Name:	Index Number:	Class:

HUA YI SECONDARY SCHOOL

4NA

Mid-Year Examination 2018

4NA

SCIENCE(CHEMISTRY)

5105/3

Paper 3

7 May 2018

1 hr 15 min

Candidates answer on the Optical Answer Sheet provided.
Additional Materials: Optical Answer Sheet

READ THESE INSTRUCTIONS FIRST

Write your Name, Index Number and Class on all the work you have done.
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
There are **twenty** 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 Optical Answer Sheet.

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.

This document consists of **6** printed pages including the cover page.

© HYSS 2018
No part of this document may be reproduced in any form or transmitted in any form or by any means without the prior permission of Hua Yi Secondary School.

[Turn Over

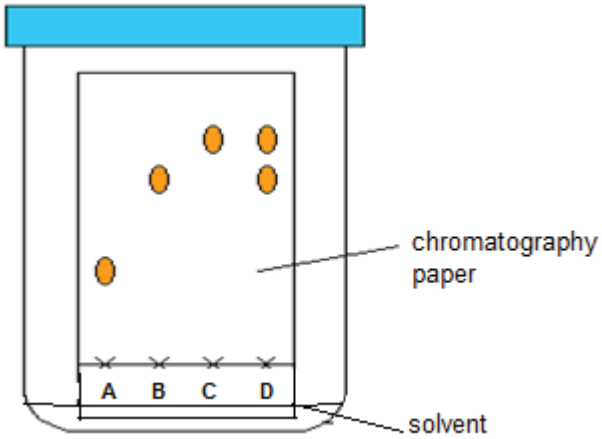
Setter: Chiang Wai Kit

Downloaded from SingaKids.com

1 Which substance is a solid at 20 °C?

	melting point/ °C	boiling point/ °C
A	-117	78
B	-93	9
C	0	100
D	36	130

2 The chromatogram of four substances, **A, B, C** and **D** is shown in the diagram below.



Which of the following statement is **not** true?

A Dye **A** is soluble in the solvent.
B Dye **B** is pure.
C Dye **C** is less soluble in the solvent than Dye **B**.
D Dye **D** is a mixture.

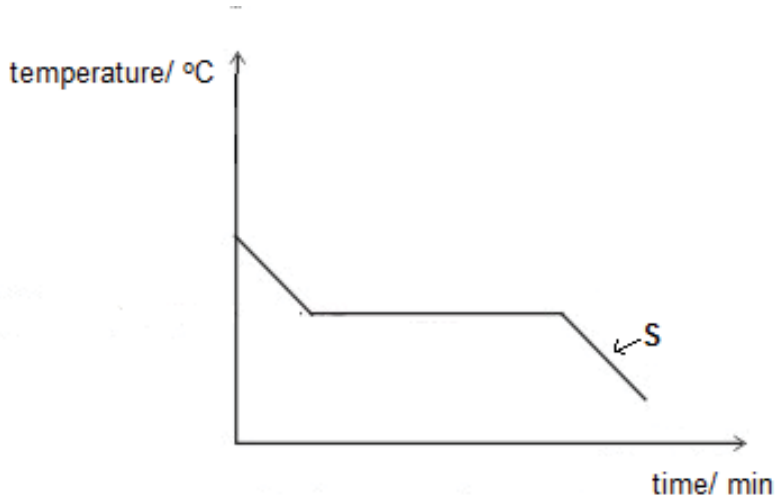
3 A student wishes to add exactly 19.2 cm^3 of dilute hydrochloric acid to exactly 25.0 cm^3 of aqueous sodium hydroxide as part of a titration experiment.
Which pair of apparatus should the student use to measure each of these volumes?

	dilute hydrochloric acid	aqueous sodium hydroxide
A	burette	measuring cylinder
B	burette	pipette
C	pipette	measuring cylinder
D	pipette	burette

www.KiasuExamPaper.com

Downloaded from SingaKids.com

4 The graph below shows the cooling curve for molten iron.

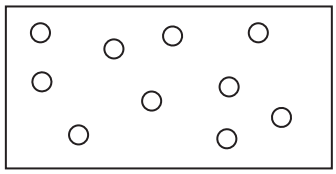


Which of the following is true at **S**?

