react with dilute acids 	
				[5]
	(b)	Ethar	nol can be used as a fuel for vehicle and other machines.	
		(i)	Name the process by which ethanol is made from glucose.	
				[1]
		(ii)	State the chemical equation of the reaction named in (b)(i).	
				[1]
		(iii)	State the condition(s) required for the reaction in (b)(i) to occur.	
				[2]
		(iv)	Write a balanced chemical equation for the combustion of ethanol.	
				[1]

END OF PAPER

Colours of Some Common Metal Hydroxides

calcium hydroxide	white			
copper(II) hydroxide	light blue			
iron(II) hydroxide	green			
iron(III) hydroxide	red-brown			
lead(II) hydroxide	white			
zinc hydroxide	white			

The Periodic Table of Elements

	0	2 He	elium 4	10	Ne	neon	70	18	Ar	argon	40	36	궃	rypton	84	54	Xe	cenon	131	98	牊	adon.	ı				
	IIA					fluorine	\dashv									_							_				
	M					oxygen	_			_				_										16	>	mniau	
	_																							_	_	liverm	_
	>			7	z	nitrogen	14	15	۵	phosphor	31	33	As	arsenic	75	51	Sp	antimon	122	83	<u>.</u>	bismuth	209				
	Ν			9	O	carbon	17	14	S	silicon	28	32	Ge	germanium	73	20	Sn	ţį	119	82	Pp	lead	207	114	<i>F</i> ¹	flerovium	ı
	≡			2	В	boron	11	13	Αl	aluminium	27	31	Ga	gallium	20	49	П	mnipui	115	81	lΤ	thallium	204				
												30	Zu	zinc	65	48	g	cadmium	112	80	Ĥ	mercury	201	112	ວົ	opernicium	ı
												59	Cu Zn	copper	64	47	Ag	silver	108	79	Au	gold	197	111	Rg	entgenium c	ı
dn												28	Z	nickel	29	46	Pd	palladium	106	78	귙	platinum	195	110	Ds	armstadtium	ı
Group													රි													_	\neg
		- T	hydrogen 1									56	Fe	iron	26	44	R	ruthenium	101	9/	SO	osmium	190	108	Hs	hassium	ı
				ı								25	Mn	nanganese	22	43	٦ ک	technetium	1	75	Re	rhenium	186	107	Bh	pohrium	ı
				mber	lo		nass						ప		52	42	Mo	nolybdenum	96	74	>	tungsten	184	106	Sg	seaborgium	ı
			Key	proton (atomic) number	atomic symbo	name	relative atomic mass					23	>	vanadium	21	41	q	niobium	93	73	Та	tantalum	181	105		dubnium	ı
				proton (ato	1	relativ					22	ï	titanium	48	40	ZL	zirconium	91	72	Ξ	hafnium	178	104	¥	rutherfordium	ı
												21	Sc	scandium	45	39	>	yttrium	88	57 – 71	lanthanoids			89 – 103	actinoids		
	=			4	Be	beryllium	ກ	12	Mg	magnesium	24	20	Ca	calcium	40	38	S	strontium	88	99	Ba	barium	137	88		radium	ı
	_			က	:=	lithium	,		Na			19	¥	potassium	39	37	Rb	rubidium	85	22	S	caesium	133	87	Ŧ	francium	ı

71		Intetium	175	103	۲	lawrencium	ı	
02	Υb	ytterbium	173	102	%	nobelium	ı	
69	Tm	thulium	169	101	Md	mendelevium	I	
89	ш	erbium	167	100	Fm	fermium	ı	
29	웃	holmium	165	66	Es	einsteinium	1	
99	D	dysprosium	163	86	₽	californium	ı	
65	Tp	terbium	159	97	益	berkelium	ı	
64	В	gadolinium	157	96	Cm	curium	ı	
63	Ω	europium	152	92	Am	americium	ı	
62	Sm	samarium	150	94	Pu	plutonium	1	
61	Pm	promethium	1	93	ď	neptunium	1	
09	Nd	neodymium	144	92	\supset	uranium	238	
29	Ŗ	praseodymium	141	91	Ра	protactinium	231	
28	Ce	cerium	140	06	Ч	thorium	232	
22	La	lanthanum	139	89	Ac	actinium	ı	
lanthanoids				actinoids				

The volume of one mole of any gas is $24\,\mathrm{dm}^3$ at room temperature and pressure (r.t.p.)

