

NAME:	NO:	CLASS:
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ADMIRALTY SECONDARY SCHOOL



PRELIMINARY EXAMINATION 2017

SUBJECT : Science (Chemistry)

CODE/PAPER : 5078/1

LEVEL/STREAM : Secondary Four Express
Secondary Five Normal (Academic)

DATE : 18 August 2017

TIME : 0800h – 0900h

DURATION : 1 hour

Instructions to candidates:

Write your name, index number and class on the cover page.

Write in dark blue or black pen.

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

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 OTAS Sheet.

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.

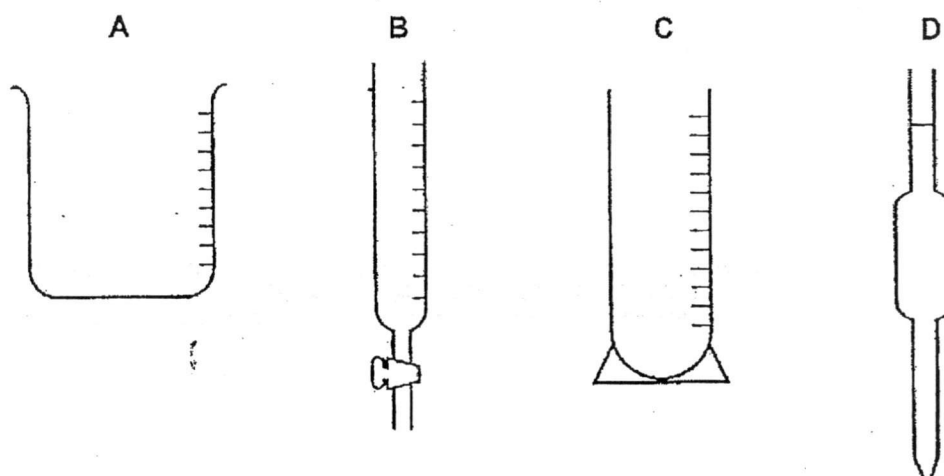
A copy of the Periodic Table is printed on the last page.

For Examiner's Use	
Total	/ 40

DO NOT TURN OVER THIS PAPER UNTIL YOU ARE TOLD TO DO SO.

This question paper consists of 19 printed pages including this cover page.

- 1 Which piece of apparatus is used to measure exactly 25.0 ml of acid?



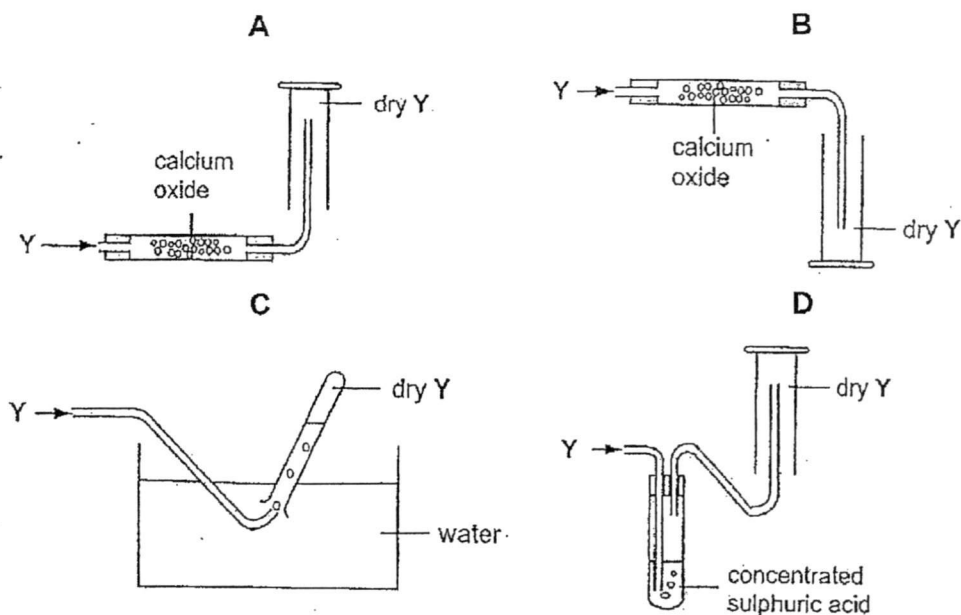
- 2 Which changes occur when a liquid at 50 °C becomes a gas at 120 °C?

	Separation of particles	Energy of particles	Attractive force between particles
A	decreases	increases	decreases
B	decreases	decreases	increases
C	increases	increases	decreases
D	increases	decreases	increases

- 3 Which statement about the molecules in the gas carbon dioxide is correct?

- A The molecules are close together.
- B The molecules are diatomic.
- C The molecules move randomly.
- D The molecules all move with the same speed.

- 4 A gas Y, is less dense than air, very soluble in water and is an alkali. Calcium oxide and sulfuric acid are drying agents. Which method is used to collect a dry sample of the gas?



- 5 What is the formula of nickel (II) hydroxide?

- A NiOH
- B NiOH₂
- C Ni(OH)₂
- D Ni₂OH

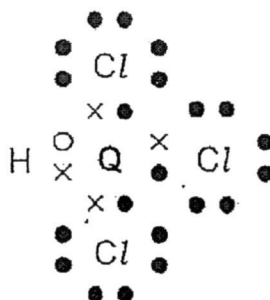
- 6 A nucleus is represented by the symbol ${}_{37}^{81}\text{X}$.
What does this nucleus contain?

- A 37 electrons and 44 neutrons
- B 37 neutrons and 81 protons
- C 37 protons and 44 neutrons
- D 37 protons and 81 neutrons

- 7 The atoms of element X have the electronic configuration 2,8,6. Which statement about element X is correct?

- A It forms an ionic compound with sodium.
- B It has 6 protons in the outer shell of an atom.
- C It forms an ion of charge 2+.
- D It only reacts with non-metals.

- 8 Element Q has four electrons in its outermost shell.
Element Q can combine with hydrogen and chlorine to form a compound QHCl_3 .
The diagram shows the outer electronic configuration structure of QHCl_3 .



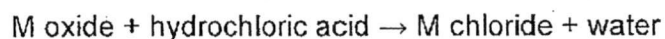
Which of these properties will this compound have?

- A It will be a solid at room temperature.
B It will be readily soluble in water.
C It will be a good conductor of electricity.
D It will have a low boiling point.
- 9 Four aqueous solution have the pH shown in the table.

solution	P	Q	R	S
pH	2	6	8	10

If pairs of solution are mixed, which pair must produce an acidic mixture?

- A P and Q
B P and R
C P and S
D Q and R
- 10 The oxide of an element M was added separately to hydrochloric acid and aqueous sodium hydroxide.
The word equations for the reactions are shown.



Which row describes M and its oxides?

	M	M oxide
A	metal	acidic
B	metal	basic
C	non-metal	amphoteric
D	non-metal	acidic

11 Which of the listed reactions produce hydrogen?

reaction 1 : potassium with water

reaction 2 : sodium carbonate with hydrochloric acid

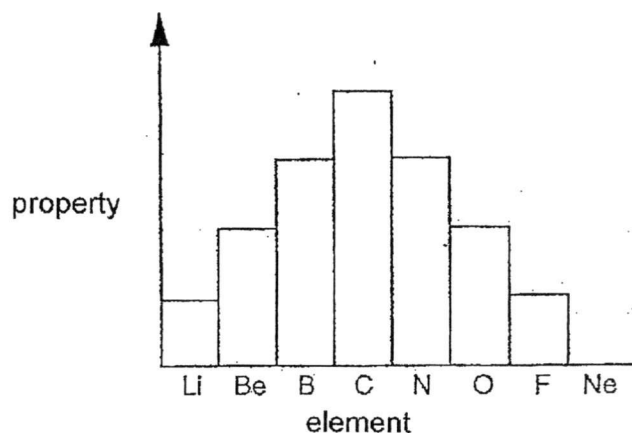
reaction 3 : zinc with hydrochloric acid

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

12 Which statement about the production of iron from haematite is correct?

- A Coke is used to oxidise the slag.
- B Limestone is used to produce oxygen for the coke to burn.
- C Molten iron floats on slag at the furnace base.
- D The haematite is reduced by carbon monoxide.

