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Name:	Index Number:	Class:
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HUA YI SECONDARY SCHOOL

3E

Mid-Year Examination 2017

3E

SCIENCE (PHYSICS, CHEMISTRY)

5076/01

Paper 1 Multiple Choice

8 May 2017

30 min

Candidates answer on the Multiple Choice Answer Sheet
Additional Materials: Multiple Choice Answer Sheet

READ THESE INSTRUCTIONS FIRST

Write your Name, Index Number and Class on the Answer Sheet in the spaces provided.

Write in soft pencil.

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

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 Answer Sheet.

Read the instructions on the Answer Sheet very carefully.

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

Any rough working should be done in this booklet.

For Examiner's Use

Paper 1

This document consists of **10** printed pages including the cover page.

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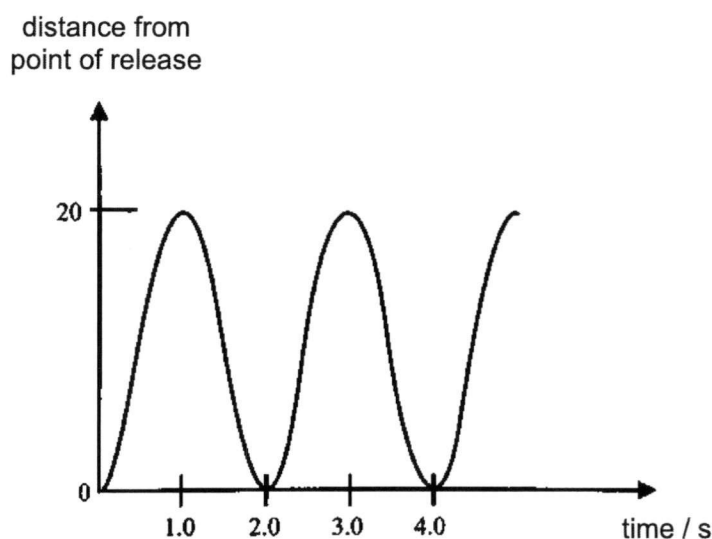
[Turn Over]

- 1 The diameter of a steel ball is measured using a micrometer screw gauge. A student takes an initial zero reading and then a reading of the diameter. The two diagrams show the micrometer screw gauge readings.



What is the diameter of the steel ball?

- A 5.13 mm
B 5.15 mm
C 5.14 mm
D 5.55 mm
- 2 The bob of a simple pendulum is pulled to one side and released. The motion during the swing is shown on the graph below.



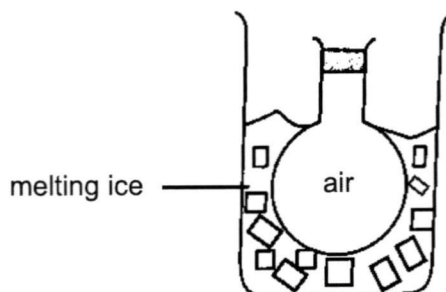
What is the period of the pendulum?

- A 1.0 s
B 2.0 s
C 3.0 s
D 4.0 s
- 3 Which statement about a gravitational field is correct?
- A A gravitational field is a region in which an object experiences a force because of its mass.
B A gravitational field is a region in which an object experiences a force because it is charged.
C The gravitational field of the Earth acts outwards from its surface.
D The strength of the Moon's gravitational field is less than the Earth's because it has no atmosphere.

- 4 A ball is brought from the Earth to the Moon.

Which of these statements about the ball's inertia is true?

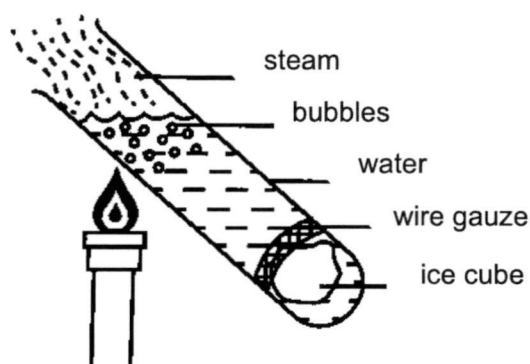
- A** The inertia will decrease because weight decreases.
B The inertia will decrease because mass decreases.
C The inertia will remain the same because weight remains constant.
D The inertia will remain the same because mass remains constant.
- 5 A round-bottomed flask is filled with air and tightly capped at room temperature. The flask is then placed in melting ice as shown in the diagram below. The flask stays the same size.