Name	Register Number	Class



GREENRIDGE SECONDARY SCHOOL O LEVEL PRELIMINARY EXAMINATION 2019 Secondary 4 Express / 5 Normal Academic

SCIENCE (CHEMISTRY, BIOLOGY)

5078/01

Paper 1

4 September 2019
Wednesday

Additional Materials: Multiple Choice Answer Sheet

GREENRIDGESECONDARYSCHOOL GREENRIDGESECONDAR

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.

Do not use staples, paper clips, highlighters, glue or correction fluid.

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Choose the **one** you consider correct and record your choice in **soft pencil** on the separate Multiple Choice Answer Sheet.

Read the instructions on the Answer Sheet very carefully.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.

Any rough working should be done in this booklet.

The total number of marks for this paper is 40.

A copy of the Data sheet is printed on page 9.

A copy of the Periodic Table is printed on page 10.

For Examiner's Use Only					
Total	/ 40				

- 1 Which apparatus is most suitable for measuring 25.0 cm³ of hydrochloric acid?
 - A beaker
 - **B** burette
 - **C** measuring cylinder
 - **D** pipette
- **2** A substance X has the following properties.
 - fixed melting point
 - conducts electricity when molten
 - does not conduct electricity when in solid state

Which row correctly describes substance X?

	element, compound or mixture	chemical bonding			
Α	compound	covalent			
В	compound	ionic			
С	element	covalent			
D	mixture	ionic			

3 An unknown oxide M reacts with both sulfuric acid and sodium hydroxide solution to produce salt and water only.

Which oxide is M likely to be?

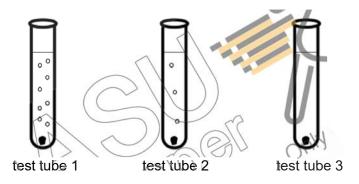
- A aluminium oxide
- B barium oxide
- C calcium oxide
- D magnesium oxide

4 Ammonia gas can be produced by reacting nitrogen and hydrogen as shown in the equation below.

$$N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$$

What volume of ammonia is produced when 50 cm³ of nitrogen is reacted with 90 cm³ of hydrogen?

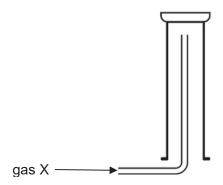
- **A** 60 cm³
- **B** 100 cm³
- **C** 140 cm³
- **D** 150 cm³
- Test tubes labelled 1, 2 and 3 respectively were filled with equal volume of dilute hydrochloric acid. Three different metal strips of same size and mass were added separately to test tubes 1, 2 and 3. The diagram below shows the observations obtained.



What could be the identities of the metals in each test tube?

	test tube 1	test tube 2	test tube 3
Α	calcium	copper	iron
В	calcium	zinc	copper
С	copper	iron	zinc
D	zinc	iron	copper

6 The ideal method of collecting gas X is shown below.

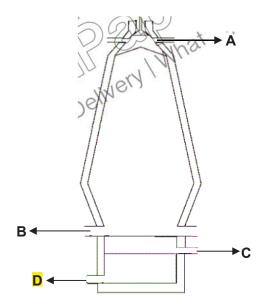


What can be deduced about the density and solubility of gas X in water?

	density of gas X	solubility of gas X in water		
Α	denser than air	insoluble		
В	denser than air	soluble		
С	less dense than air	insoluble		
D	less dense than air	soluble		

7 Iron can be extracted from its ore using a blast furnace as shown below.

At which position will molten iron be obtained?



- 8 Which substance is used to reduce acidity in soil?
 - **A** barium sulfate
 - **B** calcium hydroxide
 - **C** potassium chloride
 - **D** sodium hydroxide
- **9** Which is the major component of air?
 - **A** argon
 - B carbon dioxide
 - C nitrogen
 - **D** oxygen
- 10 Which is true about covalent bonds?
 - A Covalent bonds are formed between metals.
 - B Covalent bonds are formed by sharing electrons.
 - **C** Covalent bonds are formed by transferring electrons.
 - D Covalent bonds are weak.
- 11 Which matches the fraction of crude oil to its use?

