Name:	Register Number:	Class:

4E 5N

BEDOK GREEN SECONDARY SCHOOL

4E 5N

Preliminary Examination 2018

SCIENCE (CHEMISTRY/BIOLOGY) 5078/01

Paper 1 Multiple Choice 21 August 2018

1 hour

Additional Material: Multiple Choice Answer Sheet

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Do not use staples, paper clips, glue or correction fluid.
Write your name, register number and class on the 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 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 Question Booklet.
A copy of the Data Sheet is printed on page 16.
A copy of the Periodic Table is given on page 17.
The use of an approved scientific calculator is expected, where appropriate.

1 Which apparatus is most suitable to measure 21.20 cm^3 of hydrochloric acid?

A pipette

B burette

C measuring cylinder

D electronic top pan balance

2 Which method is suitable for obtaining pure ethanol from wine?

A filtration

B distillation

C crystallisation

D fractional distillation

3 An unknown white substance was found on a murdered victim's body. A crime scene investigator conducted a series of tests on the substance.

First, he dissolved the substance in water to form a colourless solution. Next, to a portion of the solution, he added aqueous sodium hydroxide dropwise. A white precipitate was formed. The precipitate did not dissolve when excess sodium hydroxide was added.

What is the white substance likely to be?

A zinc nitrate

B zinc sulfate

C calcium nitrate

D calcium sulfate

4 Which group of particles has eight electrons in their valence shells?

A Li^+, Na^+, Cl^-, S

B Li^+, Na^+, Cl^-, Ne

C H^+, Mg^{2+}, F^-, He

D S^{2-}, Na^+, O^{2-}, Ar

5 An element has the electronic configuration, 2.8.4. What is the identity of the element?

A sulfur

B silicon

C carbon

D nitrogen

6 Two elements react to form a compound with the chemical formula $\mathbf{X}_2\mathbf{Y}$.

This compound is able to conduct electricity when dissolved in water.

Which of the following pairs is most likely to be elements **X** and **Y**?

	X	**Y**
A	sodium	sulfur
B	magnesium	chlorine
C	oxygen	carbon
D	nitrogen	oxygen

7 Using the equation shown below, find the volume of oxygen needed to completely react with 36 dm^3 of CH_4 at room temperature and pressure.

$$CH_4\ (g) + 2O_2\ (g) \longrightarrow CO_2\ (g) + 2H_2O\ (g)$$

A 24 dm^3

B 36 dm^3

C 48 dm^3

D 72 dm^3

8 In a village, before using a cast iron wok, lemon juice is used to clean the surface of the wok. This is because

A the lemon juice is acidic and will react with iron surface to produce iron(II) salt.

B the lemon juice is acidic and will react with iron surface to produce iron(III) salt.

C the lemon juice is acidic and will remove the iron(III) oxide that is found on the surface.

D the lemon juice is acidic and will add on to the iron(III) oxide that is found on the surface.

9 Aluminium oxide can react with both acid and alkali to form a salt. What type of oxide is it?

A basic

B acidic

C neutral

D amphoteric

10 What result is obtained when liquid bromine is added to aqueous potassium chloride?

A A brown vapour forms.

B A silvery solid is formed.

C A green gas is produced.

D There is no visible reaction.

11 Element **Z** has the electronic configuration of 2.8.8.1. A scientist dropped a piece of element **Z** in cold water. What would his observation be?

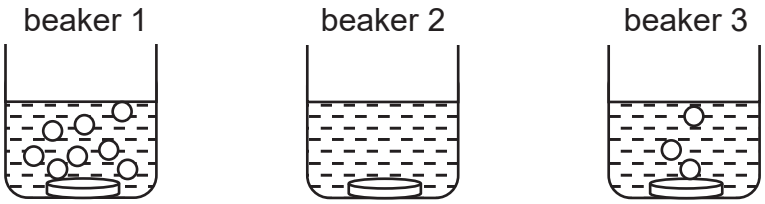
A Element **Z** sinks to the bottom of the container and no bubbles was seen.

B Element **Z** floats on the surface of the water and some bubbles were seen.

C Element **Z** sinks to the bottom of the container and effervescence was seen.

D Element **Z** darts around the surface of the water, effervescence and sparks were seen.

12



The diagrams above show the results obtained when three different metallic discs of the same shape and size were dropped into dilute hydrochloric acid separately.

Which metal is likely to have been placed in each beaker?

	beaker 1	**beaker 2**	**beaker 3**
A	magnesium	copper	calcium
B	calcium	copper	magnesium
C	copper	magnesium	calcium
D	calcium	magnesium	copper

13 Nickel is between iron and lead in the reactivity series.

Which statement(s) can be deduced from its position in the reactivity series?

I Nickel forms effervescence with cold water.
II Nickel is obtained by heating nickel ore with carbon monoxide.
III Nickel reacts with dilute hydrochloric acid to produce hydrogen gas.