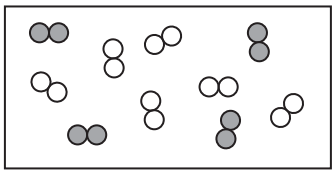
A particles are closely packed in random order
B particles gain energy
C particles move further apart
D particles vibrate about fixed position

5 Which of the following diagrams shows a pure compound?

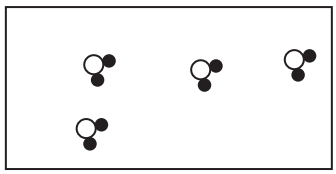
A



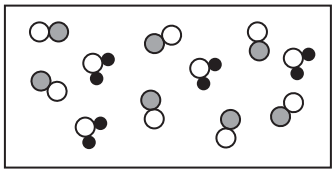
B



C



D



6 Which property is **different** for isotopes of the same element?

A chemical reactions
B nucleon number
C proton number
D size of atom

www.KiasuExamPaper.com

Downloaded from SingaKids.com

7 Which change takes place when an atom becomes a positive ion?

A when an electron is added
B when an electron is removed
C when a proton is added
D when a proton is removed

8 Which of the following statements about ionic compound is correct?

A They are insoluble in water.
B They conduct electricity in solid state only.
C They have high melting points.
D They are malleable.

9 Element **X** has an electronic structure 2,4 and element **Y** has an electronic structure 2,8,6. What is the type of bonding and the chemical formula of the compound formed when element **X** reacts with element **Y**?

	type of bonding	chemical formula
A	covalent	XY_2
B	covalent	X_2Y
C	ionic	XY_2
D	ionic	X_2Y

10 Which elements form an acidic oxide and a basic oxide?

		forms an acidic oxide	forms a basic oxide	
	A	magnesium	sodium	
	B	nitrogen	magnesium	
	C	sodium	sulphur	
	D	sulfur	nitrogen	

11 Substance **X** is used to control soil acidity. What is **X**?

A calcium chloride **B** calcium hydroxide
C calcium nitrate **D** calcium sulfate

12 Aqueous solution **X** is added to aqueous ammonium sulfate. The mixture is heated and ammonia gas is produced. What is **X**?

A ammonium chloride **B** sodium chloride
C sodium hydroxide **D** sulfuric acid

13 The formula of a nitrate of chromium is $Cr(NO_3)_3$. What is the formula of the corresponding oxide?

A CrO **B** CrO_2
C Cr_2O_3 **D** Cr_3O_2

www.KiasuExamPaper.com

Downloaded from SingaKids.com

14 A data book gives the following information about an element.

appearance	silver-grey solid
melting point	98^{o}C
density	0.97 g/cm^{3}
reaction with water	vigorous reaction with cold water

Where is the element likely to be found in the Periodic Table?

A Group 0
B Group I
C Group VII
D Transition metal

15 Which of the following statements about the change in properties of the elements from left to right across a period is true?

A The electrical conductivity of the elements increases.
B The metallic properties decreases.
C The number of electron shell decreases.
D The number of protons in an atom decreases.

16 A blast furnace is used to extract iron from iron ore. Why is limestone added to the blast furnace?

A to change the ore into iron
B to convert acidic impurities in the ore into slag
C to heat up the furnace
D to produce oxygen for the coke to burn

17 Why does a bicycle chain that is coated with oil **not** rust?

A Oil dissolves any rust that forms.
B Oil prevents oxygen and water from coming in contact to the chain.
C Oil reacts with rust causing a chemical reaction that removes rust.
D Oil reacts with oxygen so no rust forms.

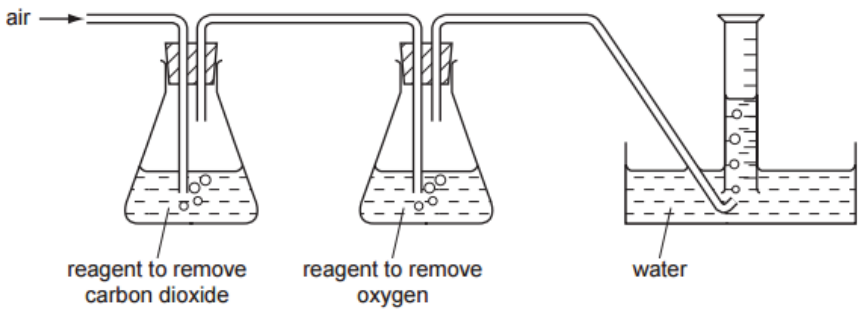
18 Which of the following statements about the need for recycling of metals is **false**?