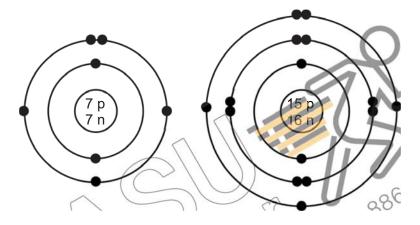
	fraction	use		
Α	bitumen	to produce polishes		
В	diesel	to pave roads		
С	kerosene	to lubricate engines		
D	naphtha	to make plastics		

- Which equation represents a redox reaction?
 - A AgNO₃ (aq) + NaCl (aq) \rightarrow AgCl (s) + NaNO₃ (aq)
 - **B** Ca (s) + 2HC/ (aq) \rightarrow CaC/₂ (aq) + H₂ (g)
 - C CuO (s) + H_2SO_4 (aq) \rightarrow CuSO₄ (aq) + H_2O (/)
 - **D** $MgCO_3(s) + H_2SO_4(aq) \rightarrow MgSO_4(aq) + H_2O(1)$

When an unknown gas X was bubbled into bromine solution, the solution was decolourised rapidly.

Which could be gas X?

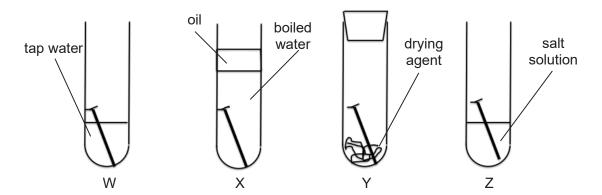
- A ethane
- **B** ethanoic acid
- **C** ethanol
- D ethene
- 14 The diagram below shows the structure of two atoms.



Which is true about the two atoms?

- A Both atoms are isotopes.
- B Both atoms are metals.
- C Both atoms belong to the same group.
- **D** Both atoms belong to the same period.
- 15 Moving from the left to the right side of the periodic table, elements
 - A become less metallic.
 - **B** become more metallic.
 - C decrease in mass.
 - **D** increase in reactivity.

16 Four set ups containing iron nails are shown below.



In which order will the nail rust from the fastest to the slowest?

- $\textbf{A} \qquad \textbf{W} \rightarrow \textbf{X} \rightarrow \textbf{Y} \rightarrow \textbf{Z}$
- $\textbf{B} \qquad \textbf{X} \rightarrow \textbf{Z} \rightarrow \textbf{Y} \rightarrow \textbf{W}$
- $\textbf{C} \qquad Y \to X \to Z \to W$
- $Z \rightarrow W \rightarrow X \rightarrow Y$
- 17 As the number of carbon atoms in alkanes increase,
 - A their melting and boiling points decrease.
 - B they become more flammable.
 - C they become more reactive.
 - D they become more viscous.
- 18 Long chain alkanes can be cracked into smaller molecules to produce more useful products.

The equation below shows an example of such reactions.

$$C_{35}H_{72} \rightarrow 2C_3H_6 + 2C_4H_8 + C_{15}H_{30} + X$$

What is a possible identity of X?

- A C₆H₁₂
- **B** C₆H₁₄
- ${f C}$ $C_{23}H_{46}$
- $D C_{23}H_{48}$

19 An equation is shown below.

$$x$$
Fe + y C $I_2 \rightarrow z$ FeC I_3

Which numbers will correctly balance the equation?

	x	У	z
Α	1	1	1
В	1	2	1
С	2	2	3
D	2	3	2

Which substance will be made up of particles packed closely together in an orderly arrangement at room temperature?

	melting point / °C	boiling point / °C
Α	- 20	17
В	0	100
С	15	131
D	40	150

~ End of Paper ~

Colours of Some Common Metal Hydroxides

Calcium hydroxide	white
Copper(II) hydroxide	light blue
Iron(II) hydroxide	green
Iron(III) hydroxide	red-brown
Lead(II) hydroxide	white
Zinc hydroxide	white