A **I** only

B **I** and **III**

C **II** and **III**

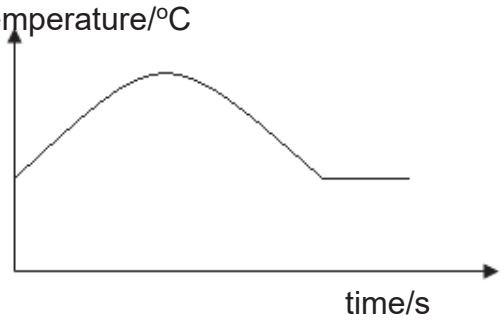
D **I**, **II** and **III**

14 Carbon monoxide, sulfur dioxide and oxides of nitrogen are all common pollutants of air. Which pollutant is shown with its correct source and its adverse effect on the environment?

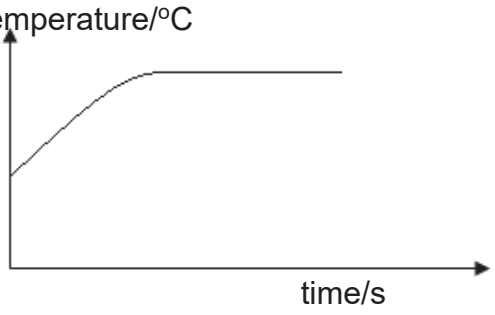
	pollutant	**source**	**effect on the environment**
A	carbon monoxide	combustion of fossil fuels	acid rain
B	carbon monoxide	lightning	global warming
C	oxides of nitrogen	lightning	acid rain
D	sulfur dioxide	volcanoes	global warming

15 Ammonium chloride was added to distilled water. Which graph correctly shows the change in temperature?

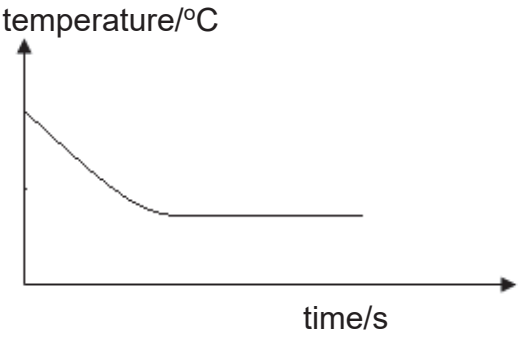
A



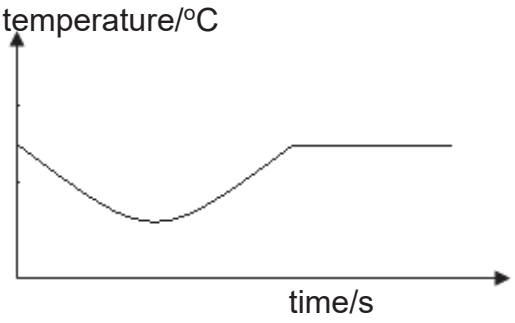
B



C



D



16 Acidified potassium manganate(VII) can be used to detect the presence of ethanol vapour in the breath of a person who has consumed alcohol.

If ethanol is present, a colour change is observed. What is the colour change observed?

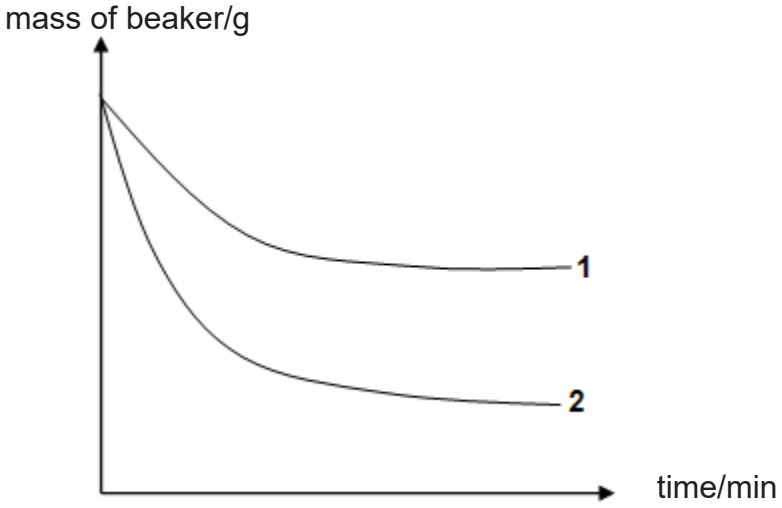
A colourless to brown

B purple to colourless

C colourless to purple

D brown to colourless

17 Excess magnesium was added to a beaker of dilute hydrochloric acid on an electronic mass balance. A graph of the mass of the beaker and contents was plotted against time (curve **1**).



What change in the experiment could give curve **2**?

I The same volume of a more concentrated solution of hydrochloric acid.
II The same mass of magnesium but in smaller pieces.
III A lower temperature.

