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Geylang Methodist School (Secondary) Preliminary Examination 2017

SCIENCE (CHEMISTRY)

5078/01

Paper 1 Multiple Choice

Sec 4 Express
Sec 5 Normal (A)

Additional materials: Optical Answer Sheet

1 hour

Setter : Ms Ng Sio Ying
Ms Lam Yuit Kwai

18 August 2017

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.

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

Write your name, index number and class on the Optical Answer Sheet in the spaces provided.

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

Read the instructions on the Optical Answer Sheet very carefully

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

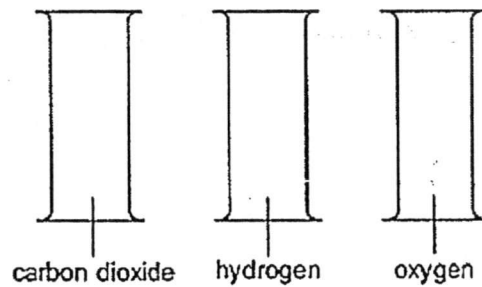
Any rough working should be done in this booklet.

A copy of the Periodic Table is printed on page 21.

This document consists of **21** printed pages and **1** blank page.

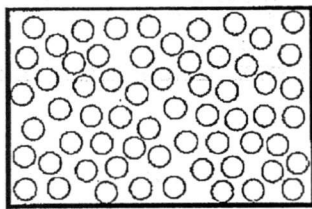
[Turn over

- 1 Three gas jars contain carbon dioxide, hydrogen and oxygen, as shown.

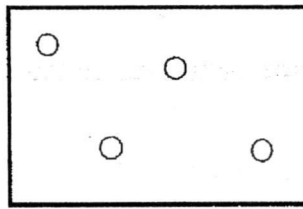


Which one of the following tests could be used to identify the gases in each jar?

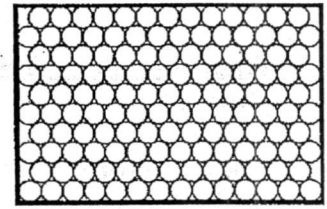
- A a glowing splint
 - B a lighted splint
 - C damp blue litmus paper
 - D limewater
- 2 The diagrams show the arrangement of particles in three different physical states of substance.



state 1



state 2

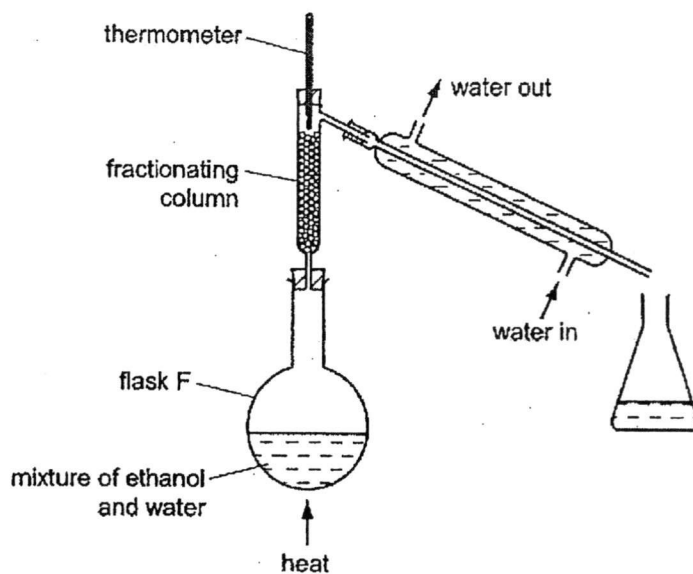


state 3

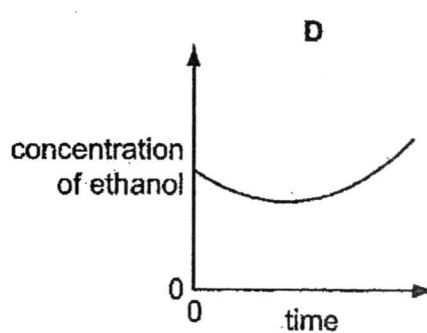
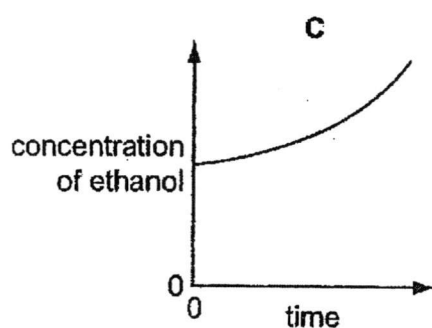
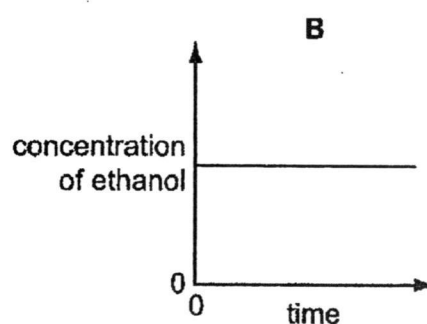
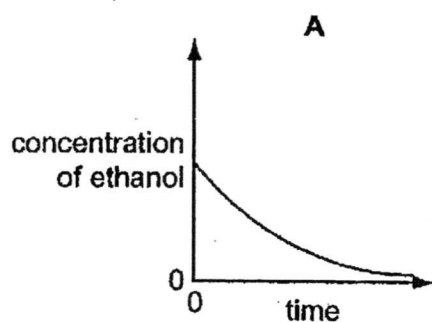
Which statement about the physical states of substance X is correct?