The Periodic Table of Elements

	0	5 무	helium 4	9	Ne	neon 20	18	Ā	argon 40	36	궃	krypton 84	54	Xe	xenon 131	98	唇	radon					71	3	lutetium 175	103
	=			6	ட	fluorine 19	17	ő	chlorine 35.5	35	亩	bromine 80	23	Ι	iodine 127	85	Αŧ	astatine					20	ΥÞ	ytterbium 173	102
	5			8	0	oxygen 16	16	S	sulfur 32	34	Se	selenium 79	25	<u>e</u>	tellurium 128	8	8	polonium	116	_	livermorium		69	E	thulium 169	101
	>			7	z	nitrogen 14	15	۵	phosphorus 31	33	As	arsenic 75	51	Sp	antimony 122	83	ä	bismuth 209					89	ш	erbium 167	100
	≥			9	ပ	carbon 12	14	S	silicon 28	32	ge	germanium 73	20	S	119 119	82	В	lead 207	114	Ε/	flerovium		29	웃	holmium 165	66
	=			2	മ	poron 11	13	ΑI	aluminium 27	31	Ğa	gallium 70	49	I	indium 115	81	11	thallium 204					99	ρ	dysprosium 163	86
										30	Z	zinc 65	48	ខ	cadmium 112	80	뤈	mercury 201	112	5	copernicium	X			terbium 159	
										59	రె	copper 64	47	Ag	silver 108	62	A	plop 1		Rg	roentgenum	7	l 10		gadolinium 157	
Group							25			28	į	nickel 58	97	В	palladium 106	82	₹	platinum 195	110	Ds	dermstadtium	0	63		en pinm	38
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	<	7	hydrogen 1		/				~	26	(E)	<u>\$</u>		\$ 1	Juthenfun 101	329	, O	osmina 1901	108/2	£	hassium		61	Pm	methiun -	93
			1	1		1	2		07	1) 25 /	OMn	manganese 35	43%	₹5	technetium,	75	æ	rhenium 186	107	絽	bohrium		09	PN	neodymi 144	92
			/	Joguni	log	Nass N	9	'in	ge G	24 <		chromium 52		ω	Ę	74	>	tungsten 184			seaborgium -			፵	praseodymium 141	9
			Key	proton (atomic) number	omic sym	name ve atomic				23	>	vanadium 51	41	g	niobium 93	73	ц	tantalum 181	105	9	dubnium		28		0	06
				proton	at	relati				22	F	titanium 48	40	Z	Ż			hafnium 178			Rutherfordium -		25	Гa	lanthanum 139	88
											သွ	scandium 45	39	>	yttrium 89	57 – 71	lanthanoids		89 - 103	actinoids			S			
	=			4	Be	beryllium 9	12	Mg	magnesium 24	20	င္မ	calcium 40	38	ശ്	strontium 88	99	Ba	barium 137	88	Ra	radium		lanthanoids			actinoids
	_			ო	:=	lithium 7	1		sodium 23	l	×	potassium 39	37	윤	rubidium 85	22	ర	caesium 133	87	<u>ኩ</u>	francium		-10			

₽ ᆵ ES einsteinium C C californium 9/ Berkelium Am Pu Plutonium actinoids

The volume of one mole of any gas is 24 dm³ at room temperature and pressure (r.t.p.).

Name	Register Number	Class



GREENRIDGE SECONDARY SCHOOL O LEVEL PRELIMINARY EXAMINATION 2019 Secondary 4 Express / 5 Normal Academic

SCIENCE 5076/5078/03

Paper 3 Chemistry

30 August 2019 1 hour 15 minutes

Friday

Additional Materials: Nil

GREENRIDGESECONDARYSCHOOL GREENRIDGESECONDAR

READ THESE INSTRUCTIONS FIRST

Write your name, register number and class on this cover and all the work you hand in.

Write in blue pen or black pen.

You may use a soft pencil for any diagrams, graphs or rough working.

Do not use staples, paper clips, glue or correction fluid.

The use of an approved scientific calculator is expected, where appropriate.

Section A

Answer all questions in the spaces provided.

Section B

Answer any two questions.

Write your answers in the spaces provided on the Question Paper.

The total number of marks for this paper is 65.

A copy of the Data sheet is printed on page **14**. A copy of the Periodic Table is printed on page **15**.

For Examiner's Use Only							
Section A	/ 45						
Section B	/ 20						
Total	/ 65						

Section A [45 marks]
Answer all the questions in this section in the spaces provided.