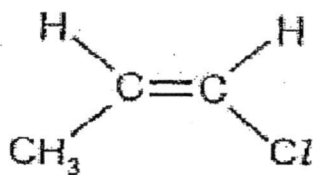
13 The bar chart shows the period of elements from lithium to neon.



Which property of these elements is shown on the chart?

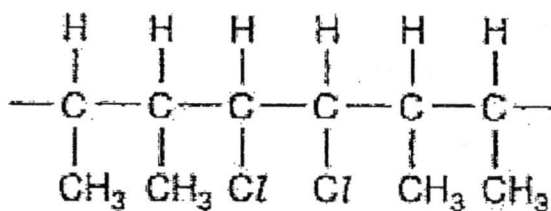
- A the number of electrons used in bonding
- B the number of orbits holding electrons
- C the proton number
- D the relative atomic mass

- 20 The following formula represent a monomer.

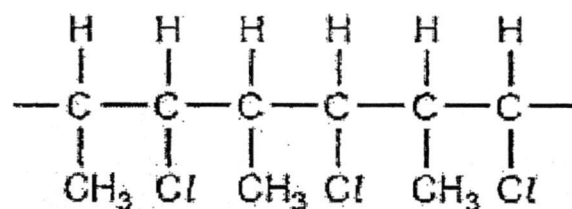


Which formula shows a part of the polymer chain formed from 3 molecules of the monomer?

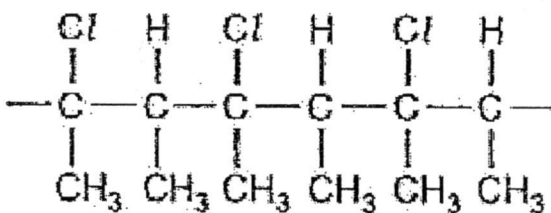
A



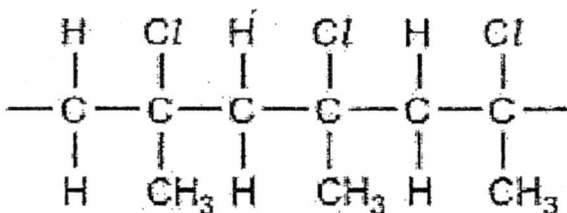
B



C



D



The Periodic Table of the Elements

Group																																																																																														
I	II	III	IV	V	VI	VII	0																																																																																							
7 Li Lithium 3	9 Be Beryllium 4	11 B Boron 5	12 C Carbon 6	13 Al Aluminium 13	14 Si Silicon 14	15 P Phosphorus 15	16 S Sulphur 16	17 Cl Chlorine 17	18 Ar Argon 18	19 K Potassium 19	20 Ca Calcium 20	21 Sc Scandium 21	22 Ti Titanium 22	23 V Vanadium 23	24 Cr Chromium 24	25 Mn Manganese 25	26 Fe Iron 26	27 Co Cobalt 27	28 Ni Nickel 28	29 Cu Copper 29	30 Zn Zinc 30	31 Ga Gallium 31	32 Ge Germanium 32	33 As Arsenic 33	34 Se Selenium 34	35 Br Bromine 35	36 Kr Krypton 36	37 Rb Rubidium 37	38 Sr Strontium 38	39 Y Yttrium 39	40 Zr Zirconium 40	41 Nb Niobium 41	42 Mo Molybdenum 42	43 Tc Technetium 43	44 Ru Ruthenium 44	45 Rh Rhodium 45	46 Pd Palladium 46	47 Ag Silver 47	48 Cd Cadmium 48	49 In Indium 49	50 Sn Tin 50	51 Sb Antimony 51	52 Te Tellurium 52	53 I Iodine 53	54 Xe Xenon 54	55 Cs Caesium 55	56 Ba Barium 56	57 La Lanthanum 57	58 Ce Cerium 58	59 Pr Praseodymium 59	60 Nd Neodymium 60	61 Pm Promethium 61	62 Sm Samarium 62	63 Eu Europium 63	64 Gd Gadolinium 64	65 Tb Terbium 65	66 Dy Dysprosium 66	67 Ho Holmium 67	68 Er Erbium 68	69 Tm Thulium 69	70 Yb Ytterbium 70	71 Lu Lutetium 71	72 Hf Hafnium 72	73 Ta Tantalum 73	74 W Tungsten 74	75 Re Rhenium 75	76 Os Osmium 76	77 Ir Iridium 77	78 Pt Platinum 78	79 Au Gold 79	80 Hg Mercury 80	81 Tl Thallium 81	82 Pb Lead 82	83 Bi Bismuth 83	84 Po Polonium 84	85 At Astatine 85	86 Rn Radon 86	87 Fr Francium 87	88 Ra Radium 88	89 Ac Actinium 89	90 Th Thorium 90	91 Pa Protactinium 91	92 U Uranium 92	93 Np Neptunium 93	94 Pu Plutonium 94	95 Am Americium 95	96 Cm Curium 96	97 Bk Berkelium 97	98 Cf Californium 98	99 Es Einsteinium 99	100 Fm Fermium 100	101 Md Mendelevium 101	102 No Nobelium 102	103 Lr Lawrencium 103

*58-71 Lanthanoid series
†90-103 Actinoid series

Key

a	X	b

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

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

NAME:

NO:

CLASS:

ADMIRALTY SECONDARY SCHOOL



PRELIMINARY EXAMINATION 2017

SUBJECT : Science (Chemistry)
CODE/PAPER : 5076/3, 5078/3
LEVEL/STREAM : 4 Express / 5 Normal Academic
DATE : 11 August 2017
TIME : 1100h – 1215h
DURATION : 1 hour 15 minutes

Instructions to candidates:

Write your name, index number and class on the cover page.

Write in dark blue or black pen.

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

Section A: Short answer questions [45 marks]

Answer all questions.

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

Section B: Structured questions [20 marks]

Answer any two out of three questions.

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

Candidates are reminded that all quantitative answers should include appropriate units.

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

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

A copy of the Periodic Table is given on the last page.

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

DO NOT TURN OVER THIS PAPER UNTIL YOU ARE TOLD TO DO SO.

This question paper consists of 16 printed pages including this cover page.

Section A
Answer all questions.

- 1 A mixture contains the following three liquids that are completely miscible.

liquid	boiling point / °C
propanone	56
ethanol	78
water	100

The liquids can be separated using the setup shown in Fig. 1.1.

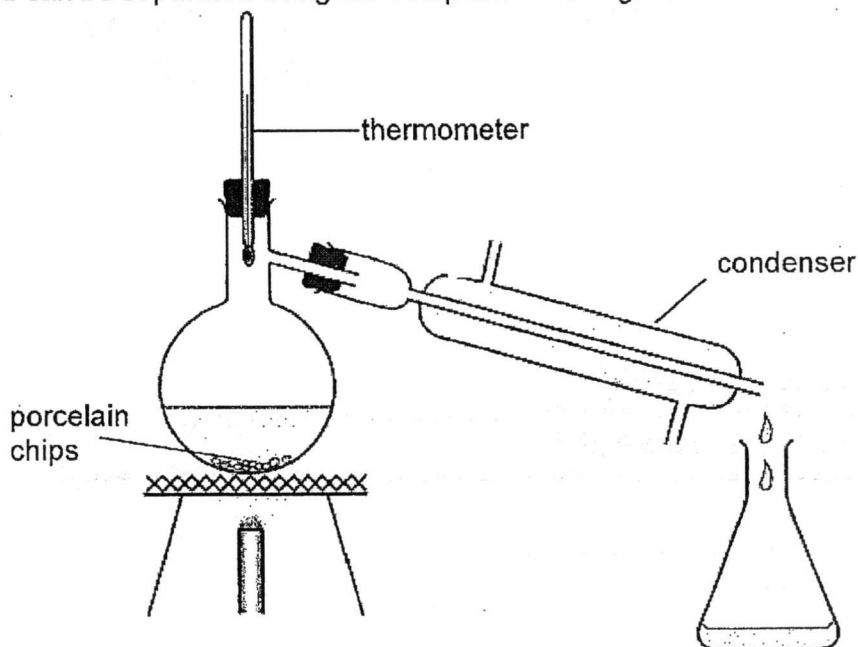


Fig. 1.1

- (a) State the name for this method of separation. [1]
-
- (b) State, with a reason which liquid will distil over first. [2]
-
- (b) On Fig.1.1, draw arrows to show how water enters and leaves the condenser. [1]

- 2 The Fig. 2.1 represent the structures of three unknown substances, A, B and C.