- A Particles in state 1 vibrate about fixed positions.
- B State 1 changes to state 2 by diffusion.
- C State 2 changes directly to state 3 by sublimation.
- D The substance in state 3 has a fixed volume.

- 3 The apparatus shown is used to distil ethanol (boiling point 78°C) from a mixture of ethanol and water.



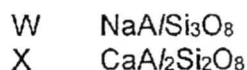
Which graph shows the change in concentration of the ethanol in flask F as the distillation proceeds?



4 What can be deduced from the symbol ${}^9_4\text{Be}$?

- A An atom of beryllium contains 4 electrons.
- B An atom of beryllium has 4 protons and 9 neutrons in its nucleus.
- C Beryllium has a proton (atomic) number of 9.
- D Beryllium exists as a diatomic molecule.

5 The chemical formula of two substances, W and X, are given.



Which statements are correct?

- 1 W and X contain the same amount of oxygen.
- 2 W contains three times as much silicon as X.
- 3 X contains twice as much aluminium as W.

- A 1 and 2
- B 1 and 3
- C 2 and 3
- D 1, 2 and 3

6 The table shows four elements W, X, Y and Z with their proton numbers

element	W	X	Y	Z
proton number	6	8	11	17

Which of the following shows the correct formula of likely ionic and covalent compounds formed from the four elements shown above?

	formula of ionic compound	formula of covalent compound
A	WX	YZ
B	YW	WZ_4
C	YZ	ZX
D	Y_2X	WX_2

7 Which of the following could be an ionic compound?

	melting point / °C	boiling point / °C	electrical conductivity of		
			solid	liquid	solution in water
A	1610	2230	poor	poor	insoluble
B	660	2470	good	good	insoluble
C	-112	-83.7	poor	poor	good
D	801	1413	poor	good	good

8 For the reaction shown, which volume of 1.0 mol/dm^3 hydrochloric acid is required to react completely with 5 g of calcium?



- A** 5 cm^3 **B** 10 cm^3 **C** 125 cm^3 **D** 250 cm^3

9 The diagram shows the positions of elements L, M, Q, R and T in the Periodic Table.

These letters are not the chemical symbols of the elements.

[illegible]

Which statement about the properties of these elements is correct?

- A L reacts more vigorously with water than does M.
B L, M and Q are all metals.
C T exists as diatomic molecules.
D T is more reactive than R.

- 10 In the Periodic Table, element X is in the same group as chlorine but has a lower boiling point.

Which statement about X is correct?

- A It has a lighter colour than chlorine.
- B It is a liquid at room temperature.
- C It has an atomic number greater than 17.
- D It loses an electron when it reacts with metal.

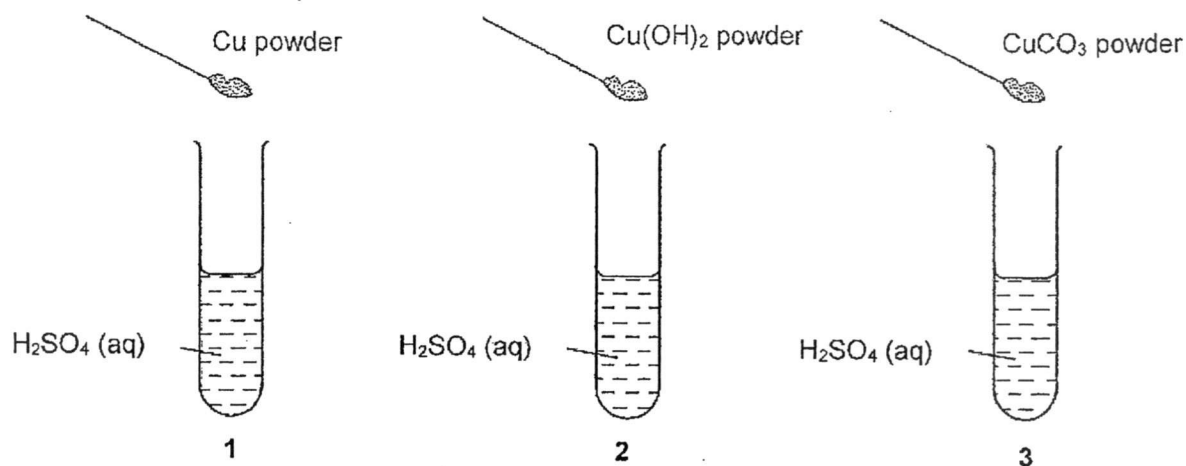
- 11 W, X, Y and Z are four metals.
Some properties of these metals are listed below.

- 1 Only X and Y can be extracted by electrolysis.
- 2 X reacts more vigorously with cold water than Y.
- 3 Only Z can be found free in nature.

What are metals W, X, Y and Z?