Which of the following is true about the kinetic energy and average spacing between the air molecules in the flask?

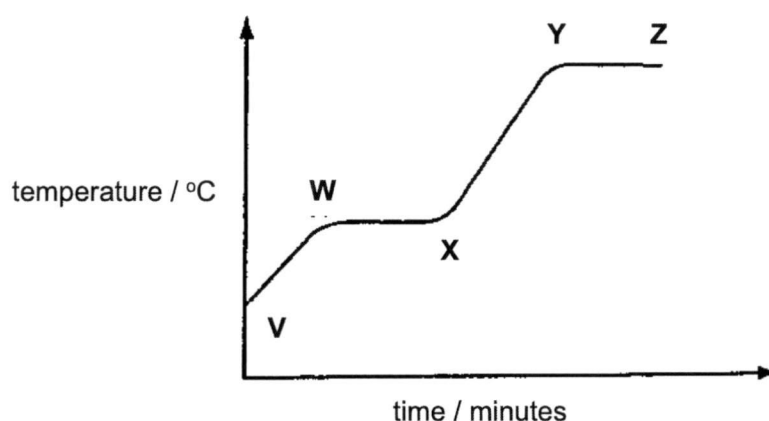
	kinetic energy	average spacing between molecules
A	decreases	decreases
B	decreases	remains constant
C	remains constant	decreases
D	remains constant	remains constant

- 6 An experiment is carried out as shown in the diagram.



Why does the ice take a long time to melt?

- A Water is a poor conductor of heat.
 B Convection cannot occur in water.
 C The gauze prevents thermal energy from reaching the ice.
 D Ice is a poor conductor of heat.
- 7 Some ice is placed in a beaker and heated. The graph shows the temperature of the beaker and its contents during the experiment.



Between which two points on the graph does the beaker contain a mixture of liquid and gas?

- A Y and Z
 B W and X
 C X and Y
 D V and W

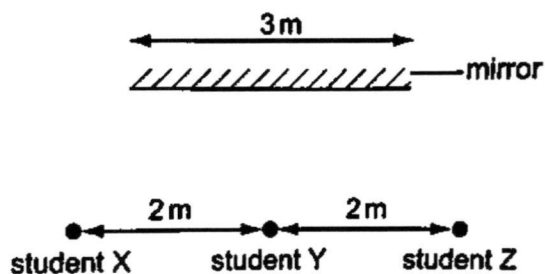
- 8 A woman stands in front of a plane mirror. She sees an image of herself in the mirror.

plane mirror



The woman moves 2.0 m further away from the mirror.
What happens to the distance between the woman and her image?

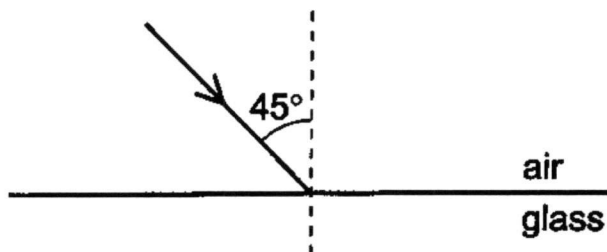
- A decreases by 2.0 m
B decreases by 4.0 m
C increases by 2.0 m
D increases by 4.0 m
- 9 Three students stand 2 m apart in front of a plane mirror which is 3 m long. Student Y is standing opposite the mid-point of the mirror.



How many students can see the images of the other two?

- | | |
|-----|-----|
| A 0 | B 1 |
| C 2 | D 3 |

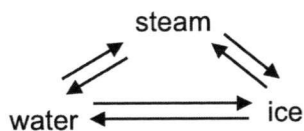
- 10 The diagram shows a ray of light entering a glass block of refractive index 1.67 at an angle of incidence of 45° .



By how many degrees does the light ray change direction when entering the glass?

- | | |
|---------------------|---------------------|
| A 15° | B 20° |
| C 25° | D 45° |

- 11 In which conversion do water molecules gain speed?