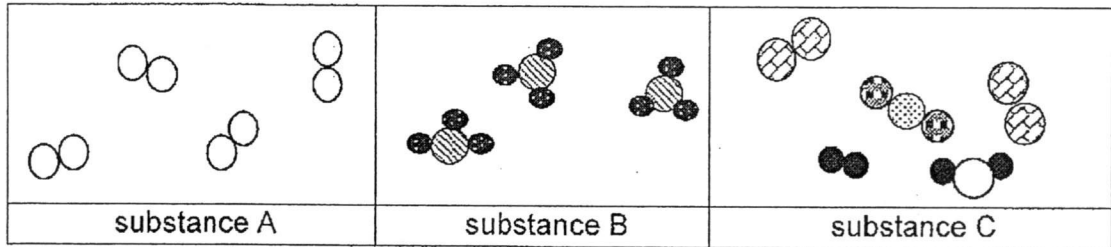


Fig 2.1

Complete the table below by

- stating whether each substance is an element, compound or a mixture,
- identifying the unknown substances from the list given below.

air	ammonia	hydrogen gas	methane	steel
-----	---------	--------------	---------	-------

substance	element, compounds or mixture	possible identity of substance
A		
B		
C		

[3]

- 3 The Fig 3.1 shows how the outer shell electrons are arranged in the compound.

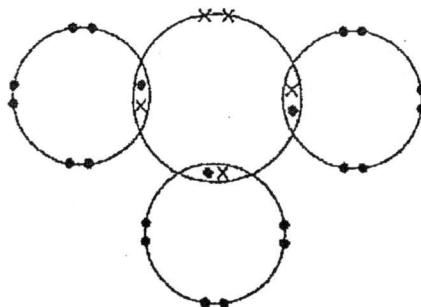


Fig. 3.1

- (a) Put ticks (\checkmark) in the boxes to show whether the following statements about the compound are true or false.

statements	true	false
It is a saturated hydrocarbon.		
It could be ammonia, NH_3 .		
It is a halogen compound.		
It is an ionic compound.		

[2]

- (b) Suggest whether the boiling point of this substance would be high or low. Explain based on its bonding and structure.

.....

.....

.....

.....

[3]

- (c) Draw a similar diagram to show the arrangement of electrons in a molecule of carbon dioxide, CO_2 . You only need to show outer shell electrons.

[2]

4 Lead (II) sulfate is a salt that can be prepared by the precipitation method.

(a) Name suitable reagents for the preparation of lead (II) sulfate.

..... [2]

(b) Explain why the precipitation method is suitable for the preparation of lead (II) sulfate.

..... [1]

(c) Describe how a pure and dry sample of lead (II) sulfate can be prepared in the laboratory.

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..... [3]

- 5 The physical properties of some substances A to F are shown in the Table 5.1. Note that letters used are not the actual symbols of the elements.

Table 5.1

Substance	Electrical conductivity		Solubility in water	Melting point / °C	Boiling point / °C
	Solid	Liquid / Molten			
A	Poor	Poor	Soluble	- 101	- 34
B	Poor	Poor	Soluble	153	365
C	Excellent	Poor	Soluble	- 45	12
D	Excellent	Excellent	Insoluble	2050	5842
E	Poor	Poor	Soluble	0	100
F	Poor	Excellent	Soluble	34	127

Identify the substance(s) that is/are

- (a) a solid at room temperature of 25 °C,

..... [1]

- (b) the distillate of simple distillation of sea water,

..... [1]

- (c) an ionic compound,

..... [1]

- (d) likely to exist as metal,

..... [1]

- (e) most likely to contain particles that move around rapidly at 75 °C.

..... [1]

- 6 5 g of magnesium ribbon was added to 100 cm³ of 1.0 mol/dm³ of excess hydrochloric acid. The hydrogen evolved was collected in a gas syringe and the volume collected is recorded every 30 seconds.

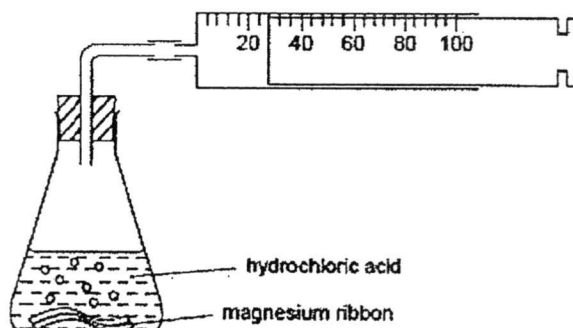


Fig. 6.1 shows the results obtained for the experiment.

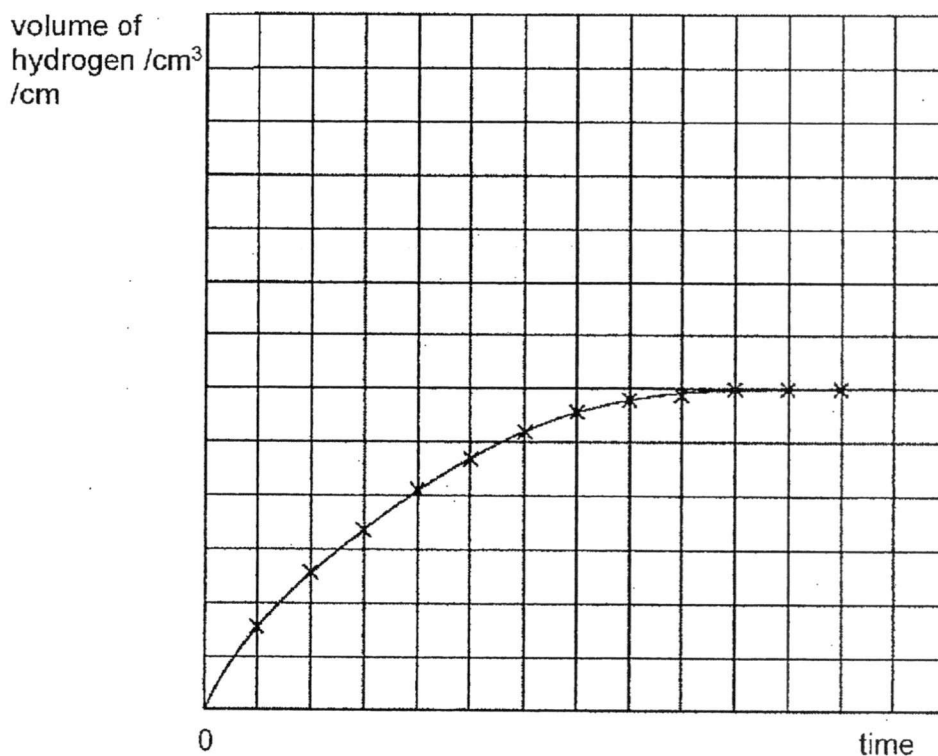


Fig. 6.1

- (a) Write a balance chemical equation for the reaction between magnesium and hydrochloric acid. Include state symbols in your chemical equation.

..... [2]

- (b) Calculate the volume of hydrogen gas produced.

Volume of hydrogen gas : dm^3 [2]

- (c) Suggest how you would calculate the average speed of reaction for the reaction between magnesium and hydrochloric acid.

.....

..... [1]

- (d) (i) The experiment was repeated with 5 g of magnesium ribbon and 100 cm^3 of 0.5 mol/dm^3 hydrochloric acid. Sketch the graph that you would obtain from the results of this experiment on the same grid in Fig. 6.1. Label it X.
- (ii) The experiment was repeated using 2.5 g of magnesium ribbon and 100 cm^3 of 1.0 mol/dm^3 sulfuric acid. Sketch the graph that you would obtain from the results of this experiment on the same grid in Fig. 6.1. Label it Y. [2]

- (e) Explain the graph obtained in d(ii).