A **I** only

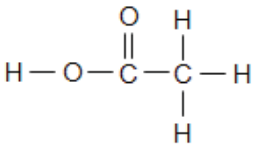
B **II** only

C **I** and **II** only

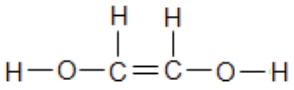
D **II** and **III** only

18 A compound with molecular formula $C_2H_4O_2$ dissolves readily in water to form an aqueous solution. When this aqueous solution reacts with magnesium and limestone respectively, bubbles of colourless gas are observed. What is the structural formula of this compound?

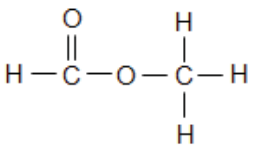
A



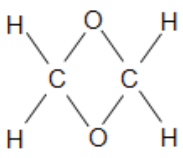
B



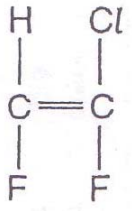
C



D

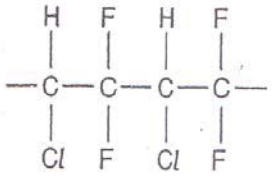


19 The diagram shows the structure of a monomer.



Which polymer can be made from this monomer?

A



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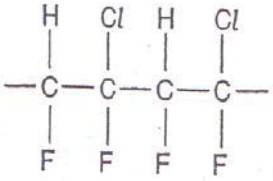
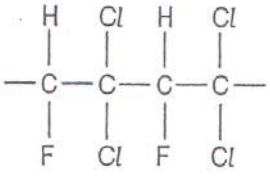
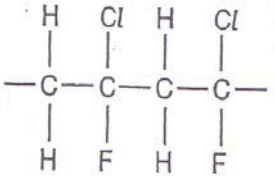


C

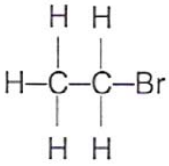


D

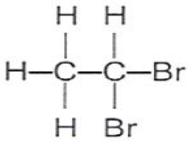


20 What is the structure of the product formed when ethene gas is passed through aqueous bromine?

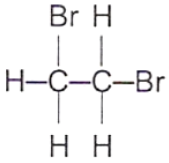
A



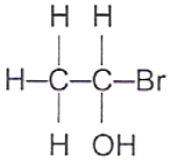
B



C



D



Name:	Register Number:	Class:

4E 5N

BEDOK GREEN SECONDARY SCHOOL

Preliminary Examination 2018

4E 5N

5076/03

5078/03

SCIENCE (CHEMISTRY)

Paper 3 Theory

15 August 2018

1 hour 15 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

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

The use of an approved scientific calculator is expected, where appropriate.
You may lose marks if you do not show your working or if you do not use appropriate units.

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 in the spaces provided on the question paper.

A copy of the Data Sheet is printed on page 12.
A copy of the Periodic Table is printed on page 13.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

For Examiner's Use	
Section A [45 marks]	
Section B [20 marks]	
Total [65 marks]	

This document consists of **13** printed pages.

[Turn Over

Section A

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

1 Fig. 1.1 shows the particles in six substances.

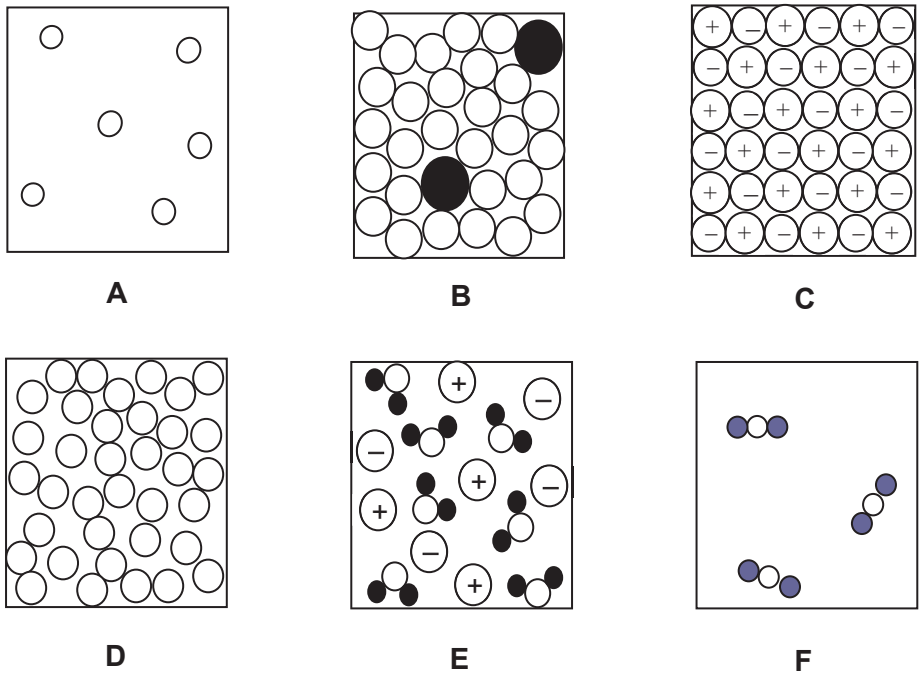


Fig 1.1

(a) Which diagram best represents

(i) carbon dioxide, ……..