A Fewer landfills are needed to dispose off waste material from metal extraction.
B Recycling helps to conserve resources such as fossil fuels.
C Recycling metals is always cheaper than extracting metals from the Earth.
D Waste materials from metal extraction may lead to air and water pollution.

www.KiasuExamPaper.com

Downloaded from SingaKids.com

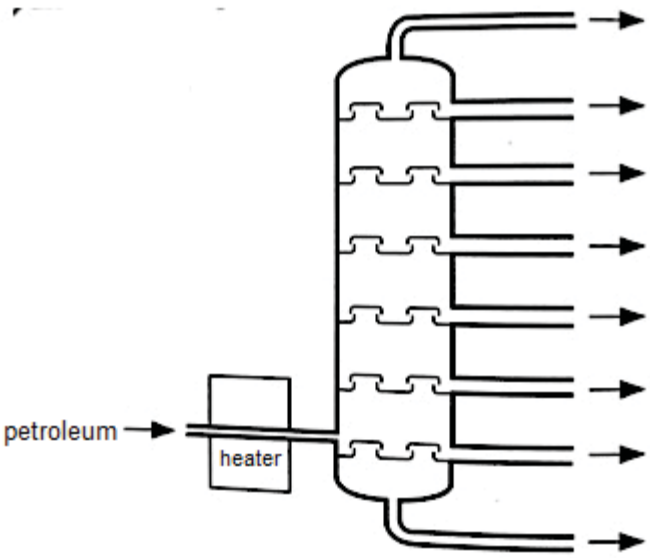
19 The diagram shows an experiment on the composition of air.



The volume of the air that passes into the apparatus is 100 cm^3. What is the volume and the composition of the gas collected in the measuring cylinder?

	volume / cm^3	composition
A	20	nitrogen and other gases
B	20	pure nitrogen
C	80	nitrogen and other gases
D	80	pure nitrogen

20 The diagram shows the apparatus used for the fractional distillation of petroleum.



Which statement about the fractional distillation of petroleum is correct?

A At each level in the column, only one compound is collected.
B The higher up in the column, the higher the temperature.
C The fraction collected at the bottom of the column is the most flammable.
D The molecules of the fraction collected on the top of the column have the smallest relative molecular masses.

End of Paper

www.KiasuExamPaper.com

Downloaded from SingaKids.com

Name:	Index Number:	Class:

HUA YI SECONDARY SCHOOL

4NA

Mid-Year Examination 2018

4NA

SCIENCE(CHEMISTRY)

5105/4

Paper 4

7 May 2018

1 hr 15 min

Candidates answer on the Question Paper.
Additional Materials: NIL

READ THESE INSTRUCTIONS FIRST

Write your Name, Index Number and Class on all the work you have done.
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 **two** out of three questions.
Write your answers in the spaces provided on the question paper.
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 9.

For Examiner's Use	
Section A	
Section B	
Total	

This document consists of **9** printed pages including the cover page.
© HYSS 2018
No part of this document may be reproduced in any form or transmitted in any form or by any means without the prior permission of Hua Yi Secondary School.
[Turn Over

Setter: Ms Chiang Wai Kit

Downloaded from SingaKids.com

Section A [14 marks]
Answer **all** the questions in the spaces provided.

1 The arrangement of electrons in the atoms of six different elements is shown in the table. The letters do not represent the chemical symbols of the elements.

element	**P**	**Q**	**R**	**S**	**T**	**U**
arrangement of electrons in the atoms	2,4	2,6	2,7	2,8,1	2,8,6	2,8,8

Use the letters, **P**, **Q**, **R**, **S**, **T** and **U** to answer the following questions.

(a) Which elements belong to the same group?

……... [1]

(b) What is the formula of the compound formed between elements **S** and **T**?

……... [1]

(c) Which element forms a basic oxide?

……... [1]

(d) Which element has a proton number of 8?