.....

..... [2]

7 Fig 7.1 shows the reaction scheme of some of the chemical substances.

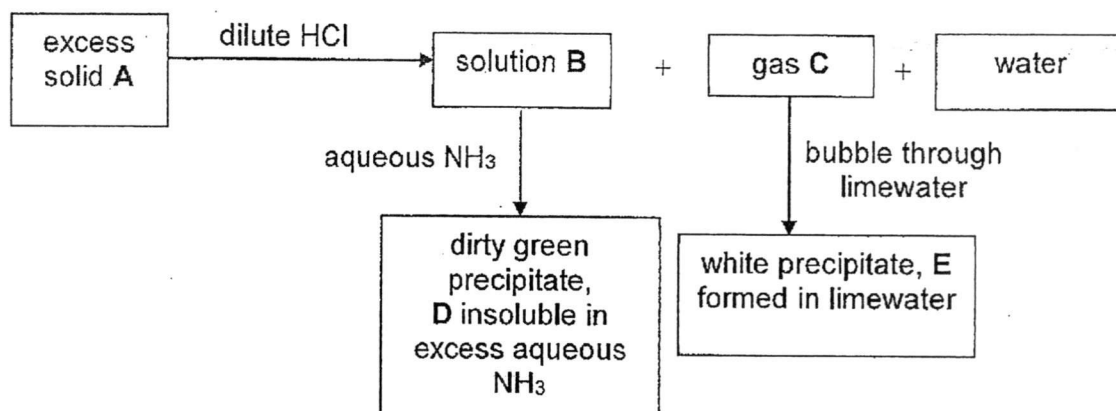


Fig 7.1

Name substance A, B, C, D and E.

- (a) A
- (b) B
- (c) C
- (d) D
- (e) E

[5]

- 8 (a) Table 8.1 shows information about some organic compounds. Complete the table below with the name, structural formula and process used to manufacture each of the compound.

Table 8.1

name of compound	structural formula of compound	process used to manufacture the compound
ethene		catalytic _____ of long hydrocarbon chain hydrocarbon
	$\begin{array}{c} \left(\begin{array}{cc} \text{H} & \text{H} \\ & \\ \text{---C} & \text{---C---} \\ & \\ \text{H} & \text{H} \end{array} \right)_n \end{array}$	_____ of ethene
ethanoic acid		_____ of ethanol

[3]

- (b) Ethene will undergo complete combustion if there is sufficient oxygen.
 (i) Write the chemical reaction for this reaction.

..... [1]

- (ii) When ethene undergoes incomplete combustion, it will form an air pollutant. Name the air pollutant and state its effect on human health.

name of air pollutant

effect of air pollutant

..... [2]

Section B

Answer any two out of three questions.

9 Chlorine can form both ionic and covalent bonds when combined with other elements.

(a) Explain why chlorine can form both ionic and covalent compounds when combined with other elements. Use 'dot and cross' diagram to support your explanation. State clearly the other elements used in your explanation.

(i) Ionic compound

.....

.....

.....

.....

(ii) covalent compound

[3]

.....

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.....

.....

[3]

(b) State two differences in the physical properties of ionic compound and covalent compound. Use your knowledge of the particles to explain the differences.

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[4]

10 (a) Name one homologous series and give the general formula for its members.

.....
.....

[2]

(b) Explain why, on moving from one member of a homologous series to the next higher member, the relative molecular mass increases by 14. Give an example of another property that changes on moving to the next higher member.

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[3]

(c) The molecules of an alcohol each contain four carbon atoms. Suggest the name and molecular formula of this alcohol. Use your knowledge of homologous series to suggest the full structural formula of this alcohol. Determine the percentage of carbon in the alcohol.

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[5]

11 Lithium, sodium and potassium are in Group I of the Periodic Table.

(a) Explain why these metals belong to Group I.

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..... [1]

(b) Describe an experiment to show a trend in the reactivity of these metals with a compound of your choice.

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..... [3]

- (c) Caesium, Cs is also in Group I. How would the reaction of caesium differ with this same compound from (a). Write a full chemical equation for this reaction.

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[4]

- (d) Suggest how these metals can be obtained from its ore. Explain your answer.

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[2]

END OF PAPER

The Periodic Table of the Elements

		Group																																																																																																											
I	II	III	IV	V	VI	VII	0					0																																																																																																	
7 Li Lithium 3	9 Be Beryllium 4	11 B Boron 5	12 C Carbon 6	13 Al Aluminium 13	14 N Nitrogen 7	15 O Oxygen 8	16 F Fluorine 9	17 Ne Neon 10	18 Na Sodium 11	19 Mg Magnesium 12	20 Al Aluminium 13	21 Si Silicon 14	22 P Phosphorus 15	23 S Sulphur 16	24 Cl Chlorine 17	25 Ar Argon 18	26 K Potassium 19	27 Ca Calcium 20	28 Sc Scandium 21	29 Ti Titanium 22	30 V Vanadium 23	31 Cr Chromium 24	32 Mn Manganese 25	33 Fe Iron 26	34 Co Cobalt 27	35 Ni Nickel 28	36 Cu Copper 29	37 Zn Zinc 30	38 Ga Gallium 31	39 Ge Germanium 32	40 As Arsenic 33	41 Se Selenium 34	42 Br Bromine 35	43 Kr Krypton 36	44 Rb Rubidium 37	45 Sr Strontium 38	46 Y Yttrium 39	47 Zr Zirconium 40	48 Nb Niobium 41	49 Mo Molybdenum 42	50 Tc Technetium 43	51 Ru Ruthenium 44	52 Rh Rhodium 45	53 Pd Palladium 46	54 Ag Silver 47	55 Cd Cadmium 48	56 In Indium 49	57 Sn Tin 50	58 Sb Antimony 51	59 Te Tellurium 52	60 I Iodine 53	61 Xe Xenon 54	62 Ba Barium 55	63 La Lanthanum 56	64 Ce Cerium 57	65 Pr Praseodymium 58	66 Nd Neodymium 59	67 Pm Promethium 60	68 Sm Samarium 61	69 Eu Europium 62	70 Gd Gadolinium 63	71 Tb Terbium 64	72 Dy Dysprosium 65	73 Ho Holmium 66	74 Er Erbium 67	75 Tm Thulium 68	76 Yb Ytterbium 69	77 Lu Lutetium 70	78 Hf Hafnium 71	79 Ta Tantalum 72	80 W Tungsten 73	81 Re Rhenium 74	82 Os Osmium 75	83 Ir Iridium 76	84 Pt Platinum 77	85 Au Gold 78	86 Hg Mercury 79	87 Tl Thallium 80	88 Pb Lead 81	89 Bi Bismuth 82	90 Po Polonium 83	91 At Astatine 84	92 Rn Radon 85	93 Fr Francium 86	94 Ra Radium 87	95 Ac Actinium 88	96 Th Thorium 89	97 Pa Protactinium 90	98 U Uranium 91	99 Np Neptunium 92	100 Pu Plutonium 93	101 Am Americium 94	102 Cm Curium 95	103 Bk Berkelium 96	104 Cf Californium 97	105 Es Einsteinium 98	106 Fm Fermium 99	107 Md Mendelevium 100	108 No Nobelium 101	109 Lr Lawrencium 102	110 Rf Rutherfordium 103	111 Db Dubnium 104	112 Sg Seaborgium 105	113 Bh Bohrium 106	114 Hs Hassium 107	115 Mt Meitnerium 108	116 Ds Darmstadtium 109	117 Ts Tennessine 110	118 Og Oganesson 111

Key

a	X	b

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

*58-71 Lanthanoid series
 †90-103 Actinoid series

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

NAME:

NO:

CLASS:

ADMIRALTY SECONDARY SCHOOL



PRELIMINARY EXAMINATION 2017

SUBJECT : Science (Chemistry)
CODE : 5076/5, 5078/5
LEVEL/STREAM : 4 Express / 5 Normal Academic
DATE : 1 September 2015
TIME : as scheduled
DURATION : 1 hour 30 minutes

Instructions to candidates:

1. The paper consists of 1 question on chemistry.
2. Answer all questions in the spaces provided.
3. You may use a calculator for this paper if necessary. A 'Chemistry Practical Notes' for your reference is available at page 4 of this paper.
4. All essential working must be shown where necessary. Loss of essential working and illegible handwriting may lead to loss of marks.
5. Do not use correction fluid anywhere in your answer script.