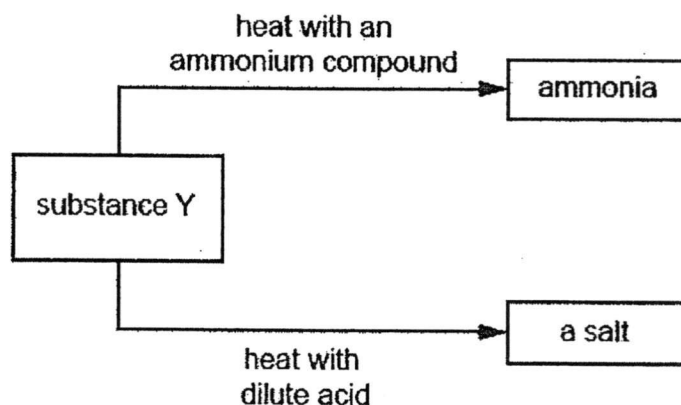
	W	X	Y	Z
A	calcium	aluminium	silver	iron
B	iron	potassium	aluminium	silver
C	silver	calcium	potassium	gold
D	aluminium	silver	iron	potassium

- 12 The diagrams show three experiments using dilute sulfuric acid. Three different powders are added to the acid. The mixtures are stirred.



Which test tubes now contain $\text{Cu}^{2+}(\text{aq})$ ions?

- A 3 only
 - B 1 and 2 only
 - C 2 and 3 only
 - D 1, 2 and 3
- 13 The diagram shows some reactions of substance Y.

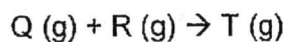


Which type of substance is Y?

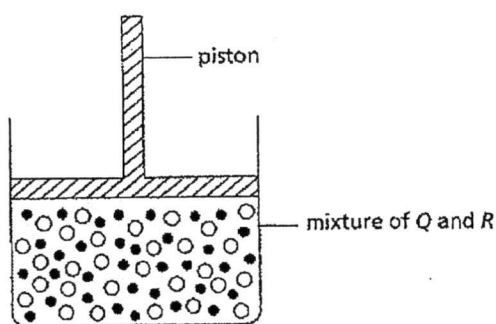
- A an alcohol
- B an alkali
- C a catalyst
- D a metal

- 14 Which process is **not** exothermic?
- A obtaining lime from limestone
 - B condensation of water vapour
 - C reacting hydrogen with oxygen
 - D burning a fossil fuel

- 15 Gases Q and R react according to this equation:



The reaction mixture is placed in a container at room temperature as shown in the figure below.



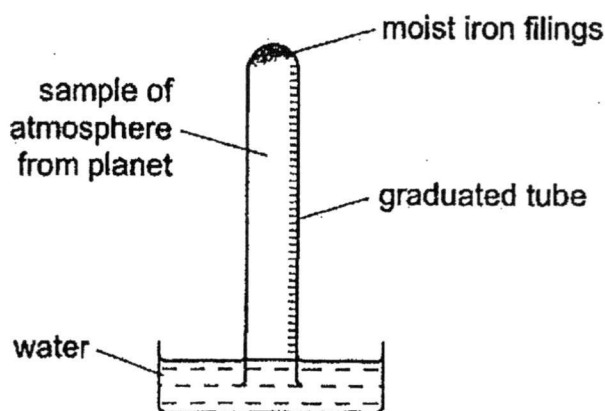
Which of the following actions can increase the speed of reaction?

- A placing the container in a dark room
- B lowering the piston in the container
- C placing the container in water at 0°C
- D using a bigger container

- 16 The atmosphere of a newly discovered planet contains the following gases.

carbon dioxide	20%
nitrogen	40%
noble gases	10%
oxygen	30%

The apparatus below was set up with a 100 cm^3 sample of the atmosphere of the planet in the graduated tube. The volume of the sample was measured at intervals until no further change in volume took place.



What volume of the sample of the atmosphere would remain?

- A 20 cm^3 B 30 cm^3 C 70 cm^3 D 80 cm^3
- 17 These statements are about a gas.
- 1 It is produced by thermal decomposition of a carbonate.
 - 2 It is produced by the fermentation of glucose.
 - 3 It makes up 1% of unpolluted air.
 - 4 It is produced during the production of iron from iron(III) oxide.

Which statements are correct for carbon dioxide?

- A 1 and 2 only
 B 1, 2 and 3
 C 1, 2 and 4
 D 1, 3 and 4

18 Which statement about petroleum is **not** correct?

- A It can be separated into useful substances by fractional distillation.
- B It consists mainly of hydrocarbons.
- C It is found underground in many parts of the world.
- D Its main use is for making lubricants and polishes.

19 A hydrocarbon P is cracked to be Q and hydrogen.
Compound R is formed by the addition polymerisation of Q.

To which homologous series do P, Q and R belong?

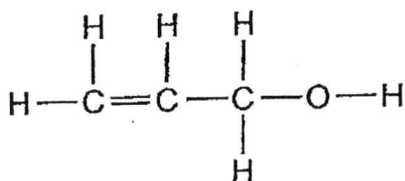
	P	Q	R
A	alkene	alkane	alkane
B	alkane	alkene	alkane
C	alkane	alkane	alkene
D	alkane	alkene	alkene

20 The results of two tests on compound Z are shown.

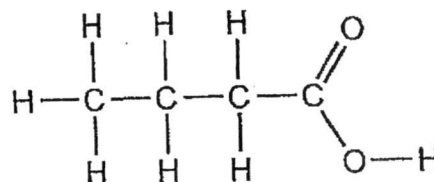
test	result
add bromine water	turns colourless
add aqueous sodium carbonate	carbon dioxide formed

Which of the following represents compound Z?