……... [1]

[Total: 4]

2 A student reacted the following reactants with sulfuric acid.

reactant	observation	formula of salt formed
lead	small amount of effervescence produced for a few seconds	$PbSO_4$
zinc carbonate	effervescence	$ZnSO_4$

(a) The student weighed the salts and found that 5 g of zinc sulfate was produced. Calculate the amount of zinc sulfate produced, in moles.

amount of zinc sulfate = ……mol [2]

www.KiasuExamPaper.com

Downloaded from SingaKids.com

(b) Explain why the reaction of lead and sulfuric acid did **not** go to completion.

……...

……... [2]

(c) Sugggest a more suitable choice of reactants to produce lead sulfate.

reactant 1: ……

reactant 2: ……. [2]

[Total: 6]

3 Motor vehicles emit harmful gases to the atmosphere every year. When cars remain stationary with engines turned on, gases such as carbon monoxide may be produced. When cars are accelerating, gases such as nitrogen dioxide may be produced.

(a) Complete the table below.

name of gas	harmful effect on human/ environment
carbon monoxide	
nitrogen dioxide	

[2]

(b) Suggest why nitrogen dioxide will be formed when cars accelerate.

……...

……... [2]

[Total: 4]

www.KiasuExamPaper.com

Downloaded from SingaKids.com

Section B [16 marks]
Answer any **two** questions.
Answer **all** the questions in the spaces provided.

4 An experiment is carried out to investigate the reaction between aqueous sodium hydroxide and an acid. In this reaction, sodium sulfate is produced.

A solution of the acid is placed in a burette. A pipette is used to transfer a 20.0 cm^3 portion of aqueous sodium hydroxide into a conical flask. Three drops of universal indicator are added to the conical flask. The mixture is swirled and its temperature is taken.

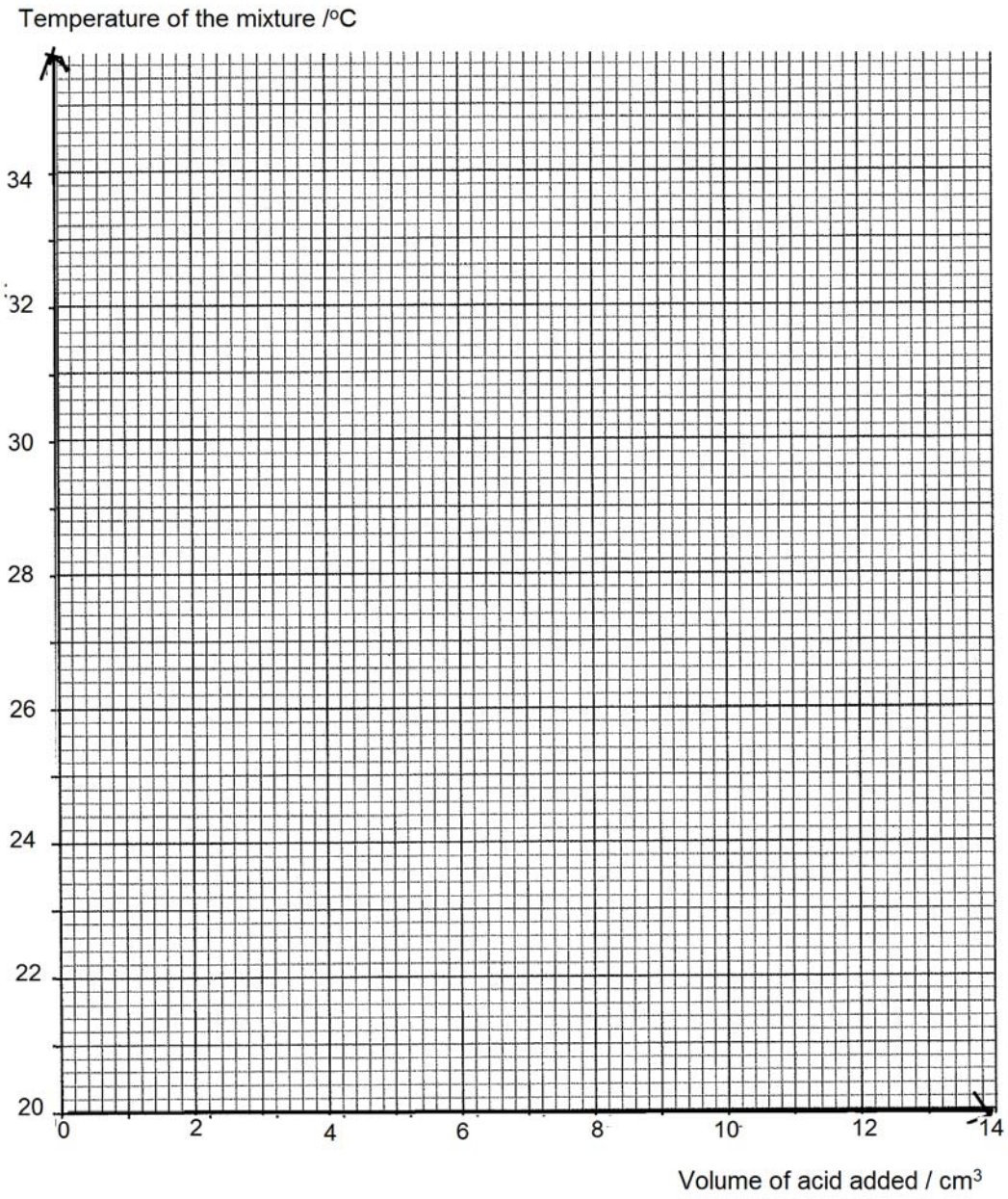
To this mixture, 2.0 cm^3 of the acid is added with swirling and the highest temperature reached is measured and recorded. This is repeated several times. The results for this experiment are shown in the table.