Chemistry Section

For Examiner's Use

Q1

15

PLEASE DO NOT TURN OVER THE PAPER UNTIL YOU ARE TOLD TO DO SO!

This question paper consists of 4 printed pages including this cover page.

Q1. You are provided with a solution X and solution Y.

Carry out the following experiments and test any gasses evolved. Carefully record your observations. The volumes given below, unless referring to drops of solution are approximate and should be estimated rather than measured.

For
Examiner's
Use

		test	observations
(a)	(i)	Place 2 cm ³ of the solution X in a clean test tube. Add 1cm ³ of nitric acid, followed by 2cm ³ of silver nitrate solution.	[1]
	(ii)	Place 2 cm ³ of solution X in a clean test tube. Add dilute sodium hydroxide solution dropwise, with shaking, until no further change is observed.	[1]
	(iii)	Place 2 cm ³ of solution X in a clean test tube. Add dilute ammonium hydroxide solution dropwise, with shaking, until no further change is observed.	[1]
	(iv)	Place 2 cm ³ of solution X in a clean test tube. To this test-tube, add 3-4 pieces of zinc. Leave this test-tube to stand in the test-tube rack.	[2]
(b)	(i)	Place 2 cm ³ of solution Y in a clean test tube. Add dilute sodium hydroxide solution dropwise, with shaking, until no further change is observed.	[2]
	(ii)	Place 2 cm ³ of the solution Y in a clean test-tube. Add aqueous sodium hydroxide, then add aluminum foil. Warm gently.	[1]
	(iii)	Place 2 cm ³ of the solution Y in a clean test-tube. Add 1cm ³ of hydrochloric acid, followed by 2cm ³ of barium chloride solution.	[1]

- (c) (i) Using your observations in (a), give 3 conclusions. Give evidence to support each of your conclusions.

conclusion 1 :

.....

evidence 1 :

.....

conclusion 2 :

.....

evidence 2 :

.....

conclusion 3 :

.....

evidence 3 :

.....[3]

- (ii) Solution Y contains either lead or zinc ion. Describe how you would carry out some test to confirm the identity of cation in solution Y.

.....

.....

.....

.....[2]

- (iii) Deduce the anion in solution Y.

anion :

explanation

.....[1]

End of Paper

CHEMISTRY PRACTICAL NOTES

Test for anions

<i>anion</i>	<i>test</i>	<i>test result</i>
carbonate (CO_3^{2-})	add dilute acid	effervescence, carbon dioxide produced
chloride (Cl^-) [in solution]	acidify with dilute nitric acid, then add aqueous silver nitrate	white ppt.
nitrate (NO_3^-) [in solution]	add aqueous sodium hydroxide then aluminium foil; warm carefully	ammonia produced
sulfate (SO_4^{2-}) [in solution]	acidify with dilute nitric acid, then add aqueous barium nitrate	white ppt.

Test for aqueous cations

<i>cation</i>	<i>effect of aqueous sodium hydroxide</i>	<i>effect of aqueous ammonia</i>
ammonium (NH_4^+)	ammonia produced on warming	–
calcium (Ca^{2+})	white ppt., insoluble in excess	no ppt.
copper(II) (Cu^{2+})	light blue ppt., insoluble in excess	light blue ppt., soluble in excess giving a dark blue solution
iron(II) (Fe^{2+})	green ppt., insoluble in excess	green ppt., insoluble in excess
iron(III) (Fe^{3+})	red-brown ppt., insoluble in excess	red-brown ppt., insoluble in excess
lead(II) (Pb^{2+})	white ppt., soluble in excess giving a colourless solution	white ppt., insoluble in excess
zinc (Zn^{2+})	white ppt., soluble in excess giving a colourless solution	white ppt., soluble in excess giving a colourless solution

Test for gases

<i>gas</i>	<i>test and test result</i>
ammonia (NH_3)	turns damp red litmus paper blue
carbon dioxide (CO_2)	gives white ppt. with limewater (ppt. dissolves with excess CO_2)
chlorine (Cl_2)	bleaches damp litmus paper
hydrogen (H_2)	"pops" with a lighted splint
oxygen (O_2)	relights a glowing splint
sulfur dioxide (SO_2)	turns aqueous acidified potassium manganate(VII) from purple to colourless

NAME:	NO:	CLASS:
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ADMIRALTY SECONDARY SCHOOL



PRELIMINARY EXAMINATION 2017

CODE : 5076/5, 5078/5

SUBJECT : Science (Chemistry)

LEVEL/STREAM : Secondary 4 Express / 5 Normal Academic

DATE : 17 August 2017

DURATION : 1 hour 30 minutes

Instructions to candidates:

Write your name, index number and class in the spaces at the top of this page.
Write your answers in the spaces provided on the question paper.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets [] at the end of each question or part question.
You are advised to spend 45 minutes on this question.

CHEMISTRY SECTION

For Examiner's Use	
Total	/ 15

PLEASE DO NOT TURN OVER THE PAPER UNTIL YOU ARE TOLD TO DO SO

This Question paper consists of 5 printed pages including this cover page.

You are provided with a solid **X** and solution **Y**. Both solid **X** and solution **Y** consists of one cation and one anion each.

Carry out the following experiments and test any gasses evolved. Carefully record your observations.

The volumes given below, unless referring to drops of solution, are approximate and should be estimated rather than measured.

		test	observations
(a)		Dissolve the solid salt X in the large test-tube, in distilled water and then add more distilled water until the test-tube is about two-thirds full. Stopper and shake the test-tube thoroughly.	[1]
(b)	(i)	Transfer 2 cm ³ of the solution X in a clean test tube. Add 1 cm ³ of nitric acid, followed by 2 cm ³ of silver nitrate solution.	[1]
	(ii)	Transfer 2 cm ³ of solution X in a clean test tube. Add dilute sodium hydroxide solution dropwise, with shaking, until no further change is observed.	[1]
	(iii)	Transfer 2 cm ³ of solution X in a clean test tube. Add dilute ammonium hydroxide solution dropwise, with shaking, until no further change is observed. Leave this test-tube to stand in the test-tube rack.	[1]

	test	observations
(iv)	<p>Transfer 2 cm³ of solution X in a clean test tube.</p> <p>To this test-tube, add 3-4 pieces of zinc.</p> <p>Leave this test-tube to stand in the test-tube rack.</p>	[2]

	test	observations
(c) (i)	<p>Transfer 2 cm³ of solution Y in a clean test tube.</p> <p>Add dilute sodium hydroxide solution dropwise, with shaking, until no further change is observed.</p>	[2]
(ii)	<p>Transfer 2 cm³ of the solution Y in a clean test-tube.</p> <p>Add aqueous sodium hydroxide, then add aluminum foil. Warm gently.</p>	[1]
(iii)	<p>Transfer 2 cm³ of the solution Y in a clean test-tube.</p> <p>Add 1 cm³ of hydrochloric acid, followed by 2 cm³ of barium chloride solution.</p>	[1]

- (d) (i) Using your observations in (b), give 3 conclusions. Give evidence to support each of your conclusions.

conclusion 1 :

.....

evidence 1 :

.....

conclusion 2 :

.....

evidence 2 :

.....

conclusion 3 :

.....

evidence 3 :

.....[3]

- (ii) Solution Y contains either lead or zinc ion. Describe how you would carry out some test to confirm the identity of cation in solution Y.

.....

.....