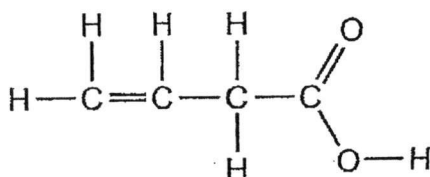
A



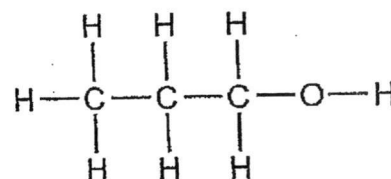
B



C



D



Group																	
I	II			III	IV	V	VI	VII	0								
		1 H Hydrogen 1															
7 Li Lithium 3	9 Be Beryllium 4																
23 Na Sodium 11	24 Mg Magnesium 12																
39 K Potassium 19	40 Ca Calcium 20	45 Sc Scandium 21	48 Ti Titanium 22	51 V Vanadium 23	52 Cr Chromium 24	55 Mn Manganese 25	56 Fe Iron 26	59 Co Cobalt 27	59 Ni Nickel 28	64 Cu Copper 29	65 Zn Zinc 30	70 Ga Gallium 31	73 Ge Germanium 32	75 As Arsenic 33	79 Se Selenium 34	80 Br Bromine 35	84 Kr Krypton 36
85 Rb Rubidium 37	88 Sr Strontium 38	89 Y Yttrium 39	91 Zr Zirconium 40	93 Nb Niobium 41	96 Mo Molybdenum 42	96 Tc Technetium 43	101 Ru Ruthenium 44	103 Rh Rhodium 45	106 Pd Palladium 46	108 Ag Silver 47	112 Cd Cadmium 48	115 In Indium 49	119 Sn Tin 50	122 Sb Antimony 51	128 Te Tellurium 52	127 I Iodine 53	131 Xe Xenon 54
133 Cs Caesium 55	137 Ba Barium 56	139 La Lanthanum 57	178 Hf Hafnium 72	181 Ta Tantalum 73	184 W Tungsten 74	186 Re Rhenium 75	190 Os Osmium 76	192 Ir Iridium 77	195 Pt Platinum 78	197 Au Gold 79	201 Hg Mercury 80	204 Tl Thallium 81	207 Pb Lead 82	209 Bi Bismuth 83	210 Po Polonium 84	210 At Astatine 85	222 Rn Radon 86
Fr Francium 87	226 Ra Radium 88	227 Ac Actinium 89															

Key

a	X
---	---

a = relative atomic mass
X = atomic symbol
b = proton (atomic) number

The volume of one mole of any gas is 24 dm^3 at room temperature and pressure (r.t.p.).

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Geylang Methodist School (Secondary) Preliminary Examination 2017

Candidate Name			
Class		Index Number	

SCIENCE

5076/03 5078/03

Paper 3 Chemistry

Sec 4 Express
Sec 5 Normal (A)

Additional Materials : Writing Paper

1 hour 15 minutes

Setter: Ms Ng Peck Suan

14 August 2017

READ THESE INSTRUCTIONS FIRST

Write your name, index number and class on all the work you hand in.
Write in dark blue or black pen.
You may use a pencil for any diagrams, graphs, tables or rough working.
Do not use staples, paper clips, highlighters, glue or correction fluid.

Section A

Answer **all** questions.

Write your answers in the spaces provided on the question paper.

Section B

Answer any **two** questions.

Write your answers on the separate answer paper provided.

At the end of the examination,

1. enter the numbers of the Section B questions you have answered in the grid below;
2. hand in the answers to Sections A & B separately.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets [] at the end of each question or part question.

A copy of the periodic table is printed on page 13

For Examiner's Use	
Section A	/45
Section B	
.....	/10
.....	/10
Total	/65

This document consists of 12 printed pages and 2 blank pages.

[Turn over

Section A

Answer **all** questions in the spaces provided.

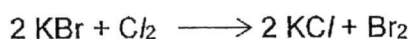
- A1** A student noticed the labels on two bottles of colourless solution have dropped off. The solutions are known to be aqueous sodium chloride and aqueous ammonium carbonate.

Outline the chemical tests the student should use to distinguish between the solutions in the two bottles.

solution	test	result
aqueous sodium chloride		
		
		
		
aqueous ammonium carbonate		
		
		
		

[4]

- A2** The equation below shows a displacement reaction involving Group VII elements.



- (a) State the oxidation state of the named substance in the table below.

substance	oxidation state
potassium in KCl	
chlorine in Cl_2	

[2]

- (b) State and explain if potassium bromide is oxidised or reduced in the reaction.

.....

.....

.....

.....

[2]

A3 ^{79}Br and ^{81}Br are isotopes of bromine.

(a) Explain what is meant by the term *isotopes*.