volume of acid added / cm^3	0.0	2.0	4.0	6.0	8.0	10.0	12.0	14.0
temperature of the mixture / °C	25.4	27.0	28.6	30.2	31.4	30.1	28.8	27.5

www.KiasuExamPaper.com

Downloaded from SingaKids.com

(a) Plot a graph of the temperature of the mixture against volume of acid added. Draw **two** straight lines that intersect, taking into account all the relevant points, to show the rise and the fall in temperature.



[3]

(b) What is the name of this salts preparation method?

…….. [1]

(c) **(i)** Complete neutralisation of sodium hydroxide solution occurs at the point where the two graph lines intersect (cross). Use your graph to determine the volume of acid required to exactly neutralise the aqueous sodium hydroxide.

…….cm^3 [1]

www.KiasuExamPaper.com

Downloaded from SingaKids.com

(ii) What was the colour of the Universal Indicator when it was first added into the solution in the conical flask?

…….. [1]

(d) Name the acid used in this experiment.

……... [1]

(e) Write the ionic equation of this reaction.

……... [1]

[Total: 8]

5 A student uses four different metals, **V**, **W**, **X** and **Y** to react with hydrochloric acid solutions. She uses equal volume and concentration of acid and the same mass of metal. Some of the metals react with the acid to give a gas.

The results are shown in the table.

metal	gas given off	time for $20cm^3$ of gas to be collected /s
V	yes	4
W	no	none collected
X	yes	43
Y	yes	97

Use the letters, **V**, **W**, **X**, and **Y** to answer the following questions.

(a) Which metal is the most reactive?

……... [1]

(b) Which metals are above hydrogen in the reactivity series?

……... [1]

(c) Which metal can displace **X** from its from its solution?

……... [1]

(d) Suggest a method for extracting metal **Y** from its oxide.

……... [1]

www.KiasuExamPaper.com

Downloaded from SingaKids.com

(e) Suggest the identity for metal **W**.

……... [1]

(f) **(i)** Name the gas produced when the metals react with hydrochloric acid.

……. [1]

(ii) Describe a test for the gas produced. Include the observation in your answer.

test…….

observation..…….

……. [2]

[Total: 8]

6 **(a)** The table shows information about halogens.

halogen	physical state	colour
astatine		black
chlorine	gas	
	solid	purplish black
bromine	liquid	

(i) Complete the blanks in the table above. [2]

(ii) Describe and explain what happens when chlorine is bubbled into aqueous sodium bromide.

……

……

……. [2]

(iii) Write a balanced chemical equation, with state symbols for the reaction in **(a)(ii)**.

……. [2]

www.KiasuExamPaper.com

Downloaded from SingaKids.com

(b) Chlorine and argon are in the same period in the Periodic Table. Chlorine is reactive while argon is **not**. Use the electronic structures of both chlorine and argon to explain the above statement.