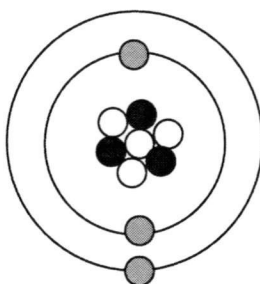
- A steam $\rightarrow$ ice
 B steam $\rightarrow$ water
 C water $\rightarrow$ ice
 D water $\rightarrow$ steam
- 12 Ethanol boils at 78 °C and water boils at 100 °C. Ethanol and water are miscible with each other.

Which method is used to separate a mixture of these two liquids?

- A evaporation
 B filtration
 C fractional distillation
 D simple distillation
- 13 Which of the following is **not** a molecule?

- A Ar
 B Cl₂
 C HCl
 D P₄

- 14 The diagram below represents an atom of the element Z.

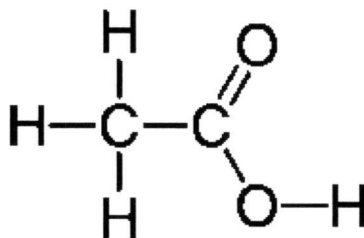


Which symbol represents this element?

- A ${}^3_7\text{Z}$
 B ${}^7_3\text{Z}$
 C ${}^7_{10}\text{Z}$
 D ${}^{10}_7\text{Z}$

- 15 Sodium reacts with chlorine to form an ionic compound. Which of the following statements about the compound formed is false?
- A Chlorine gains an electron from sodium to form a negative ion.
 - B Sodium gains seven electrons to form a positive ion.
 - C The chemical formula of the compound is NaCl.
 - D The electrostatic forces of attraction between sodium ions and chloride ions are strong.

- 16 The diagram below shows a structural formula of a compound.



How many electrons are involved in bonding in a molecule of this compound?

- A 7
 - B 8
 - C 14
 - D 16
- 17 Which pair of elements form a compound by sharing electrons?
- A carbon and chlorine
 - B lithium and iodine
 - C neon and oxygen
 - D potassium and bromine
- 18 Substance **T** has the following properties.
1. white crystalline solid at room temperature
 2. melts at 65 °C
 3. does not conduct electricity in solid or molten state

Which of the following statements about substance **T** is correct?

- A Substance **T** has a giant ionic structure.
- B Substance **T** has a simple covalent structure.
- C Substance **T** is lithium chloride.
- D Substance **T** is silver.

- 19 When sodium metal reacts with oxygen gas, a compound is formed.

Which of the following shows the correct chemical formula and name of the compound?

	chemical formula	chemical name
A	NaO	sodium oxide
B	Na ₂ O	sodium oxide
C	NaO	sodium oxygen
D	Na ₂ O	sodium oxygen

- 20 An equation is shown.



Which numbers will correctly balance this equation?