Α1 Some substances are listed below.

		air steel	carbon dioxide sulfur dioxide	iodine water	lithium iron						
	Match	the substance(s) to the descriptions given below.									
	(a)	A gas that dissolves in water and turns Universal Indicator red.									
		Sulfur dioxide				[1]					
	(b)	A mixture of elemen	ts and compounds.								
		air				[1]					
	(c)	A transition metal.									
		iron				[1]					
	(d)	A substance which sublimes when heated.									
		iodine									
A2	Chlori	ne and fluori ne both t	pelong to the same group i	n the Periodic Table.							
	(a)	State the name give	n to this group of elements	3.							
		halogens				[1]					
	(b)	Explain why chlorine	e and fluorine are placed in	the same group in th	e Periodic Table.						
		Both have 7 valence	e electrons/they have same	number of valence e	electrons	[1]					
	(c)	An element D was d Table.	iscovered by scientists and	d placed beneath asta	atine in the Periodic						
		Predict the state of astatine.	the element at room tem	perature and its rea	ctivity compared to						
		state at room tempe	rature: solid								
		reactivity compared	to astatine: less reactive			[2]					

A3 Fig. 3.1 shows the chromatogram of food products 1, 2 and 3 and permitted food dyes A, B and C.

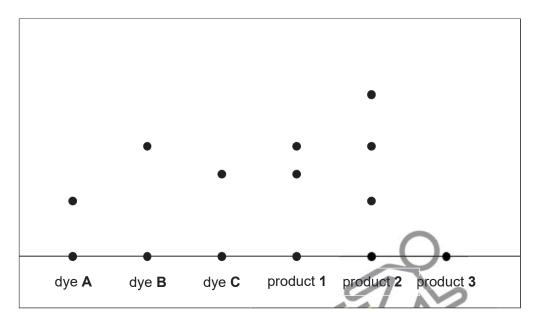


Fig. 3.1

(a) State and explain which food product(s) are safe for consumption.

Product 1. Contains only permitted food dyes.

(b) Explain why the sample of product 3 did **not** separate into different spots.

The dye is insoluble. [1]

[2]

A4 Aluminium is extracted from its ore by electron	OIVSI	/ electrolys	troivsi
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The equation given below represents the process of extraction of aluminium from its ore.

$$2AI_2O_3 \rightarrow 4AI + 3O_2$$

Explain why aluminium **cannot** be extracted from its ore by heating with carbon. (a) Aluminium is above carbon in the reactivity series. Carbon cannot reduce aluminium oxide as it is less reactive than aluminium. [2] (b) State and explain if the process of extracting aluminium is a redox reaction. Extraction of aluminium is a redox reaction as aluminium is reduced from +3 in Al2O3 to <u>0 in A/</u> and oxygen is <u>oxidized from -2 in in A/₂O₃ to 0 in A/.</u> Oxidation and reduction occurs simultaneously hence the process is a redox reaction. [2] Suggest why aluminium is widely recycled in many countries rather than being extracted. (c) Extraction of aluminium requires large amounts of energy which can be expensive, recylcying reduces the cost of production. [1] A5 Table 5.1 shows some information about the atoms of elements E, F, G and H.

Table 5.1

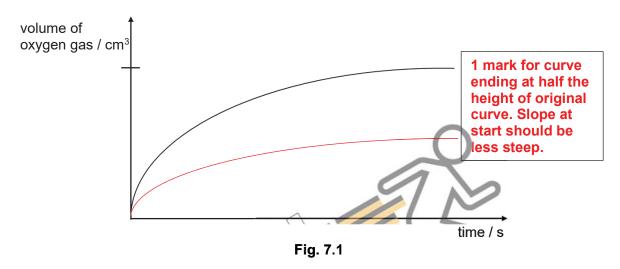
element	proton	neutron	electron	mass		
E	6	6	6	12		
F	19	20	19	39		
G	6	8	6	14		
Н	18	22	18	40		

	(a)	Complete Table 5.1.						
	(b)	State which element(s) is/are						
		(i)	noble gas(es),					
			Н	[1]				
		(ii)	isotopes.					
			E and G	[1]				
A6		en stoves are operated in an enclosed area, carbon monoxide may be produced which can m human health.						
	(a)	Explai area.	in how carbon monoxide is produced when stoves are operated in an enclosed					
		Incom	plete combustion of fuels due to lack of oxygen.	[1]				
	(b)	Descr	ibe the effects of carbon monoxide on human beings.					
		Carbon monoxide <u>binds irreversibly to haemoglobin, reducing ability of blood to carry oxygen</u> throughout body. Causes fatigue, headache and <u>death</u> .						
				[2]				

A7 When yeast is added to hydrogen peroxide, it decomposes into water and oxygen as shown by the chemical equation below.

$$2H_2O_2 \rightarrow 2H_2O + O_2$$

Fig. 7.1 shows the graph of the volume of oxygen gas collected against time when 50 cm³ of hydrogen peroxide with concentration of 0.50 mol/dm³ is allowed to decompose in the presence of yeast.