(ii) molten copper, ……..

(iii) solid sodium chloride, ……..

(iv) helium, ……..

(v) brass. ……..

[5]

(b) Which of the above substances, **A** – **F**, represents an element?

……..[1]

2 Table 2.1 gives some information on the component gases of clean air in the atmosphere.

Table 2.1

gas	melting point / °C	boiling point / °C
nitrogen	−210	−196
oxygen	−218	−183
argon	−189	−186
other noble gases		
carbon dioxide	sublimes at −78 °C	
water vapour	0	100

Separating air into its component gases is an important process in the industries. Air is first cooled to liquid at −200 °C before it is gradually warmed up and separated into its component gases, as illustrated in Fig. 2.1.

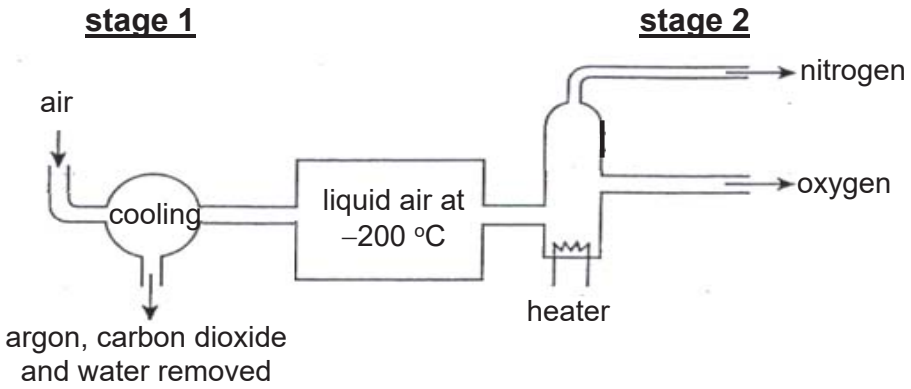


Fig. 2.1

(a) Describe the arrangement and movement of the particles in the liquid air.

……

……..…..[2]

(b) Explain why argon, carbon dioxide and water can be removed when air is compressed and cooled to −200 °C in **stage 1**.

……....[1]

(c) Name the method used to separate the components of liquid air in **stage 2**.

……....[1]

(d) Which component will be collected last in **stage 2**? Explain your answer.

……...[2]

(e) Which component will have the largest volume collected in **stage 2**?

……[1]

3 (a) Sir James Jeans, who was a great populariser of science, once described an atom of carbon as being like six bees buzzing around a space the size of a football stadium.

(i) Suggest what were represented by the six bees in this description.

……[1]

(ii) What is missing from Jeans' description when applied to an atom of carbon?

……[1]

(b) Carbon has two isotopes which have the symbols $^{12}_{6}C$ and $^{13}_{6}C$.

(i) State, in terms of atomic structure, the difference between the two isotopes of carbon.

……

……[1]

(ii) Draw a diagram to show the arrangement of electrons in an atom of the $^{12}_{6}C$ isotope.

[1]

4 Chromatography is often used to solve crimes involving forgery.

In an investigation of a case which involves a bank cheque issued with a forged signature, the sample of ink from the forged signature was tested together with inks from the pens of five suspects **V**, **W**, **X**, **Y** and **Z**. Fig. 4.1 shows the chromatogram that was obtained with the use of an organic solvent.