	<i>x</i>	<i>y</i>
A	1	1
B	1	2
C	2	1
D	2	2

End of Paper

The Periodic Table of the Elements

Group																			
I	II	1 H hydrogen 1										III	IV	V	VI	VII	0		
7 Li lithium 3	9 Be beryllium 4											11 B boron 5	12 C carbon 6	14 N nitrogen 7	16 O oxygen 8	19 F fluorine 9	20 Ne neon 10		
23 Na sodium 11	24 Mg magnesium 12											27 Al aluminium 13	28 Si silicon 14	31 P phosphorus 15	32 S sulfur 16	35.5 Cl chlorine 17	40 Ar argon 18		
39 K potassium 19	40 Ca calcium 20	45 Sc scandium 21	48 Ti titanium 22	51 V vanadium 23	52 Cr chromium 24	55 Mn manganese 25	56 Fe iron 26	59 Co cobalt 27	59 Ni nickel 28	64 Cu copper 29	65 Zn zinc 30	70 Ga gallium 31	73 Ge germanium 32	75 As arsenic 33	79 Se selenium 34	80 Br bromine 35	84 Kr krypton 36		
85 Rb rubidium 37	88 Sr strontium 38	89 Y yttrium 39	91 Zr zirconium 40	93 Nb niobium 41	96 Mo molybdenum 42	101 Tc technetium 43	101 Ru ruthenium 44	103 Rh rhodium 45	106 Pd palladium 46	108 Ag silver 47	112 Cd cadmium 48	115 In indium 49	119 Sn tin 50	122 Sb antimony 51	128 Te tellurium 52	127 I iodine 53	131 Xe xenon 54		
133 Cs caesium 55	137 Ba barium 56	139 La lanthanum 57	178 Hf hafnium 72	181 Ta tantalum 73	184 W tungsten 74	186 Re rhenium 75	190 Os osmium 76	192 Ir iridium 77	195 Pt platinum 78	197 Au gold 79	201 Hg mercury 80	204 Tl thallium 81	207 Pb lead 82	209 Bi bismuth 83	210 Po polonium 84	210 At astatine 85	222 Rn radon 86		
Fr francium 87	Ra radium 88	Ac actinium 89																	
*58-71 Lanthanoid series																			
†90-103 Actinoid series																			
140 Ce cerium 58	141 Pr praseodymium 59	144 Nd neodymium 60	147 Pm promethium 61	150 Sm samarium 62	152 Eu europium 63	157 Gd gadolinium 64	159 Tb terbium 65	162 Dy dysprosium 66	165 Ho holmium 67	167 Er erbium 68	169 Tm thulium 69	173 Yb ytterbium 70	175 Lu lutetium 71	102 No nobelium 102	101 Md mendelevium 101	103 Lr lawrencium 103			
Key a X b																			
a = relative atomic mass X = atomic symbol b = proton (atomic) number																			

Key

a

X

b

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

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

Name:

Index Number:

Class:

3E



HUA YI SECONDARY SCHOOL

Mid-Year Examination 2017

3E

SCIENCE (CHEMISTRY)

5076/03

Paper 3

4 May 2017

1 hour

Additional Materials: NIL

READ THESE INSTRUCTIONS FIRST

Write your Name, Index Number and Class at the top of this page.

Write in dark blue or black pen.

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

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

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

Section A

Answer **all** questions.

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

Section B

Answer **all** 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 11.

FOR EXAMINER'S USE

Section A	
Section B	
TOTAL	

This document consists of 11 printed pages including the cover page.

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[Turn Over]

Setter: Mdm Nurul Dini

Section A (30 marks)

Answer all questions.

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

- 1 Fig. 1 shows the heating curve of substance B.