(a) Explain why the volume of oxygen stops rising after some time.

All the hydrogen peroxide is used up/decomposed.

[1]

(b) (i) On Fig. 7.1, sketch a curve of what would happen if the concentration of hydrogen peroxide was decreased to 0.25 mol/dm³.

[1]

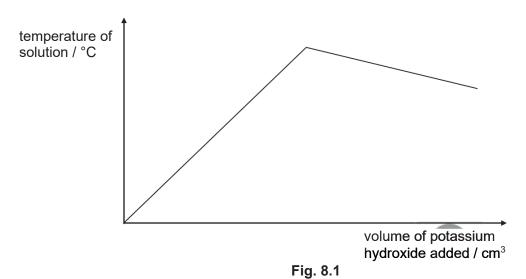
(ii) Using your knowledge of collision theory, explain your answer in (b)(i).

Number of particles decreased in the same volume.

Lower rate of effective collisions, hence lower rate of reaction.

[2]

A8 Potassium hydroxide solution was slowly added to 40 cm³ of nitric acid with a concentration of 1.00 mol/dm³ and the temperature of the solution was measured and plotted on Fig. 8.1.



The reaction between potassium hydroxide and nitric acid can be represented by the equation below.

(a) Name the type of reaction between potassium hydroxide and nitric acid.

Neutralisation [1]

(b) State if the reaction is exothermic or endothermic. Explain your answer using Fig. 8.1.

Exothermic. Temperature of solution increased when potassium hydroxide was added to nitric acid.

(c) Given that 30 cm³ of potassium hydroxide was required to react with 40 cm³ of nitric acid, find the concentration of the potassium hydroxide solution.

No. of moles of $HNO_3 = 1.00 \times 0.04 = 0.04 \text{ mol } [1]$ $HNO_3 : KOH$

1:1

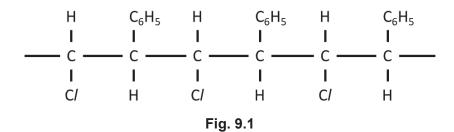
No. of moles of KOH = 0.04 mol [1]

Concentration of KOH = 0.04 / 0.03

= 1.33 mol/dm³ [1] (must be in 3s.f. NOT fraction)

[2]

A9 (a) Fig. 9.1 shows part of the structure of an addition polymer.



(a) Draw the structural formula of the monomer that makes up the polymer in Fig. 9.1.



[1]

- (b) Poly(ethene) is an example of an addition polymer that is widely used.
 - (i) State the condition(s) required for poly(ethene) to be formed from its monomer.

High temperature and pressure, presence of catalyst.

[1]

(ii) State one common use of poly(ethene).

Plastic bags (accept reasonable answers)

[1]

[1]

(c) Disposal of polymers by burying them in landfills causes land pollution to occur.

Explain why polymers cause land pollution when buried.

Polymers are usually non-biodegradable.

A10 Fig. 10.1 below describes some properties and reactions of several substances.

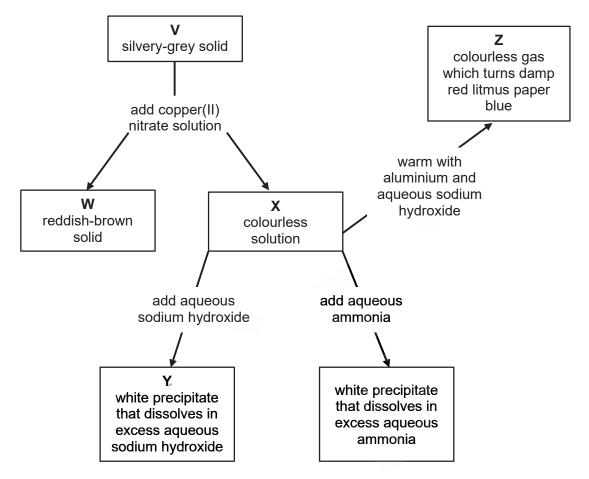


Fig. 10.1

- (a) Name V, W, X, Y and Z.
 - V zinc
 - W copper
 - X zinc nitrate
 - Y zinc hydroxide
 - Z ammonia [5]
- (b) Write a balanced chemical equation for any **one** of the reactions in Fig. 10.1.