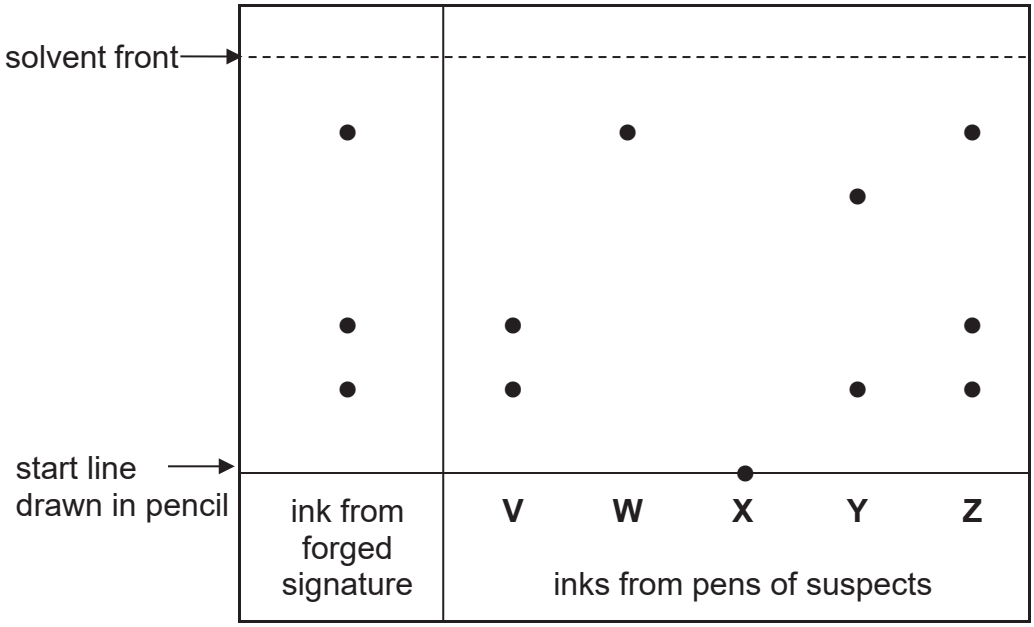


Fig. 4.1

(a) Which suspect is most likely to have forged the signature in the bank cheque?

……[1]

(b) Suggest why the ink from the pen of suspect **W** gives only one spot on the chromatogram.

……[1]

(c) Explain why the start line is drawn in pencil but not in pen.

……

……[2]

(d) Suggest a reason why water would probably **not** be a suitable solvent to use for this chromatography.

……[1]

5 Haematite, a common ore used for the extraction of iron, contains the compound, iron(III) oxide. Iron is produced in the blast furnace by heating a mixture of iron(III) oxide, coke and limestone with air. Fig. 5.1 gives the outline of a blast furnace in which iron is extracted from its ore.

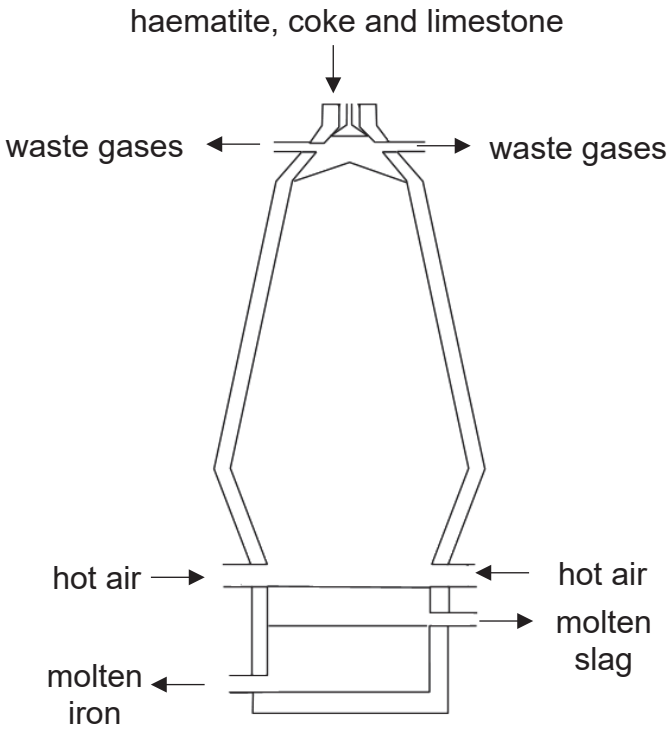


Fig. 5.1

(a) Describe how carbon dioxide is produced under high heat in the blast furnace.

……..…….....

……..….....[2]

(b) The chemical equation for the production of iron in the blast furnace is shown.

$$Fe_2O_3\ (s)\ +\ 3CO\ (g)\ \rightarrow\ 2Fe\ (l)\ +\ 3CO_2\ (g)$$

(i) State the oxidation state of iron in iron(III) oxide.

…….....[1]

(ii) Explain, in terms of oxidation states, whether iron(III) oxide is oxidised or reduced.

……..…….....

……..….....[2]

6 **(a)** A 500 cm^3 aqueous sample contains 37.6 g of copper(II) nitrate. Calculate the concentration of the copper(II) nitrate solution in mol/dm^3.

[Relative atomic masses: A_r, Cu, 64; N, 14; O, 16]

concentration = ……mol/dm^3 [2]

(b) When a piece of zinc is added to the copper(II) nitrate solution, a reddish brown solid is formed. Explain the observation.

……

……

……[2]

7 Fig. 7.1 describes some of the properties and reactions of solution **Z**.

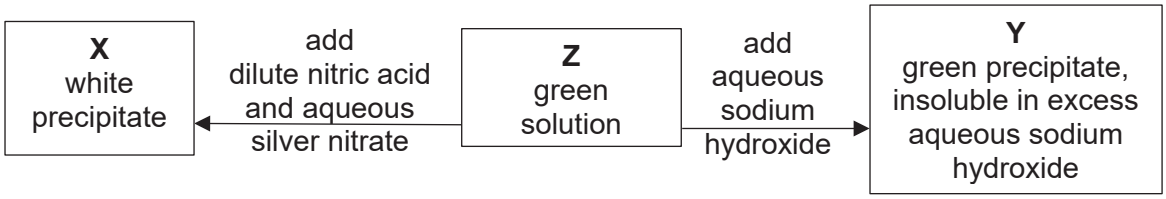


Fig. 7.1

(a) Give the identities of **X, Y** and **Z**.