.....[1]

- (iii) Deduce the anion in solution Y.

anion :

explanation

.....[1]

End of Paper

NOTES FOR QUALITATIVE ANALYSIS

Test for anions

anion	test	test result
carbonate (CO_3^{2-})	add dilute acid	effervescence, carbon dioxide produced
chloride (Cl^-) [in solution]	acidify with dilute nitric acid, then add aqueous silver nitrate	white ppt.
nitrate (NO_3^-) [in solution]	add aqueous sodium hydroxide, then aluminium foil, warm carefully	ammonia produced
sulfate (SO_4^{2-}) [in solution]	acidify with dilute nitric acid, then add aqueous barium nitrate	white ppt.

Test for aqueous cations

cation	effect of aqueous sodium hydroxide	effect of aqueous ammonia
ammonium (NH_4^+)	ammonia produced on warming	—
calcium (Ca^{2+})	white ppt., insoluble in excess	no ppt.
copper(II) (Cu^{2+})	light blue ppt., insoluble in excess	light blue ppt., soluble in excess giving a dark blue solution
iron(II) (Fe^{2+})	green ppt., insoluble in excess	green ppt., insoluble in excess
iron(III) (Fe^{3+})	red-brown ppt., insoluble in excess	red-brown ppt., insoluble in excess
lead(II) (Pb^{2+})	white ppt., soluble in excess giving a colourless solution	white ppt., insoluble in excess
zinc (Zn^{2+})	white ppt., soluble in excess giving a colourless solution	white ppt., soluble in excess giving a colourless solution

Test for gases

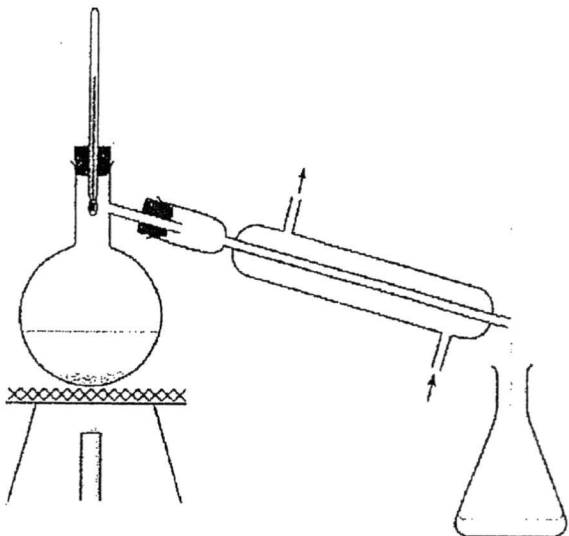
gas	test and test result
ammonia (NH_3)	turns damp red litmus paper blue
carbon dioxide (CO_2)	gives white ppt. with limewater (ppt. dissolves with excess CO_2)
chlorine (Cl_2)	bleaches damp litmus paper
hydrogen (H_2)	"pops" with a lighted splint
oxygen (O_2)	relights a glowing splint
sulfur dioxide (SO_2)	turns aqueous acidified potassium manganate(VII) from purple to colourless

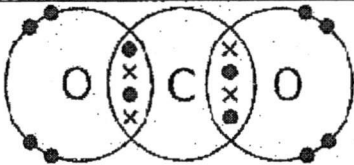
Admiralty Sec School
Marking Scheme
Preliminary Exam 2017
4E/5N
Science Chemistry (5076 / 5078)

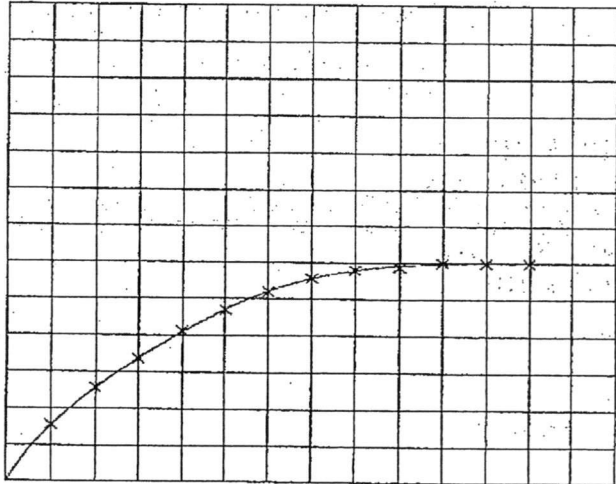
PAPER 1

Q1/21	Q2/22	Q3/23	Q4/24	Q5/25	Q6/26	Q7/27	Q8/28	Q9/29	Q10/30
D	C	C	A	C	C	A	D	A	B
Q11/31	Q12/32	Q13/33	Q14/34	Q15/35	Q16/36	Q17/37	Q18/38	Q19/39	Q20/40
C	D	A	C	D	A	C	A	C	B

PAPER 3 SECTION A [45 marks]

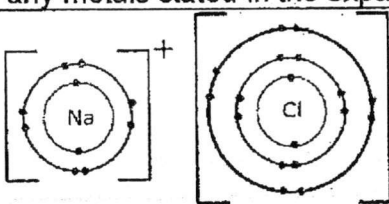
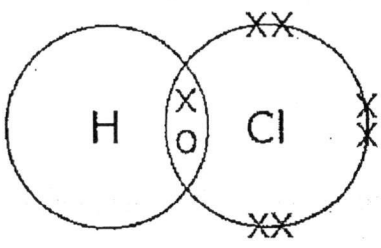
1	(a)	Fractional distillation Accept : simple distillation & distillation		[1]	
	(b)	Proponone. It has the lowest boiling point thus it distils over first.		[1] [1]	
	(b)	 <p>½ mark if one of the arrow is correct.</p>		[1]	
2		substance	element, compounds or mixture	possible identity of substance	[3]
		A	element	hydrogen gas	
		B	compound	ammonia	
		C	mixture	air	
		½ marks for each correct answer.			
3	(a)	statements	true	False	[2]
		It is a saturated hydrocarbon.		√	
		It could be ammonia, NH ₃ .		√	
		It is a halogen compound.	√		
		It is an ionic compound.		√	
		½ mark for each correct answer.			

	(b)	The boiling point of the substance would be low. The compound has a molecular structure with weak intermolecular forces , thus low amount of energy required to break the bond.	[1] [2]
	(c)	 <p>Correct number of overlapping circles = ½ mark Correct number of electrons shared = ½ mark Correct number of valence electrons = ½ mark Correct representation of dot and cross = ½ mark</p>	[2]
4	(a)	Lead(II) nitrate Any soluble sulfate salt Accept : sulphuric acid	[1] [1]
	(b)	Lead(II)sulfate is an insoluble salt.	[1]
	(c)	Add/ Mix lead(II)nitrate and soluble salt named in part (a) in a beaker. Allow e.c.f for wrong reagent named in part (a)	[1] [1]
		Filter to remove the lead(II)sulfate as the residue. Wash with distilled water (½ mark) and pat dry in between filter paper (1/2 mark).	[1]
5	(a)	B, D and F Any one correct answer. N ½ mark if incorrect answer included	[1]
		E ½ mark if incorrect answer included	[1]
		F ½ mark if incorrect answer included	[1]
		D ½ mark if incorrect answer included	[1]
		A and C (1/2 mark for each correct answer)	[1]
	(a)	$Mg(s) + 2HCl(aq) \rightarrow MgCl_2(aq) + H_2(g)$ 1 mark : correct balanced equations 1 mark : correct state symbol	[2]
6	(a)	No. of mole of magnesium = $5/24 \text{ mol}$ / 0.208 mol Or Mole ratio : 1 mol of Mg produces 1 mol of H ₂ 0.208 mol of Mg produces 0.208 mol of H₂ Volume of H₂ = $0.208 \times 24 = 4.992 \text{ dm}^3$ or 5 dm^3	[1] [1]
	(b)	Average speed of reaction can be calculated by dividing the total volume of hydrogen produced to total time taken for the reaction to stop / no more effervescence observed/ maximum volume reached.	[1]