……..…...

……...…….. [2]

[Total: 8]

End of Paper

www.KiasuExamPaper.com

Downloaded from SingaKids.com

The Periodic Table of Elements

Group																		
I	II										III	IV	V	VI	VII	0
					1 H hydrogen 1												2 He helium 4
3 Li lithium 7	4 Be beryllium 9										5 B boron 11	6 C carbon 12	7 N nitrogen 14	8 O oxygen 16	9 F fluorine 19	10 Ne neon 20
11 Na sodium 23	12 Mg magnesium 24										13 Al aluminium 27	14 Si silicon 28	15 P phosphorus 31	16 S sulfur 32	17 Cl chlorine 35.5	18 Ar argon 40
19 K potassium 39	20 Ca calcium 40	21 Sc scandium 45	22 Ti titanium 48	23 V vanadium 51	24 Cr chromium 52	25 Mn manganese 55	26 Fe iron 56	27 Co cobalt 59	28 Ni nickel 59	29 Cu copper 64	30 Zn zinc 65	31 Ga gallium 70	32 Ge germanium 73	33 As arsenic 75	34 Se selenium 79	35 Br bromine 80	36 Kr krypton 84
37 Rb rubidium 85	38 Sr strontium 88	39 Y yttrium 89	40 Zr zirconium 91	41 Nb niobium 93	42 Mo molybdenum 96	43 Tc technetium -	44 Ru ruthenium 101	45 Rh rhodium 103	46 Pd palladium 106	47 Ag silver 108	48 Cd cadmium 112	49 In indium 115	50 Sn tin 119	51 Sb antimony 122	52 Te tellurium 128	53 I iodine 127	54 Xe xenon 131
55 Cs caesium 133	56 Ba barium 137	57 – 71 lanthanoids	72 Hf hafnium 178	73 Ta tantalum 181	74 W tungsten 184	75 Re rhenium 186	76 Os osmium 190	77 Ir iridium 192	78 Pt platinum 195	79 Au gold 197	80 Hg mercury 201	81 Tl thallium 204	82 Pb lead 207	83 Bi bismuth 209	84 Po polonium –	85 At astatine –	86 Rn radon –
87 Fr francium –	88 Ra radium –	89 – 103 actinoids	104 Rf Rutherfordium –	105 Db dubnium –	106 Sg seaborgium –	107 Bh bohrium –	108 Hs hassium –	109 Mt meitnerium –	110 Ds darmstadtium –	111 Rg roentgenium –	112 Cn copernicium –		114 Fl flerovium –		116 Lv livermorium –		

Key

proton (atomic) number
atomic symbol
name
relative atomic mass

lanthanoids	57 La lanthanum 139	58 Ce cerium 140	59 Pr praseodymium 141	60 Nd neodymium 144	61 Pm promethium –	62 Sm samarium 150	63 Eu europium 152	64 Gd gadolinium 157	65 Tb terbium 159	66 Dy dysprosium 163	67 Ho holmium 165	68 Er erbium 167	69 Tm thulium 169	70 Yb ytterbium 173	71 Lu lutetium 175
actinoids	89 Ac actinium –	90 Th thorium 232	91 Pa protactinium 231	92 U uranium 238	93 Np neptunium –	94 Pu plutonium –	95 Am americium –	96 Cm curium –	97 Bk berkelium –	98 Cf californium –	99 Es einsteinium –	100 Fm fermium –	101 Md mendelevium –	102 No nobelium –	103 Lr lawrencium –

www.KiasuExamPaper.com

Downloaded from SingaKids.com

Downloaded from SingaKids.com

4NA Science(Chemistry) Mid-Year Examination 2018
Marking Scheme

Paper 3 [Total 20]
MCQ

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

Paper 4
Section A [Total 14]

Question No.			Marks
1	(a)	Q and T	1
	(b)	S_2T / Na_2O	1
	(c)	S	1
	(d)	Q	1
		Total :	**4**
2	(a)	Mr of $ZnSO_4$ = 65+32+4(16)= 161 [1] No. of moles of $ZnSO_4$ = 5/161 = 0.0311 mol [1]	2
	(b)	lead and sulfuric acid forms <u>insoluble</u> lead sulfate [1] which will cover the lead and prevent further reaction. [1]	2
	(c)	lead nitrate and sodium sulfate (any soluble salts of lead and sulfates)	2
		Total :	**6**
3	(a)		**2**