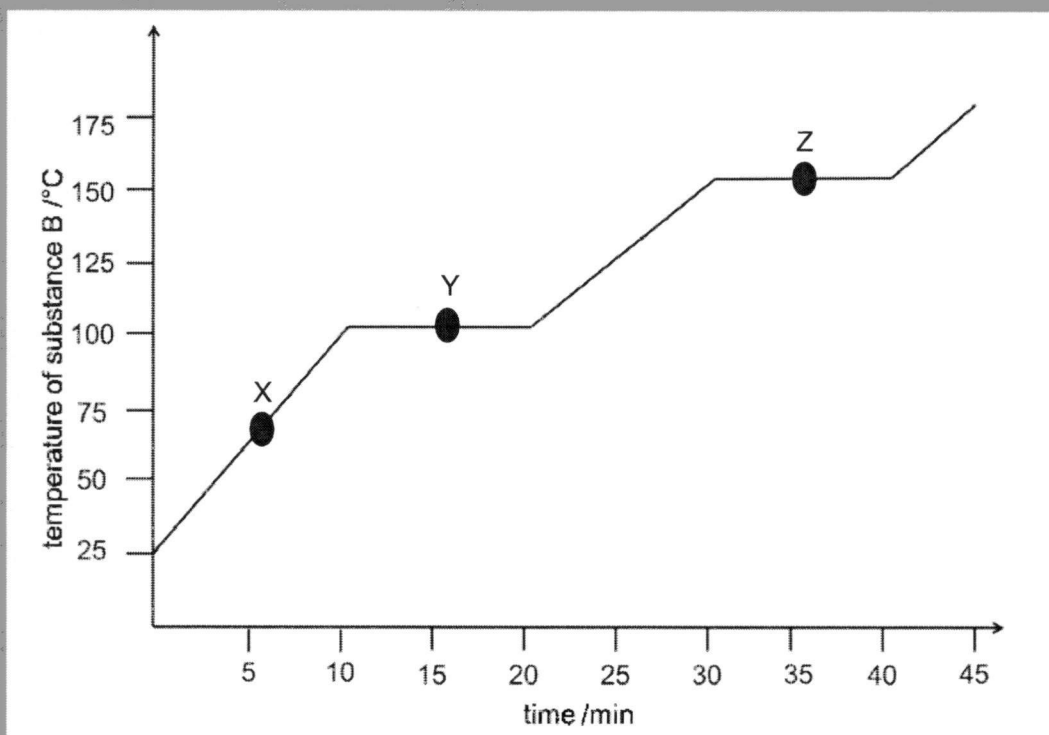


Fig. 1

- (a) What is/are the physical state(s) of B at

(i) point X?

..... [1]

(ii) point Y?

..... [1]

(iii) point Z?

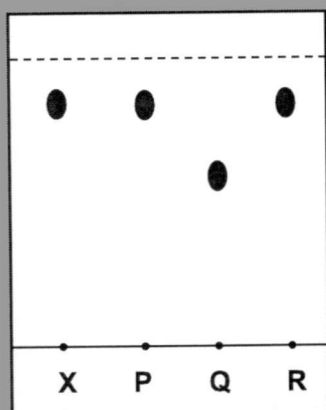
..... [1]

- (b) Determine if substance B is pure or impure. Explain your answer, citing evidence from the curve.

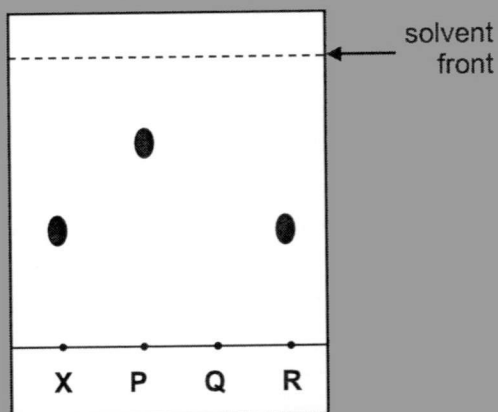
..... [2]

[Total: 5]

- 2 The ink, **X**, from a forged letter was analysed with three other inks, **P**, **Q** and **R**, taken from the pens of three suspects. Two chromatograms are shown below were obtained using different solvents, water and ethanol.



water as solvent



ethanol as solvent

- (a) Explain, using the results from the chromatogram, why it was necessary to carry out the second chromatogram using a different solvent.

.....
 [2]

- (b) Which ink, **P**, **Q** or **R**, has been used to write the forged letter?

..... [1]

- (c) Explain why ink **Q** produces a spot in water but not in ethanol.

..... [1]

[Total: 4]

- 3 (a) Name the piece of apparatus most suitable to complete the following laboratory actions:

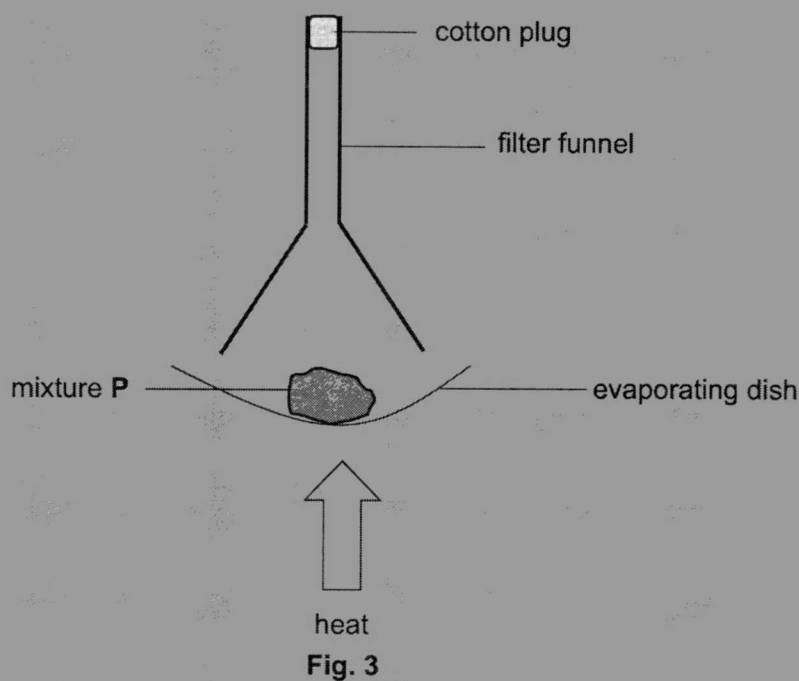
(i) measure 22.5 cm^3 of solution into a beaker