$$Zn + Cu(NO_3)_2 \rightarrow Zn(NO_3)_2 + Cu$$
 [2]
 $Zn(NO_3)_2 + 2NaOH \rightarrow Zn(OH)_2 + 2NaNO_3$

~End of Section A~

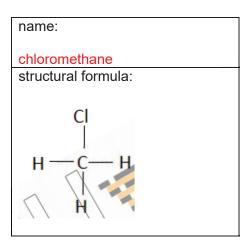
Section B [20 marks]

Answer any two questions.

- **B11** (a) Alkanes can react with halogens to produce other organic compounds.
 - (i) State the condition(s) required for halogens to react with alkanes.

Presence of UV light. [1]

(ii) When methane is reacted with chlorine, hydrogen chloride is produced. Name another product of the reaction and show its structural formula.

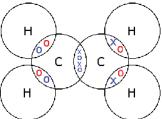


[2]

(iii) Write a balanced chemical equation, to describe the reaction of methane with oxygen.

$$CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$$
 [2]

(b)	Anotl	her hydrocarbon, ethene, has the chemical formula C_2H_4 .
	(i)	Draw the 'dot-and-cross' diagram of ethene.



[2]

[2]

(ii) Explain, using your knowledge of chemical bonding, why ethene is a gas at room temperature and pressure.

Ethene exists as a simple covalent molecule which is held together by weak intermolecular forces of attraction.

Little energy is required to overcome it. Hence, it has low melting and boiling point, therefore it is a gas at room temperature.

(iii) Explain why ethene is classified as an unsaturated hydrocarbon.

Ethene contains carbon-carbon double bond. [1]

B12	(a)	Describe in terms of the arrangement and movement of particles, the process of ice melting
		Particles in ice are held together closely in an orderly manner and they vibrate and rotate about a fixed position. [1] As they absorb energy from the surroundings, the particles begin vibrating faster and start moving apart. [1] When it reaches the melting point, energy absorbed is sufficient to overcome the intermolecular forces of attraction holding the particles together and the particles break apart from their fixed positions. [1] The particles can now move around freely by sliding across each other. [1]
		[4
	(b)	Water can be formed by the reaction between hydrogen and oxygen. The reaction can be described by the equation below.
		$2H_2 + O_2 \rightarrow 2H_2O$
		Find the mass of oxygen required to react with 32.0 cm³ of hydrogen.
		No. of moles of H_2 = 32.0 / 24 000 = 0.00133 mol [1] H_2 : O_2 2 : 1 0.00133 : 0.000666 No. of moles of O_2 = 0.000666 mol [1] Mass of O_2 = 0.000666 x 32 = 0.0213 g [1]
		mass of oxygen required: g [3
	(c)	With the aid of a diagram, explain why alloys are harder and stronger than pure metals.
		[1] for diagram
		Different sized atoms <u>disrupt the orderly arrangement</u> of metals. [1] This makes it difficult for the layers atoms to <u>slide across each other</u> when a force is applied. [1] Therefore, alloys are stronger and harder than pure metals.
		[3

B13	(a)		ribe how you can prepare a pure dry sample of copper(II) chloride. You may use ving information to help you.	the
			 copper(II) chloride is soluble in water copper metal does not react with dilute acids 	
		stir. [Conti disso Filter Heat Let th Filter	o cm³ of hydrochloric acid, add excess copper(II) oxide/copper(II) carbonate and lanue adding copper(II) oxide/copper(II) carbonate while stirring until no more layes. [1] the mixture to obtain copper(II) chloride as the filtrate. [1] the filtrate until it is saturated. In the filtrate cool and crystallise. In the mixture to obtain the crystals and wash with cold distilled water. In the crystals between sheets of filter paper. In the crystals between sheets of filter paper.	
	4.)			[5]
	(b)		nol can be used as a fuel for vehicle and other machines.	
		(i)	Name the process by which ethanol is made from glucose.	
		(ii)	Fermentation State the chemical equation of the reaction named in (b)(i).	[1]
			$C_6H_{12}O_6$ (aq) $\rightarrow 2C_2H_5OH$ (aq) + $2CO_2$ (g)	[1]
		(iii)	State the condition(s) required for the reaction in (b)(i) to occur.	
			Temperature maintained at 37 °C [1] Absence of air/oxygen [1] Presence of yeast	[2]
		(iv)	Write a balanced chemical equation for the combustion of ethanol.	