	<p>(c) volume of hydrogen</p>  <p>Graph X $\frac{1}{2}$ mark : gradient is lower than original graph / time taken is more than original time $\frac{1}{2}$ mark : final volume is same</p> <p>Graph Y $\frac{1}{2}$ mark : gradient is steeper than original graph $\frac{1}{2}$ mark : final volume is half of the original volume</p>	[2]									
	<p>(d) The final volume of hydrogen gas produced is half of the volume produced in the original experiment. This is because, the mass of magnesium used is reduced by half.</p> <p>The speed of reaction is faster because, in same number of mole of sulphuric acid and hydrochloric acid, there's more concentration of hydrogen ions.</p>	[1] [1]									
7	(a) Iron (II) carbonate	[1]									
	(b) Iron (II) chloride	[1]									
	(c) carbon dioxide gas	[1]									
	(d) Iron(II) hydroxide	[1]									
	(e) calcium carbonate	[1]									
Note : $\frac{1}{2}$ given if correct chemical formula written											
8	<table border="1"> <thead> <tr> <th data-bbox="331 1560 655 1680">name of compound</th> <th data-bbox="655 1560 979 1680">structural formula of compound</th> <th data-bbox="979 1560 1310 1680">process used to manufacture the compound</th> </tr> </thead> <tbody> <tr> <td data-bbox="331 1680 655 1862">ethene</td> <td data-bbox="655 1680 979 1862"> $\begin{array}{c} \text{H} & & \text{H} \\ & \diagdown & / \\ & \text{C} = \text{C} \\ & / & \diagdown \\ \text{H} & & \text{H} \end{array}$ </td> <td data-bbox="979 1680 1310 1862">Catalytic cracking of long hydrocarbon chain hydrocarbon</td> </tr> <tr> <td data-bbox="331 1862 655 2027">Poly(ethane)</td> <td data-bbox="655 1862 979 2027"> $\left(\begin{array}{cc} \text{H} & \text{H} \\ & \\ -\text{C} & -\text{C}- \\ & \\ \text{H} & \text{H} \end{array} \right)_n$ </td> <td data-bbox="979 1862 1310 2027">Polymerisation of ethene</td> </tr> </tbody> </table>	name of compound	structural formula of compound	process used to manufacture the compound	ethene	$\begin{array}{c} \text{H} & & \text{H} \\ & \diagdown & / \\ & \text{C} = \text{C} \\ & / & \diagdown \\ \text{H} & & \text{H} \end{array}$	Catalytic cracking of long hydrocarbon chain hydrocarbon	Poly(ethane)	$\left(\begin{array}{cc} \text{H} & \text{H} \\ & \\ -\text{C} & -\text{C}- \\ & \\ \text{H} & \text{H} \end{array} \right)_n$	Polymerisation of ethene	$\frac{1}{2}$ mark for each answer
name of compound	structural formula of compound	process used to manufacture the compound									
ethene	$\begin{array}{c} \text{H} & & \text{H} \\ & \diagdown & / \\ & \text{C} = \text{C} \\ & / & \diagdown \\ \text{H} & & \text{H} \end{array}$	Catalytic cracking of long hydrocarbon chain hydrocarbon									
Poly(ethane)	$\left(\begin{array}{cc} \text{H} & \text{H} \\ & \\ -\text{C} & -\text{C}- \\ & \\ \text{H} & \text{H} \end{array} \right)_n$	Polymerisation of ethene									

	ethanoic acid	$ \begin{array}{c} \text{H} \\ \\ \text{H} - \text{C} - \text{C} \\ \quad // \quad \backslash \\ \text{H} \quad \text{O} \quad \text{O} - \text{H} \end{array} $	<u>oxidation of ethanol</u>	
(b)	$\text{C}_2\text{H}_4 + 3\text{O}_2 \rightarrow 2\text{CO}_2 + 2\text{H}_2\text{O}$ ½ mark : correct fomula ½ mark : correct balancing			[1]
(c)	carbon monoxide			[1]
	Reduces ability of haemoglobin to carry oxygen to different parts of the body. ½ mark : difficulty in breathing			[1]

PAPER 3 SECTION A [45 marks]

8	(a)(i)	It needs gain 1 electron from another metal to become stable Eg: sodium, lithium, any metals stated in the expansion	[1] [1]
		 <p>Bonding showed through brackets : ½ mark Correct representation dot and cross, charges and metals used in explanation : ½ mark</p>	[1]
	(a)(ii)	Chlorine can share electrons with another non-metal. Eg : hydrogen, chlorine, any appropriate non-metal stated clearly	[1] [1]
		 <p>Bonding showed through overlapping circle : ½ mark Correct representation of dot and cross, number of electrons shared and non-metal used in the explanation : ½ mark</p>	[1]
	(b)	ionic compound has high melting and boiling point (1/2 mark) while covalent compounds has low melting and boiling point (1/2 mark)	[1]
		Large amount of energy required to break the strong electrostatic forces between the oppositely charged ions, in ionic compounds. (1/2 mark)	[1]
		Weak intermolecular forces in covalent compounds required low amount of energy to break the forces of attraction. (1/2 mark)	[1]
		ionic compound conducts electricity in molten and aqueous stat ((1/2	[1]

	mark), while covalent compound does not conduct electricity (1/2 mark)	
	This is due to the presence of mobile ions in ionic compounds(1/2 mark) and there are no mobile ions in covalent compound (1/2 mark)	[1]

10	(a)	Either one correct combination of homologous series and general formula : Alkane, C_nH_{2n+2} Alkene, C_nH_{2n} Alcohol, $C_nH_{2n+1}OH$ Carboxylic Acid, $C_nH_{2n+1}COOH$	[2]
	(b)	Moving down from one member to another member of a homologous series, there is addition of 1 Carbon and 2 Hydrogen. Therefore the relative molecular mass increases by $12 + 2(1) = 14$	[1]
		Any one of the physical properties : Melting & boiling points increases Viscosity increases Density increases Flammability decreases Trend stated : increase / decrease	[1]
	(c)	Name : Butanol	[1]
		Molecular formula : C_4H_9OH	[1]
		$ \begin{array}{cccc} H & H & H & H \\ & & & \\ H-C & -C & -C & -C-O-H \\ & & & \\ H & H & H & H \end{array} $ 1 mark : Hydroxyl group 1 mark : correct structure	[2]
		Percentage of carbon = $ \frac{4(12)}{10(1) + 1(16) + 4(12)} \times 100 $ = 68.86% or 68.9%	[1]
11	(a)	All the metals have 1 valence electrons Accept : need to lose 1 electron	[1]
	(b)	Add the metals in a test tube containing water/acid. A compound used must be stated clearly	[1]
		Observe the reaction / effervescence produced in each of the test tube. Accept : displacement or any other observations stated	[1]
		Lithium will produce least effervescence or slow reaction as it is placed top in the group 1. Sodium will produce the most number of effervescence or fast reaction as it is placed below potassium and lithium in group 1 Accept : comparison is made	[1]
	(c)	Cesium will produce an explosion when reacted with water/acid.	[1]
		Cesium is more reactive than lithium, potassium and sodium.	[1]
		Cesium is placed below lithium, potassium and sodium in the periodic table. Accept Easier to lose electrons as the number of shell is more	[1]
		$Cs + H_2O \rightarrow CsOH + H_2$ OR any correct equation	[1]
	(d)	These metals are extracted through electrolysis	[1]
		These metals are placed high in the reactivity series.	[1]

ADMIRATLY SECONDARY SCHOOL
COMBINED SCIENCE (PHYSICS/CHEMISTRY/BIOLOGY)

PRELIMINARY PRACTICAL EXAM 2017
PREPARATORY INSTRUCTIONS FOR LABORATORY STAFF

CONFIDENTIAL

Great care should be taken that any confidential information given does not reach candidates either directly or indirectly.