..... [1]

(ii) add exactly 25.0 cm^3 of solution to each of several beakers

..... [1]

- (b) Mixture **P** consists of sand, ammonium chloride and sodium chloride. The apparatus in Fig. 3 can be used to separate one of the substances that is found in mixture **P**.



- (i) After mixture **P** is heated, what substances will be left as residue?

..... [1]

- (ii) Describe the steps taken to obtain pure and dry samples of each component of the residue that is left in (b)(i).

.....

.....

..... [3]

[Total: 6]

- 4 The boxes in Fig. 4 show the arrangement of atoms in four substances.

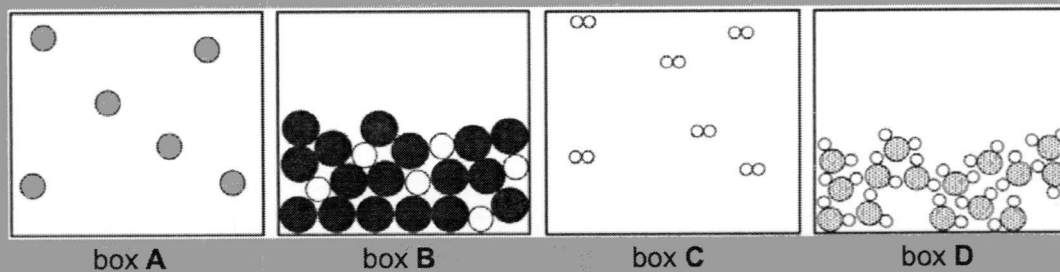


Fig. 4

- (a) Identify whether each substance contains an element, compound or mixture.

box A

box B

box C

box D

[2]

- (b) State two differences between compounds and mixtures.

difference 1:

.....

difference 2:

.....

[2]

[Total: 4]

- 5 Fig. 5 shows the proton number of four elements, **W**, **X**, **Y** and **Z**.

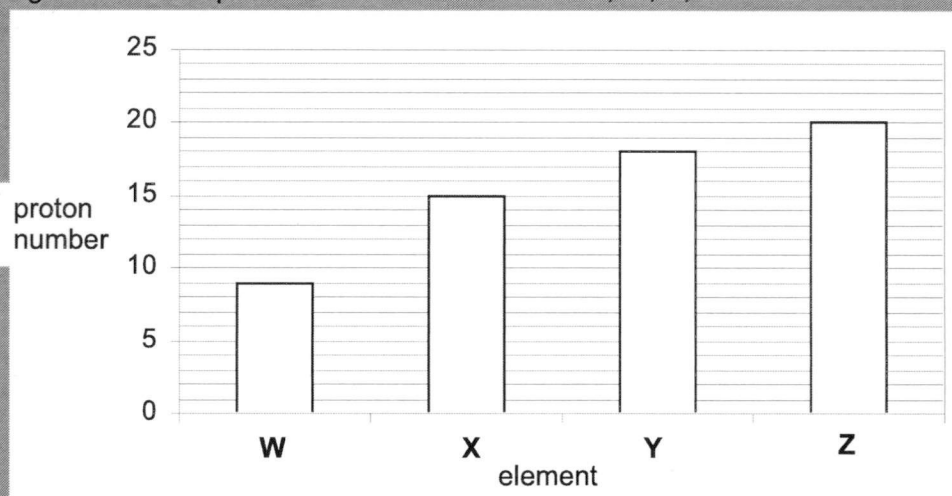


Fig. 5

- (a) Which element has atoms that could form ions with the biggest negative charge?

..... [1]

- (b) State the electronic configuration of the element which has the most number of valence electrons.

..... [1]

- (c) Element **Z** reacts with element **W** to form a white solid **Q**.

- (i) State the chemical formula of **Q**.