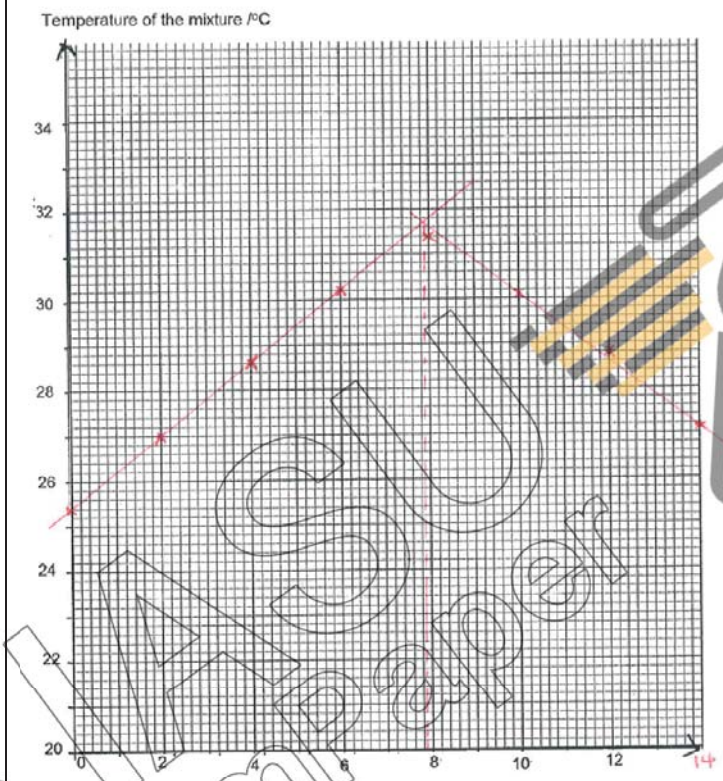
name of gas	harmful effect on human/ environment
carbon monoxide	combines with haemoglobin in blood, causes breathing difficulty and eventually death. (headaches, fatigue accepted)
nitrogen dioxide	respiration difficulties, eye irritation, lung irritation, inflammation of lungs.

KiasuExamPaper

Downloaded from SingaKids.com

				□ causes acid rain (resulting in plant damage, loss of marine life, corrosion on buildings)	
	(b)	The high temperatures in car engines during acceleration [1] causes the nitrogen to undergo combustion with oxygen [1]			**2**
				Total :	**4**

Section B [Total 24]

4	(a)	 Correct plot points [1] Best fit line [1m each]	3
	(b)	titration	1
	(c)(i)	7.9 cm^3	1
	(ii)	purple	1
	(d)	sulfuric acid	1
	(e)	$H^+ (aq) + OH^- (aq) \rightarrow H_2O (l)$ (Reject if no state symbols are given)	1
		Total :	**8**
5	(a)	V	1
	(b)	V, X and Y	1
	(c)	Y	1

KiasuExamPaper

Downloaded from SingaKids.com

	(d)	Heating with carbon	1
	(e)	Copper, Mercury, Silver, Gold, Platinum	1
	(f)(i)	hydrogen	1
	(ii)	Test: Place lighted splint at the mouth of the test tube. Observation: Lighted splint extinguishes with a"pop" sound.	2
6	(i)		

halogen	physical state	colour
astatine	**solid**	black
chlorine	gas	**yellowish-green**
iodine	solid	purplish black
bromine	liquid	**reddish brown/ brown**

		Every 2 correct ans [1]	2
	(ii)	Colourless solution turns reddish brown. [1] Chlorine is more reactive than bromine, displaces bromine from sodium bromide. [1]	2
	(iii)	Cl_2 (g) + KBr(aq) → KCl (aq) + Br_2 (aq) (1m for chemical eqn) (1m for state symbol)	2
	(b)	Argon atom as a full electronic structure. (reject noble gas) Chlorine atom has 7 valence electrons which has a / incompletely filled valence electron shell.	1 1
		Total :	**8**

KiasuExamPaper

Downloaded from SingaKids.com