Subject: Chemistry

Please complete parts A, B, C where applicable

A) Apparatus / Materials:

Items to be supplied by the Centre (per set per candidate unless otherwise specified)

S/No	Items (Apparatus / Material)	Quantity	Remarks
1.	Solid X – Copper(II)chloride	(approx. 20cm ³)	Dispense the solution into the stoppered vial labelled solution X.
2.	Solution Y – Lead nitrate	1 sealed packet / bottle (approx. 20cm ³)	Dispense the solution into the stoppered vial labelled solution Y.
3.	Zinc granules	1 packet	5 – 6 granules per packet
4.	Hard glass test tubes	6 nos	
5.	Boiling tubes	2 nos	
6.	Test tube holder	1 no	
7.	Test tube rack	1 no	
8.	Spatula	1 no	
9.	Lighter	1 no	
10.	Goggles	1 no	
11.	Red, blue litmus papers	1 set	
12.	Delivery tube	1 no	
13.	Glass rod	1 no	
14.	Wooden splint	2 pcs	
15.	Dilute nitric acid	1 bottle	

S/No	Items (Apparatus / Material)	Quantity	Remarks
16.	Dilute hydrochloric acid	1 bottle	
17.	Aqueous sodium hydroxide	1 bottle	
18.	Aqueous ammonia	1 bottle	
19.	Aqueous silver nitrate		May be placed at side bench
20.	Aqueous barium chloride		May be placed at side bench

B) Additional Instructions to Laboratory Staff / Subject Supervisor / Invigilator

1. All standard reagents not mentioned above would be available to candidates at students bench or side bench as per routine
2. Candidates should be warned to warm the solution carefully (precaution to be written on whiteboard on day of exam)
3. Additional unknown samples labelled **X and Y** should be available on teachers' bench
Cloths or tissues should be available in case of spillages.
4. Additional apparatus and materials on stand-by should be available at the teacher's bench.

C) Action at changeover during each shift (for Laboratory Staff / Subject Supervisor)

1. Replace the insulation if it has become wet.
2. Replace all personal items used by candidates
3. Issue fresh samples of unknown **X and Y**

NAME:

NO:

CLASS:

ADMIRALTY SECONDARY SCHOOL



PRELIMINARY EXAMINATION 2017

CODE : 5076/5, 5078/5
SUBJECT : Science (Chemistry)
LEVEL/STREAM : Secondary 4 Express / 5 Normal Academic
DATE : 17 August 2017
DURATION : 1 hour 30 minutes

Instructions to candidates:

Write your name, index number and class in the spaces at the top of this page.
Write your answers in the spaces provided on the question paper.

INFORMATION FOR CANDIDATES

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You are advised to spend 45 minutes on this question.

CHEMISTRY SECTION

For Examiner's Use

Total	/ 15
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This Question paper consists of 5 printed pages including this cover page.

You are provided with a solid **X** and solution **Y**. Both solid **X** and solution **Y** consists of one cation and one anion each.

Carry out the following experiments and test any gasses evolved. Carefully record your observations.

The volumes given below, unless referring to drops of solution, are approximate and should be estimated rather than measured.

		Test	observations
(a)		Dissolve the solid salt X in the large test-tube, in distilled water and then add more distilled water until the test-tube is about two-thirds full. Stopper and shake the test-tube thoroughly.	Crystal blue solid dissolved to <u>form blue solution.</u> [1]
(b)	(i)	Transfer 2 cm ³ of the solution X in a clean test tube. Add 1 cm ³ of nitric acid, followed by 2 cm ³ of silver nitrate solution.	No changes observed [1]
	(ii)	Transfer 2 cm ³ of solution X in a clean test tube. Add dilute sodium hydroxide solution dropwise, with shaking, until no further change is observed.	Light blue ppt is formed, insoluble in excess sodium hydroxide. [1]
	(iii)	Transfer 2 cm ³ of solution X in a clean test tube. Add dilute ammonium hydroxide solution dropwise, with shaking, until no further change is observed. Leave this test-tube to stand in the test-tube rack.	Blue ppt is formed, soluble in excess ammonium hydroxide and form a dark blue solution. [1]

		test	observations
	(iv)	<p>Transfer 2 cm³ of solution X in a clean test tube.</p> <p>To this test-tube, add 3-4 pieces of zinc.</p> <p>Leave this test-tube to stand in the test-tube rack.</p>	<p>Effervescence were observed.</p> <p>When left for standing, the solution changes colour from blue to pale blue/light green.</p> <p>Zinc dissolve in the solution</p> <p>Black solid deposited on the zinc granules.</p> <p>Any 2 observations [2]</p>

		test	observations
(c)	(i)	<p>Transfer 2 cm³ of solution Y in a clean test tube.</p> <p>Add dilute sodium hydroxide solution dropwise, with shaking, until no further change is observed.</p>	<p>White ppt is formed.</p> <p>Soluble in excess sodium hydroxide forming colourless solution.</p> <p>[2]</p>
	(ii)	<p>Transfer 2 cm³ of the solution Y in a clean test-tube.</p> <p>Add aqueous sodium hydroxide, then add aluminum foil. Warm gently.</p>	<p>Effervescences observed</p> <p>Pungent smell</p> <p>Blue litmus paper remained blue.</p> <p>Red litmus changed blue.</p> <p>[1]</p>
	(iii)	<p>Transfer 2 cm³ of the solution Y in a clean test-tube.</p> <p>Add 1 cm³ of hydrochloric acid, followed by 2 cm³ of barium chloride solution.</p>	<p>White ppt formed</p> <p>[1]</p>

- (d) (i) Using your observations in (b), give 3 conclusions. Give evidence to support each of your conclusions.

conclusion 1 : Cu^{2+} is present in solid X.

evidence 1 :

Blue ppt is formed in part b(ii) when sodium hydroxide is added dropwise and it is insoluble in excess sodium hydroxide.

Blue ppt is formed in part b(iii) when ammonium hydroxide is added dropwise and it is insoluble in excess ammonium hydroxide.

conclusion 2 : No Cl^- in solid X

evidence 2 : No white ppt is formed in part b(ii) when nitric acid is added, followed by silver nitrate solution.

conclusion 3 : Zinc displaced Cu^{2+} / cation from solution X / Zinc is more reactive than Cu^{2+} / cation in solution X

evidence 3 :

The blue color of solution X become pale blue/ light green when zinc is added in part b(iv).

Black solid deposited on zinc granules

[3]

- (ii) Solution Y contains either lead or zinc ion. Describe how you would carry out some test to confirm the identity of cation in solution Y.

Add ammonium hydroxide solution dropwise and in excess to solution Y.

If white ppt formed is soluble in excess then forming a colourless solution, then the cation is Zn^{2+} . If white ppt formed is insoluble in excess, then the cation is

Pb^{2+} .

(iii) Deduce the anion in solution Y.

anion : NO_3^- / Nitrate ion

explanation: ammonia gas is produced in part c(ii), blue litmus paper turned red.[1]

End of Paper

NOTES FOR QUALITATIVE ANALYSIS

Test for anions

anion	test	test result
carbonate (CO_3^{2-})	add dilute acid	effervescence, carbon dioxide produced
chloride (Cl^-) [in solution]	acidify with dilute nitric acid, then add aqueous silver nitrate	white ppt.
nitrate (NO_3^-) [in solution]	add aqueous sodium hydroxide, then aluminium foil; warm carefully	ammonia produced
sulfate (SO_4^{2-}) [in solution]	acidify with dilute nitric acid, then add aqueous barium nitrate	white ppt.

Test for aqueous cations

cation	effect of aqueous sodium hydroxide	effect of aqueous ammonia
ammonium (NH_4^+)	ammonia produced on warming	—
calcium (Ca^{2+})	white ppt., insoluble in excess	no ppt.
copper(II) (Cu^{2+})	light blue ppt., insoluble in excess	light blue ppt., soluble in excess giving a dark blue solution
iron(II) (Fe^{2+})	green ppt., insoluble in excess	green ppt., insoluble in excess
iron(III) (Fe^{3+})	red-brown ppt., insoluble in excess	red-brown ppt., insoluble in excess
lead(II) (Pb^{2+})	white ppt., soluble in excess giving a colourless solution	white ppt., insoluble in excess
zinc (Zn^{2+})	white ppt., soluble in excess giving a colourless solution	white ppt., soluble in excess giving a colourless solution

Test for gases

gas	test and test result
ammonia (NH_3)	turns damp red litmus paper blue
carbon dioxide (CO_2)	gives white ppt. with limewater (ppt. dissolves with excess CO_2)
chlorine (Cl_2)	bleaches damp litmus paper
hydrogen (H_2)	"pops" with a lighted splint
oxygen (O_2)	relights a glowing splint
sulfur dioxide (SO_2)	turns aqueous acidified potassium manganate(VII) from purple to colourless