..... [1]

- (ii) Draw the 'dot-and-cross' diagram of **Q**.

[2]

- (iii) State a property that **Q** would have.

..... [1]

[Total: 6]

- 6 (a) Complete Table 6 by giving the appropriate name or chemical formula.

Table 6

name	chemical formula
potassium nitrate	
	MgCO ₃
ammonia	

[3]

- (b) Solid lithium metal reacts explosively with water to produce hydrogen gas and a solution of lithium hydroxide.

Write a balanced chemical equation, including state symbols, for this reaction.

..... [2]

[Total: 5]

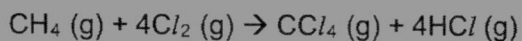
End of Section A

Section B (20 marks)

Answer **ALL** questions.

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

- 7 Methane (CH_4) is a colourless gas which reacts with chlorine gas to form tetrachloromethane (CCl_4) and hydrogen chloride (HCl). The reaction requires UV light to activate the chlorine. The reaction is as shown below:



The solubility and density of the products of this reaction are given in Table 7.

Table 7

name of gas	solubility of gas in water	density of gas compared to air
tetrachloromethane	insoluble	higher
hydrogen chloride	highly soluble	higher

- (a) Using the Kinetic Particle Theory, describe the movement and arrangement of the particles of methane at room temperature.

.....
 [2]

- (b) Explain why methane is a gas at room temperature.

.....
 [2]

- (c) Draw the 'dot-and-cross' diagram to show the bonds in methane. You only need to show outer shell electrons.

[2]

- (d) Assuming that methane has completely reacted with chlorine gas, describe, with a use of a diagram, the steps required to obtain a pure sample of tetrachloromethane from the products of the reaction.

.....

.....

.....

[2]

- (e) A student wanted to draw the structure of hydrogen chloride gas. The student's drawing is shown in Fig. 7.1.

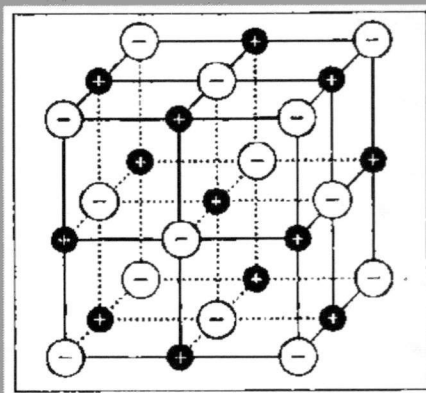


Fig. 7.1

Do you agree with the student's representation of the structure of hydrogen chloride gas? Explain your answer.

.....

.....

[2]

[Total: 10]

[TURN OVER]

- 8 Table 8 shows the information of five different particles.

Table 8

particle	relative mass	relative charge
A	2	+2
B	0	-1
C	1	+1
D	4	+2
E	9	0

- (a) Which particle is an electron? Explain your answer.

..... [1]

- (b) State the identity of particle **C**.

..... [1]

- (c) Which particle could be made up of two protons but no neutrons in the nucleus? Explain your answer.

..... [2]

- (d) Which two particles could represent the nuclei of isotopes? Explain your answer.

..... [3]

- (e) **E** has a proton number of 4. **E** and lithium have very different chemical reactivities. Use their electronic structure to explain the difference.

..... [3]

[Total: 10]

End of Paper

The Periodic Table of Elements

Group																		III	IV	V	VI	VII	0									
I	II																					2 He helium 4										
Key proton (atomic) number atomic symbol name relative atomic mass												5 B boron 11	6 C carbon 12	7 N nitrogen 14	8 O oxygen 16	9 F fluorine 19	10 Ne neon 20															
3 Li lithium 7	4 Be beryllium 9											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															
11 Na sodium 23	12 Mg magnesium 24	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	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	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 -																	
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 -

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

HUA YI SECONDARY SCHOOL
MID-YEAR EXAMINATION

SECONDARY 3 EXPRESS 2017
Marking Scheme

SCIENCE (CHEMISTRY)

Paper 1 [20 marks]