~ End of Paper ~

[1]

 $C_2H_5OH + 3O_2 \rightarrow 2CO_2 + 3H_2O$

Colours of Some Common Metal Hydroxides

calcium hydroxide	white
copper(II) hydroxide	light blue
iron(II) hydroxide	green
iron(III) hydroxide	red-brown
lead(II) hydroxide	white
zinc hydroxide	white

Elements
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		0	2 He	10	Ne	neon 20	18	Αľ	argon 40	36	궃	krypton 84	54	Xe	xenon	86	R	radon					71	Ρ	lutetium 175	103	ئد	lawrencium -							
				6	ட	fluorine 19	17	Cl	chlorine 35.5	35	Ä	bromine 80	53	П	iodine 127	85	At	astatine _					70	Yb	ytterbium 173	102	2	nobelium -							
				8	0	oxygen 16	16	တ	sulfur 32	34	Se	selenium 79	52	Те	tellurium 128	84	Ъ	polonium	116	^	livermorium –		69	Tm	thulium 169	101	Md	mendelevium —							
		>		7	z	nitrogen 14	15	۵	phosphorus 31	33	As	arsenic 75	51	qs	antimony 122	83	ā	bismuth	23						erbium 167										
		2		9	O	carbon 12	14	Si	silicon 28	32	Ge	germanium 73	20	Sn	tin 119	82	Ър	lead 207	114	F/	flerovium -			유	holmium 165	66	Es	einsteinium							
		=				boron 11			_				\vdash						+			(99	1	lysprosium 163	98	ŭ	alifornium -							
										30	Zu	zinc 65	48	გ ე	cadmium 112	80	Hg	mercury 201	113	Ö	copernioum	7	92	P	terbium 159	97	益	berkelium –							
										59	2	copper 64	47	Ag	108	79.	Au	gold 107		Rg	pentgenium		19	PS	gadolmum 157	_									
	dn							^				9	28	Ż	hickel 59	46	Pq	palladium	78/	P	platinum 195	110	Ds	armstadtum	9	-4	-	europium 152	~	4	_				
	Group	/	1	\	\	1	>	\	5	27	00	cobalt 59	45	(F)	modium 103	11	2	indium 192	600	\$	meitnerium o	M	1		samarium 150			-							
		/	H Hydrogen				(1	1	28	Pe	iron 56	7 44 ~	4	nutabajum 1947	267	SS	Osmium C	108	_	_				promethium -	_									
			CS S	1	10	20	5	7.	2 2	7 28 1	Z Z	manganese 55	43	 C	technetium	75	Re	rhenium 186	107	뮵	bohrium		09	Nd	eodymium 144	92		uranium 238							
			Key	Key	Key	₽≌	ᅙ	nass 70/	11/	O.		24	نَ	chromium 52	42	Mo	molybdenum 96	74	>	tungsten 187	106	Sg	seaborgium -			Ā	praseodymium 141	91	Ра	n protactinium 231					
						Key	Kev	Key	proton (atomic) nu	atomic symbol	name relative atomic mass						vanadium 51											28		cerium 140	06	드	thorium 232		
				proton (a	proton (a	proton (a	proton (a	proton (proton (proton (proton (atol	relativ				22	F	titanium 48	40	ZL	zirconium 91	72	Ξ	hafnium 178	104	ž	rutherfordium —		22	Га	lanthanum 139	89	Ac	actinium -
										21	သွင	scandium 45	39	>	yttrium 89	57 – 71	lanthanoids		89 – 103	actinoids															
	ŀ	=		4	Be	beryllium 9	12	Mg	magnesium 24	20	Ca	calcium 40	38	S	strontium 88	$\overline{}$		barium 137	\top		radium		anthanoids			actinoids									
		_							sodium 23							55	S	caesium 133	87	ŭ	francium		<u>e</u>												
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The volume of one mole of any gas is 24 dm³ at room temperature and pressure (r.t.p.)