.....
 [1]

(b) An ion of ^{79}Br contains the following sub-atomic particles.

particle	number
X	44
Y	36
Z	35

Identify particles X, Y and Z.

particle X

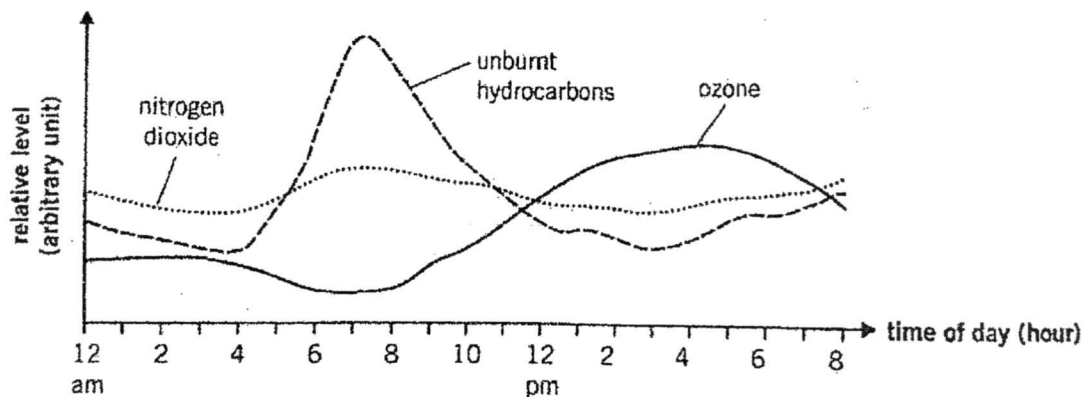
particle Y

particle Z [3]

(c) Explain why ^{79}Br and ^{81}Br have the same chemical properties.

.....
 [1]

A4 The graph below shows the relative levels of three air pollutants on the major traffic roads of a city measured over a period of 20 hours on a particular day.



- (a) What could be the source of nitrogen dioxide that is shown in this graph?

.....
.....
.....

[1]

- (b) Suggest a possible reason for the high concentration of unburnt hydrocarbons between 6 am and 10 am?

.....
.....
.....

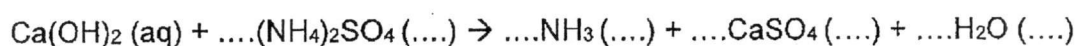
[1]

- (c) Describe one harmful effect of nitrogen dioxide to the environment.

.....
.....
.....
.....

[2]

- A5** Calcium hydroxide reacts with ammonium sulfate to produce ammonia gas. The unbalanced chemical equation is shown below:



- (a) Balance the chemical equation and give the state symbols.

[2]

- (b) State two observations of the above reaction.

.....
.....

[2]

- (c) Write the chemical name and formula of the salt formed, if ammonium nitrate is used, instead of ammonium sulfate.

Chemical name:

Chemical formula:

[2]

- (d) State the type of bonding found in a molecule of ammonia gas.

..... [1]

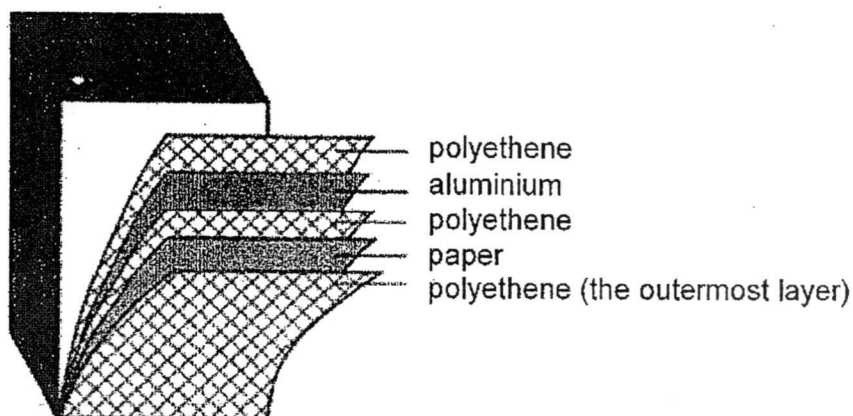
- (e) Draw the 'dot and cross' diagram of a molecule of ammonia gas. Show only the valence electrons.

[2]

- A6 (a) Ethene is an unsaturated hydrocarbon.
Define the term *unsaturated*.

..... [1]

- (b) A polymer, polyethene can be used in the making of beverage boxes. The diagram below shows the structure of a common beverage box consisting of paper, polyethene and aluminium.



- (i) Draw the structure of polyethene, showing three repeating units.

[1]

- (ii) Name the chemical reaction involved in the making of polyethene.

..... [1]

- (iii) Explain the function of the polyethene layers of the beverage box.

.....
..... [1]

- (iv) Oxygen can pass through the paper and polyethene.
Explain how the beverage box can prevent oxygen from coming in contact with the drink.

.....
.....
..... [2]

- A7 Sodium nitrate can be produced by the neutralisation of an acid and an alkali. The temperature of the solution increases during the reaction to prepare the salt.

- (a) Name an acid and an alkali needed to prepare the salt.

..... [2]

- (b) Explain why the temperature of the solution increases.

.....
..... [1]

- A8 Some students found three unknown metals and decided to name them as **alpha**, **beta** and **gamma**. They carried out a series of experiments to determine the reactivity of the metals.

The three metals are dropped into water, **alpha** does not react, but **beta** and **gamma** do, liberating a gas which extinguishes a lighted splint with a 'pop' sound.

When **beta** is mixed with dilute sulfuric acid, a solution of **beta** sulfate is formed.

When **gamma** is dropped into a solution of **beta** sulfate, **beta** is not displaced.

- (a) Place the three metals in order of reactivity, starting from the most reactive metal.

..... [1]

- (b) Name the gas given off when beta and gamma reacted with water.

..... [1]

- (c) If beta has been identified as calcium metal, suggest a metal which could be gamma.