X ……..

Y ……..

Z ……..

[3]

(b) Write a balanced chemical equation for any **one** of the reactions in Fig. 7.1.

……..…..[2]

8 (a) Complete Table 8.1 by filling in the **five** blanks.

Table 8.1

name of substance	chemical formula	solubility in water
sodium carbonate		soluble
calcium nitrate	$Ca(NO_3)_2$	soluble
	K_2SO_4	soluble
barium chloride		soluble
lead(II) chloride	$PbCl_2$	
iron(III) carbonate		insoluble

[5]

(b) (i) Give the names of the two reagents in Table 8.1 that can be used to prepare a white precipitate of calcium carbonate.

1…….

2…….

[1]

(ii) Describe the process of how you could prepare a pure dry sample of calcium carbonate from the two reagents you have given in **(b)(i)**.

…….

…….

…….

…….[3]

Section B

Answer any **two** questions in this section.

Write your answers in the spaces provided.

9 Fluorine is an element found in Group VII. It would react vigorously with potassium, from Group I, to form potassium fluoride. It would also react with hydrogen gas to form hydrogen fluoride.

(a) Write a balanced chemical equation for the reaction of fluorine and potassium.

……..……...[2]

(b) Draw and label the electronic structures of potassium fluoride and hydrogen fluoride.

[Proton (atomic) numbers: H, 1 ;F, 9; K, 19]

potassium fluoride

hydrogen fluoride

[4]

(c) Use these structures to explain why, at room temperature and pressure, potassium fluoride is a solid and hydrogen fluoride is a gas.

……

……..……..…

……

……

……..……...…[4]

10 Alcohols form a homologous series.

(a) **(i)** Give **two** general properties of a homologous series.

……

……

……[2]

(ii) Write the general formula of the homologous series of alcohols.

……[1]

(b) **X** is an alcohol with two carbon atoms in its molecule.

(i) Complete Table 10.1 by naming and drawing the full structural formula of **X**.

Table 10.1

name of X	structural formula of X

[2]

(ii) Give the chemical formula of the organic substance that is formed when **X** reacts with atmospheric oxygen.

……[1]

(iii) A solution of **X** can be made by fermentation of glucose. Describe how this process is completed in the laboratory.

……

……

……

……[3]

(iv) **X** is commonly used in Brazil as a fuel for vehicles. Suggest a reason why **X** can be used for this purpose.

……[1]

11 When hydrochloric acid reacts with strips of magnesium, a gas is given off.

(a) Draw a diagram to show how you would investigate the speed of the reaction between hydrochloric acid and magnesium in an experiment. Describe how you would find the speed of the reaction based on the data collected in this experiment.

……..

……..

……..

……..

……..[4]

(b) State and explain **one** way of increasing the speed of this reaction. Use your knowledge of reacting particles in your explanations.

……

……..……

……..

……..[3]

(c) Give the name of the gas given off in this reaction.

……..…….[1]

(d) **G** is the next member in the same group that magnesium belongs to.

(i) State the chemical symbol of **G**.

……..……..…….[1]

(ii) Explain why **G** is placed in the same group as magnesium.

……..……....…….[1]

Data Sheet

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

BEDOK GREEN SECONDARY SCHOOL
SCIENCE DEPARTMENT
MARKING SCHEME
YEAR (2018)

SUBJECT: **Science Chemistry 5076/5078 Paper 1**
SETTER: **Ms Nadiah** **EXAM: Prelim**
LEVEL: **4E5N**

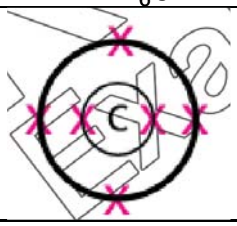
PAPER 1 (20 marks)

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

BEDOK GREEN SECONDARY SCHOOL
SCIENCE DEPARTMENT
MARKING SCHEME
YEAR (2018)

SUBJECT: Science Chemistry 5076/5078 Paper 3
SETTER: Tang Hui Boon **EXAM: Prelim**
LEVEL: 4E5N