11	12	13	14	15	16	17	18	19	20
D	C	A	B	B	D	A	B	C	C

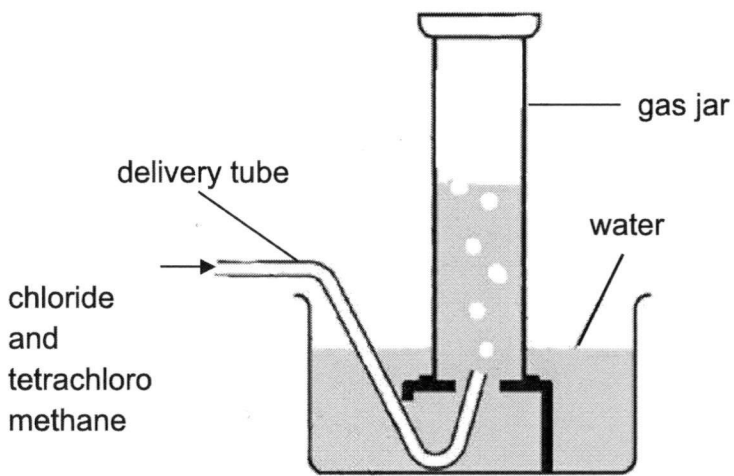
Paper 3

Section B

1ai	Solid	1
aII	Solid + Liquid	1
aIII	Liquid + Gas	1
b	Substance B is pure . ; Substance B has a fixed melting point of 100 °C / fixed boiling point of 160 °C . (no marks if temperature is not given);	1 1
2a	The results from the first chromatogram with water shows that ink X can either be from ink P or R . Thus, the identification of the culprit cannot be determined.	1 1
b	Ink R	1
c	Ink Q is soluble in water but not in ethanol.	1
3ai	Measuring cylinder or burette	1
ii	Pipette	1
bi	Sand and sodium chloride	1
ii	Add water to the mixture of sand and sodium chloride to dissolve the sodium chloride. After filtration of the mixture, sand will be left as residue while sodium chloride solution will be obtained as filtrate . To obtain dry sample of sodium chloride, evaporate the solution to dryness .	1 1 1
4a	Box A: element Box B: mixture Box C: element Box D: compound (any 2 correct = 1 mark)	2
b	Any two of the differences:	

	- Components in mixtures can be separated by physical means but components in compounds can only be separated by chemical means. ; - Chemical properties of mixture is the same as those of its components but chemical properties of a compound are different from those of its constituent elements. - Little or no energy change is involved in making mixtures but energy change is involved in making compounds. - Components in mixtures are not mixed in a fixed ratio but constituent elements in a compound are combined in a fixed ratio	2
5a	X	1
b	2.8.8	1
ci	1m – correct bonding 1m – correct number of electrons and charge on ions	2
cii	ZW ₂	1
ciii	Any of the following properties: - High melting and boiling point - Conducts electricity only in molten and aqueous state - Soluble in water but insoluble in organic solvents	1
6a	KNO₃ Magnesium carbonate NH₃	1 1 1
b	Li (s) + H₂O (l) → LiOH (aq) + H₂ (g) 1m – correct chemical formula & correctly balanced 1m – correct state symbols	2

Section C [20 marks]

7(a)	methane particles are moving randomly in all directions ; particles are arranged randomly and are far apart	1 1
b	methane is a covalent substance and has a low boiling point . Little energy is required to overcome the weak intermolecular forces of attraction between methane molecules.	1; 1;
c		2
d	To obtain tetrachloromethane, displacement of water method is used. Hydrogen chloride will dissolve in water while tetrachloromethane will be collected in the gas jar as it is insoluble in water. 	2m for diagram (with labels)
7e	No , the structure that the student drew was that of a giant ionic structure . However, hydrogen chloride has a simple covalent structure .	1 1
8a	B. An electron has negligible relative mass and has a charge of -1 .	1 1
b	Hydrogen ion	1
c	A, a proton has a relative mass of 1 and carries a positive charge of +1 .	1 1
d	A and D They contain the same number of positive charges thus indicating that they have the same number of protons. They have different relative masses, indicating that the number of neutrons in the nucleus is different.	1 1 1

e	E has an electronic structure of 2.2 while lithium has an electronic structure of 2.1 . Elements belonging to same group have the same chemical reactivities due to the same number of valence electrons . Since E and lithium belong to different groups, they have different chemical reactivities.	1 1 1
---	--	-------------