..... [1]

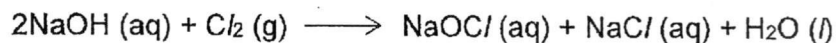
- (d) Write a balanced chemical equation for the reaction between calcium and water. State symbols are not required.

..... [1]

- (e) Describe what you would observe when calcium reacts with water.

.....
 [1]

- A9** Bleach contains sodium hypochlorite (NaOCl) which is manufactured by reacting sodium hydroxide with chlorine.



In an experiment, 3.6 dm^3 of chlorine gas was allowed to react with 250 cm^3 of 1 mol/dm^3 sodium hydroxide.

- (a) Calculate the number of moles of chlorine and sodium hydroxide used in the reaction.

[2]

- (b) Using your answer in (a), identify the reactant that is

(i) in excess:

(ii) limiting. [1]

- (c) Calculate the mass of sodium hypochlorite produced.

[2]

End of Section A

Section B

Answer any **two** questions in this section.
Write your answers in the writing papers provided.

- B10 (a) In an experiment, a student conducted a paper chromatography using acetone on a sample of leaf extract. It was found that the leaf contains 3 pigments with solubility shown below.

pigment	solubility in acetone
chlorophyll	slightly less soluble than xanthophyll
xanthophyll	moderately soluble
carotene	highly soluble

- (i) Draw a resultant chromatogram that the student will obtain. Label your diagram clearly. [2]
- (ii) Why is it important that the student ensure that the start line is drawn in pencil and not using ink? [1]
- (b) In another experiment, the student heated a sample of white solid from room temperature for 10 minutes. He noted two constant temperatures, one at 55°C and the other at 80°C.
- (i) Sketch a temperature-time graph the student obtains from this experiment. [2]
- (ii) Is the white solid a pure or impure substance? Justify your answer. [1]
- (c) Baking powder is a mixture containing sodium hydrogencarbonate and a compound which dissolves **slowly** in water to form an acid.

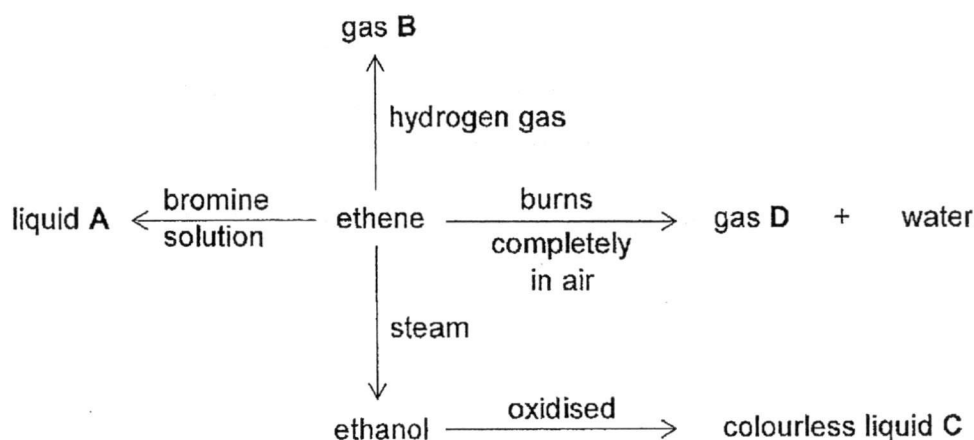
A student set-up three experiments to study the reaction between baking powder and liquid X.

experiment	mass of baking powder / g	liquid X	temperature of liquid X / °C	volume of gas produced after 5 min / dm ³
1	10	water	30	1.5
2	10	water	60	8.5
3	10	vinegar	30	10.1

- (i) Suggest which gas is produced in all three experiments. [1]
- (ii) Suggest why the gas is produced more quickly in experiment 3 than in experiment 1. [1]

- (iii) If liquid X is dilute sulfuric acid, what changes will occur to the rate of reaction between the baking powder and liquid X, and also the volume of gas collected after 5 min? [2]

B11 The flow diagram below shows some of the reactions of ethene.



- (a) Draw the full structural formula for liquid A. [1]
- (b) Name gas B and state the conditions for the formation. [2]
- (c) Draw the dot and cross diagram for gas D, showing only the outermost shell electrons. [2]
- (d) Name and draw the structural formula of colourless liquid C. [2]
- (e) In the laboratory, ethanol can be oxidised to colourless liquid C by warming it with an oxidising agent.
- (i) Name the oxidising agent. [1]
- (ii) Write the chemical equation for formation of colourless liquid C from ethanol. Include state symbols [1]
- (f) Ethene can be manufactured by the cracking of long chain hydrocarbon molecules such as $C_{22}H_{46}$.

Construct the equation to show the cracking of $C_{22}H_{46}$ to make ethene and another hydrocarbon as the only products. [1]

- B12 (a)** Iodine reacts with hydrogen to form an acidic gas, hydrogen iodide. Hydrogen iodide is very soluble in water.
- (i) Name a common laboratory reagent that you would expect to have similar chemical properties to hydrogen iodide solution. [1]
 - (ii) Write a chemical equation, with state symbols, for the reaction between hydrogen iodide solution and lithium. [2]
- (b)** Use the Periodic Table to help you answer these questions.
- (i) Both hydrogen and helium have been used to fill balloons. Hydrogen is more reactive and less safe to use. Use the electronic structure of the atoms of these two elements to explain why hydrogen is more reactive than helium. [3]
 - (ii) The Periodic Table is an arrangement of the elements in order of increasing atomic number. The elements, lithium, sodium and potassium have atomic numbers 3, 11 and 19 respectively.