PAPER 3
Section A: 45 marks

Qn. No.	*Scoring Points*			*Marks*	*Max. Marks*
1	(a)	(i)	F	[1]	[5]
		(ii)	D	[1]	
		(iii)	C	[1]	
		(iv)	A	[1]	
		(v)	B	[1]	
	(b)	A and/or D		[1]	[1]
2	(a)	Particles are **closely packed but not orderly arranged**. Particles **move freely and slide past each other** throughout the liquid.		[1] [1]	[2]
	(b)	At –200°C, argon, carbon dioxide and water will be **removed as solids.**		[1]	[1]
	(c)	Fractional distillation		[1]	[1]
	(d)	Oxygen gas It has the **highest boiling point**.		[1] [1]	[2]
	(e)	Nitrogen gas		[1]	[1]
3	(a)	(i)	electrons	[1]	[1]
		(ii)	protons or neutrons or nucleus	[1]	[1]
	(b)	(i)	They have **different number of neutrons**. $^{12}_{6}C$ has **6 neutrons** whereas $^{13}_{6}C$ has **7 neutrons.**	[1]	[1]
		(ii)		[1]	[1]
4	(a)	Suspect **Z**		[1]	[1]
	(b)	The ink from the pen of **W** is probably made from **a pure substance.**		[1]	[1]
	(c)	Unlike ink from a pen, **pencil line will not dissolve in the solvent and will not interfere with the separation of the ink**. OR **Ink** from a pen is a mixture and it will **dissolve in the solvent** and will **get separated in the solvent** which will **interfere with the separation of the ink.**		[1] [1]	[2]
	(d)	The **ink** used for signing bank cheque would probably be **insoluble in water**.		[1]	[1]

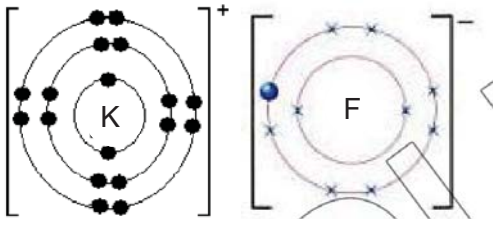
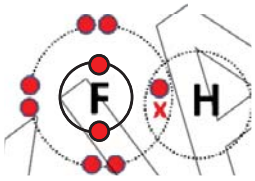
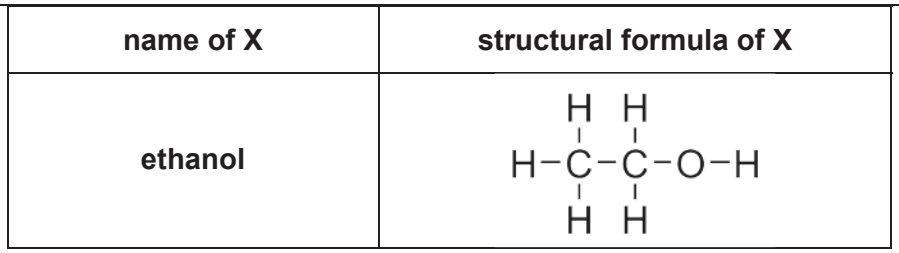
5	(a)		Carbon dioxide is formed when **coke is burnt in hot air** and when **limestone is decomposed at high temperature**. *(will not accept CO reducing Fe_2O_3 equation given in part (b). CO_2 is produced mainly by oxidation under this reaction.)*	[1] [1]	[2]
	(b)	(i)	+3	[1]	[1]
	(c)	(ii)	The **oxidation state** of iron has **decreased** and thus, it is **reduced.** Iron's oxidation state has decreased **from +3 in iron(III) oxide to 0 in iron**.	[1] [1]	[2]
6	(a)		Number of moles of $Cu(NO_3)_2 = \frac{37.6}{188} =$ **0.2** Concentration in mol / $dm^3 = \frac{0.2}{0.5} =$ **0.4 mol / dm^3**	[1] [1]	[2]
	(b)		**Zinc is more reactive than copper**. Zinc **displaces copper in copper(II) nitrate** to form **copper metal** which is the reddish brown solid.	[1] [1]	[2]
7	(a)		**X**: silver chloride / AgC*l* **Y**: iron(II) hydroxide / $Fe(OH)_2$ **Z**: iron(II) chloride / $FeCl_3$	[1] [1] [1]	[3]
	(b)		$FeCl_2 + 2AgNO_3 \rightarrow Fe(NO_3)_2 + 2AgCl$ OR $FeCl_2 + 2NaOH \rightarrow Fe(OH)_2 + 2NaCl$ correct formulae of reagents and products balanced equation	 [1] [1]	[2]
8	(a)				[5]

name of substance	**chemical formula**	**solubility in water**
sodium carbonate	**Na_2CO_3**	soluble
calcium nitrate	$Ca(NO_3)_2$	soluble
potassium sulfate	K_2SO_4	soluble
barium chloride	**$BaCl_2$**	soluble
lead(II) chloride	$PbCl_2$	**insoluble**
iron(III) carbonate	**$Fe_2(CO_3)_3$**	insoluble