Describe, in terms of the electronic configurations of these three elements, how the number and arrangement of electrons in these elements are related to their relative positions and the reactivity in the Periodic Table. [4]

End of Paper

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ANSWER:

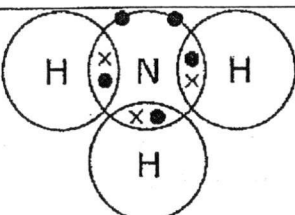
CHEMISTRY

1	2	3	4	5	6	7	8	9	10
B	D	A	A	B	D	D	D	B	A
11	12	13	14	15	16	17	18	19	20
B	C	B	A	B	C	C	D	B	C

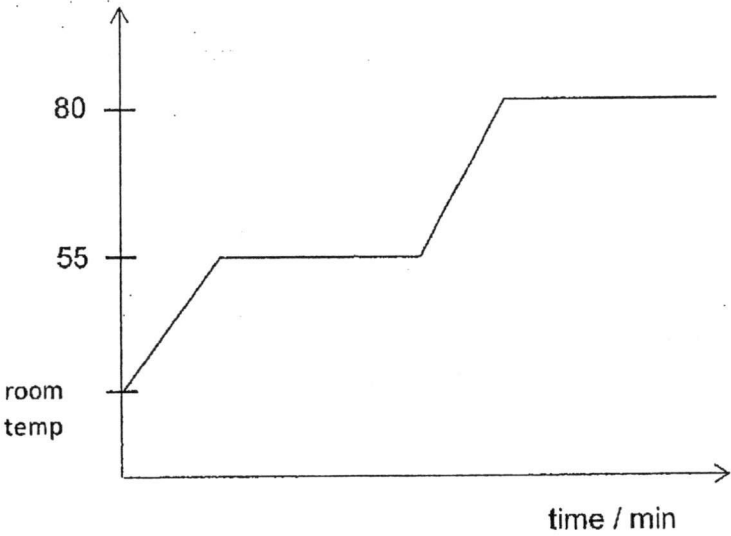
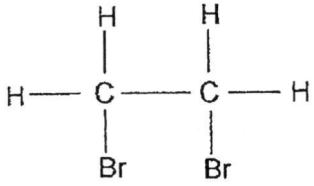
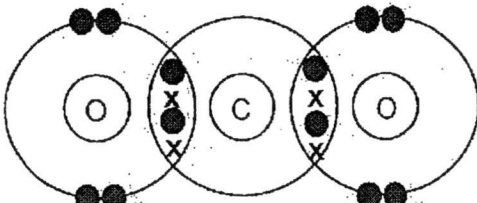
Section A

Answer all questions in the spaces provided.

A1	solution	test	observation and result		
	aqueous sodium chloride	Add aqueous sodium hydroxide separately to each solution / Add sulfuric acid separately to each solution [1]	No visible change when sodium hydroxide / sulfuric acid is added. [1]	[2]	
	aqueous ammonium carbonate	Add aqueous sodium hydroxide and warm [1] Or Add dilute hydrochloric acid [1]	Damp red litmus turns blue [1/2]. Ammonia gas is produced [1/2] Or Bubbles are seen. [1/2] Carbon dioxide gas is produced [1/2]	[2]	
A2	(a)	State the oxidation state of the named substance in the table below.			
		substance	oxidation state		
		potassium in KCl	+1	[1]	
		chlorine in Cl ₂	0	[1]	
	(b)	Potassium bromide is oxidised.			[1]
		The oxidation state of bromine increases from -1 in KBr to 0 in Br ₂ .			[1]
A3	(a)	Isotopes are atoms of the same element with the same number of protons but different number of neutrons.			[1]
	(b)	particle X	neutrons [1]	[3]	
		particle Y	electrons [1]		
		particle Z	protons [1]		
	(c)	⁷⁹ Br and ⁸¹ Br have the same number of valence electrons . (do not accept: same number of protons / same number of electrons)			[1]
A4	(a)	<u>Oxygen and nitrogen from the air reacts under high temperature in the car combustion engines.</u>			[1]
	(b)	<u>Between 6 am to 10 am, there is a lot of people commute to work using vehicles</u> therefore high level of unburnt hydrocarbons are produced from these vehicles.			[1]
	(c)	<u>Nitrogen dioxide in the air reacts with oxygen and water to form nitric acid. The nitric acid dissolves in rainwater forming acid rain which harms aquatic animals / destroy plant growth / corrodes buildings and objects made of limestone / steel. (anyone)</u>			[1/2] [1/2] [1]
A5	(a)	Ca(OH) ₂ (aq) +(NH ₄) ₂ SO ₄ (aq) → 2NH ₃ (g) +CaSO ₄ (s) + 2H ₂ O(l) 1m - state symbols; 1m - balancing			[2]
	(b)	A pungent gas will be observed. A white precipitate will form.		2m - Any two observations [2]	

		Effervescence will be observed. Damp red litmus turns blue.		
	(c)	Chemical name: <u>Calcium nitrate</u> Chemical formulae: <u>Ca(NO₃)₂</u>	[1] [1]	
	(d)	Covalent	[1]	
	(e)		[1] - correct number of electrons [1] - correct number electrons shared	
A6	(a)	Hydrocarbons that contain carbon-carbon double bonds (-C=C-).	[1]	
	(b)	(i) <pre> H H H H H H ...-C-C-C-C-C-C-... H H H H H H </pre>	[1]	
		(ii) Addition polymerisation	[1]	
		(iii) Polyethene is waterproof, hence it will prevent the beverage from seeping through the box.	[1]	
		(iv) The layer of aluminum can react with oxygen in the air to prevent oxygen from entering the beverage box and thus prevents the spoilage of beverage.	[1] [1]	
A7	(a)	Nitric acid and sodium hydroxide	[1], [1]	
	(b)	During neutralisation, heat is given out from the reaction mixture to the surrounding. Hence, there is an increase in temperature of the solution.	[1]	
A8	(a)	Beta, gamma, alpha		
	(b)	Hydrogen		
	(c)	Magnesium		
	(d)	$\text{Ca (s)} + 2\text{H}_2\text{O (l)} \longrightarrow \text{Ca(OH)}_2\text{(aq)} + \text{H}_2\text{(g)}$	Correct formulae [1] Correct balancing [1]	
	(e)	Calcium reacts quickly with water producing a lot of bubbles of gas.	[1]	

		Or Calcium reacts quickly with water and becomes smaller in size .	
A9	(a)	No of moles of chlorine = $\text{Vol}/24\text{dm}^3$ $= 0.15\text{mol}$ No of moles of NaOH = Concentration X Volume $= 1\text{mol/dm}^3 \times 0.25\text{dm}^3$ $= 0.25\text{mol}$ [1]	[1]
	(b)	(i) in excess <u>Chlorine</u> (ii) limiting <u>Sodium Hydroxide</u>	Both must be correct to be awarded [1]. No ½ m
	(c)	No of moles of sodium hypochlorite : 0.125mol Mass of sodium hypochlorite = Mole X Mr $= 0.125 \times [23 + 16 + 35.5]$ $= 9.31\text{g}$	
Section B			
B10	(a)	(i) solvent front carotene xanthophyll chlorophyll sample start line carotene xanthophyll chlorophyll sample 1m for correct labeling of pigments 1m for start line/sample (solvent front not necessary)	[2]
		(ii) To prevent the start line from separating out with the sample, hence interfering with the results.	[1]

	(b)	(i)	temperature / °C  80 55 room temp time / min 1m for labelled axes and temperature 1m for shape	[2]
		(ii)	The sample is pure as it melts and boils at fixed temperature.	[1]
	(c)	(i)	carbon dioxide	[1]
		(ii)	Liquid X in experiment 3 is an acid while that in experiment 1 is water. Acid reacts faster with the sodium hydrogencarbonate to form carbon dioxide.	[1] [1]
		(iii)	The rate of reaction would be faster than expt 3 and the volume of gas collected after 5 min would be more.	[1] [1]
B11	(a)			[1]
	(b)		Gas B is ethane Conditions: 200 °C and nickel catalyst	[1] [1]
	(c)			Correct atoms [1] Correct bonding [1]

	(d)	Liquid C is ethanoic acid <i>vinegar is not accepted (vinegar is a common name)</i>	[1]
		$ \begin{array}{c} \text{H} \quad \quad \text{O} \\ \quad \quad \\ \text{H}-\text{C}-\text{C}-\text{O}-\text{H} \\ \quad \quad \\ \text{H} \quad \quad \text{H} \end{array} $	[1]
	(e)	(i) Oxidising agent: acidified potassium manganate (VII) <i>Or mixture of sulfuric acid and potassium manganate (VII) or potassium dichromate (VI)</i> Not acceptable: Oxygen and bacteria in the air (as the question says oxidation by oxidising agent in a laboratory)	[1]
		(ii) $\text{C}_2\text{H}_5\text{OH (aq)} + 2[\text{O}] \longrightarrow \text{CH}_3\text{COOH (aq)} + \text{H}_2\text{O (l)}$	[1] If any state symbol is wrong = [0]
	(f)	$\text{C}_{22}\text{H}_{46} \longrightarrow \text{C}_2\text{H}_4 + \text{C}_{20}\text{H}_{42}$	[1]
B12	(a)	(i) Hydrochloric acid	[1]
		(ii) $2\text{HI (aq)} + 2\text{Li (s)} \longrightarrow 2\text{LiI (aq)} + \text{H}_2 \text{ (g)}$	Equation [1] State symbols [1]
	(b)	(i) Electronic structure of Hydrogen : 1 Helium : 2 Helium has a completely filled outer-most electronic structure (or full valence electrons) so Helium has no tendency to lose or gain any electrons. Hydrogen will share / gain electron to achieve stable noble gas electronic configuration and thus, hydrogen is more reactive than helium.	[1] [1] [1]
		(ii) Electronic structure of Lithium : 2.1 Sodium : 2.8.1 Potassium : 2.8.8.1	Must show electronic structure of all 3 elements to be awarded [1]

			They are placed in the same group as they have one valence electron	[1]
			They are placed in period 2, 3 and 4 as they have 2, 3 and 4 shells respectively.	[1]
			They are highly reactive metals as they have the greater tendency to lose 1 electron to achieve the stable noble gas electronic configuration.	[1]
			End of Paper	