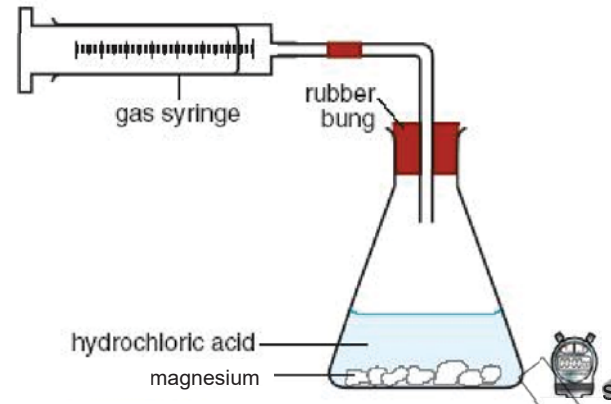
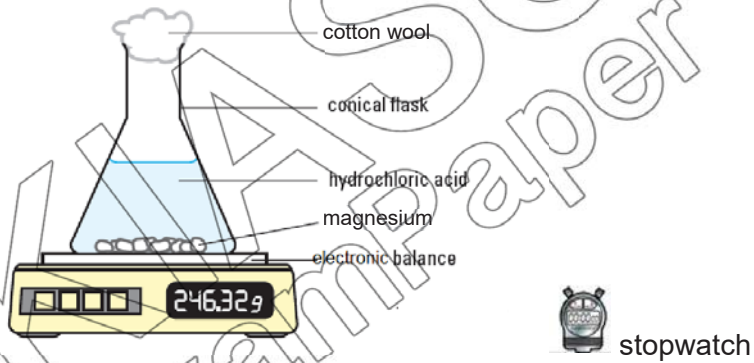
[1] [1] [1] [1] [1]

	(b)	1. sodium carbonate 2. calcium nitrate	both [1]	[1]
	(c)	**Mix sodium carbonate and calcium nitrate solution** (or reagents stated in 8(b)(i) together. **Filter** the mixture and **collect the residue**. **Wash** the residue with **distilled water** and **dry between pieces of filter paper**.	[1] [1] [1]	[3]

Section B: 30 marks

Qn. No.			Scoring Points	Marks	Max. Marks
9	(a)		$2K + F_2 \rightarrow 2KF$ correct formulae of reagents and product balanced equation	 [1] [1]	[2]
	(b)		 correct transfer of electron and charge correct number of electrons	 [1] [1]	[4]
			 correct number of shared electrons correct number of electrons in the molecule	 [1] [1]	
	(c)		Potassium fluoride is an **ionic** compound with **strong electrostatic forces of attraction** between its oppositely charged **ions**, thus it **requires a large amount of energy to overcome** the attraction and has a **high melting and boiling point**. Hydrogen fluoride is a **covalent** compound with **weak intermolecular forces**. It **requires only a little amount of energy** to **overcome** the attraction, thus it has a **low melting and boiling point**.	[1] [1] [1] [1]	[4]
10	(a)	(i)	Member of the same homologous series have **similar chemical properties** and they display a **gradual change in their physical properties** as the number of carbon atoms increases in their molecules. *(will not accept same functional groups or general formula because question ask for properties and not structure.)*	[1] [1]	[2]
		(ii)	$C_nH_{2n+1}OH$	[1]	[1]
	(b)	(i)	 correct name correct structural formula	 [1] [1]	[2]
		(ii)	CH_3COOH	[1]	[1]
		(iii)	**Yeast** is added to a solution of glucose in a conical flask and placed in a water bath. **Temperature** of the mixture in the water bath needs to be kept at **37°C**.	[1] [1]	[3]

			The conical flask is connected through a delivery tube to a test tube with limewater **to prevent oxygen** in air from entering the conical flask. **please emphasize to students that a brief mention of the 3 conditions with no proper description of experiment will be penalised one mark in the exams because the question asked for description of process.*	[1]	
		(iv)	X can be **burnt** exothermically to **produce heat** to power the vehicles.	[1]	[1]

11	(a)	 OR  diagram label **Plot a graph of volume of gas** produced **against time**. OR **Plot a graph of mass of contents in flask against time**. relevant graph to the diagram drawn. (Students are not required to plot/sketch the graph) The speed of reaction can be determined by the **gradient of graph.** *(Stopwatch needs to be mentioned "once" either in diagram or description to be awarded mark either in diagram or description.*	[1] [1] [1] [1]	[4]
	(b)	**Increasing the temperature** of reaction mixture will **increase the kinetic energy / speed** of reacting **particles**. OR Use **powdered magnesium** instead of strips of magnesium **provides smaller particle size of magnesium** which **provide a larger surface area for collision**. OR	[1] [1] OR [1] [1] OR [1]	[3]

		Use a **higher concentration** of hydrochloric **acid provides more H^+ ions per unit volume for collision** with magnesium particles. either of the above answers **Higher frequency of effective collision between H^+ ions and magnesium particles increases the speed of reaction**. *Note: Students need to mention the reacting particles, magnesium and acid particles (H^+ ions) at least once in the answers.*	[1] [1]	
	(c)	hydrogen	[1]	[1]
	(d)	(i) Ca	[1]	[1]
		(ii) They have the **same number of valence electrons**. OR They both have **two valence electrons**.	[1]	[1]