East Spring Secondary School
Towards Excellence and Success

Name: _____ **(** **)**

Class: _____

Second Semester Examination 2017
Secondary 3 Express

Science (Chemistry)

Wednesday
04 October 2017

1hour 45 minutes
1125 – 1310

Additional materials:
OTAS

INSTRUCTIONS TO CANDIDATES

1. Write your name, class and register number in the spaces provided above.

2. This paper consists of 3 sections (A, B and C).

   Section A [20 marks]
   Answer **ALL** questions in soft pencil on the OTAS.

   Section B [45 marks]
   Answer **ALL** questions in the spaces provided on pages 7 to 13.

   Section C [20 marks]
   Answer any **TWO** of the three questions in the spaces provided.

3. The use of calculator is allowed.

4. Hand in the OTAS and Question paper separately.

5. A copy of the Periodic Table is found on page 18.

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

Section	Marks
A	/20
B	/45
C	/20
Total	/85

This question paper consists of **18** printed pages including the cover page.

Section A [20 marks]

Answer **all** questions by shading on the OTAS provided.

1 The table below lists the properties of oxygen and chlorine.

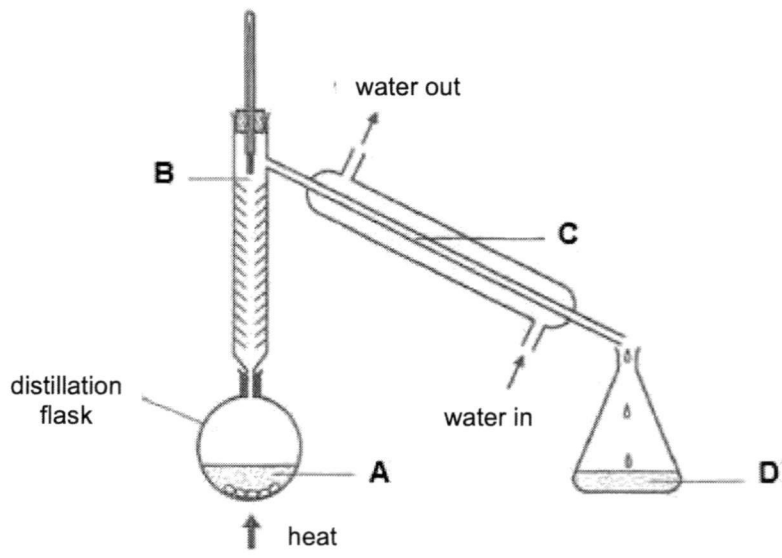
name of gas	solubility in water	density
oxygen	slightly soluble	slightly denser than air
chlorine	fairly soluble in water	much denser than air

Which is the best method to collect each gas?

	oxygen	chlorine
A	displacement of water	downward delivery
B	downward delivery	displacement of water
C	displacement of water	upward delivery
D	upward delivery	displacement of water

2 The diagram below shows a mixture of two miscible substances, **P** and **Q**, placed in a distillation flask. The boiling points of substances **P** and **Q** are 80°C and 98°C respectively.

Which of the following parts, **A** to **D**, in the diagram contains the highest portion of substance **P** when the temperature reaches 85°C?



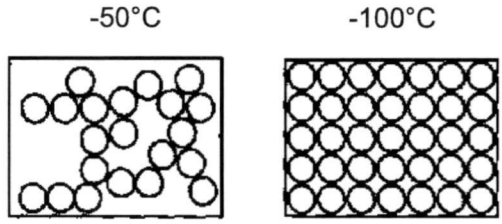
3 Which property can be used to show the purity of a sample of water?

A It is neither acidic nor alkaline.
B It does not leave a residue when boiled.
C It boils at a fixed temperature.
D It is a colourless liquid.

4 In which conversion does the particles of water move slower?

A ice → water
B water → steam
C ice → steam
D steam → water

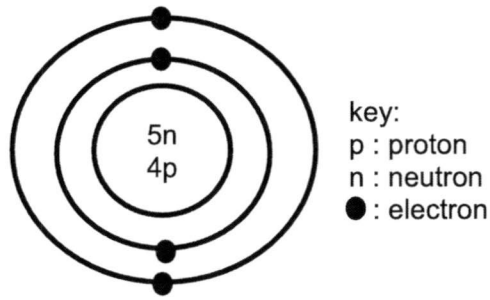
5 The diagrams show the arrangement of particles in substance **Z** at two different temperatures.



Which of the following shows the melting and boiling point of substance **Z**?

Substance	melting point/°C	boiling point/°C
A	-110	-45
B	-112	-88
C	-84	-53
D	-96	-48

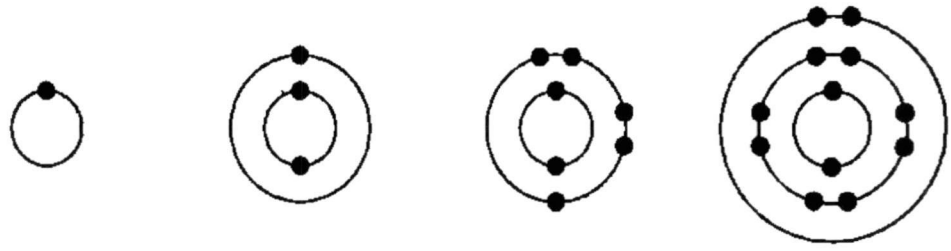
6 The diagram represents an atom of element **Y**.



Which symbol represent this atom?

A $^{9}_{4}Y$ **B** $^{9}_{5}Y$ **C** $^{4}_{9}Y$ **D** $^{5}_{9}Y$

7 The diagrams show the electronic structures of four elements.



Which elements are metals?

A 1 and 2 **B** 1 and 3

C 2 and 4 **D** 3 and 4

8 Which of the following shows the correct number of sub-atomic particles in an aluminium ion?

	number of protons	number of neutrons	number of electrons
A	13	14	13
B	13	14	10
C	13	27	13
D	13	27	10

9 The table below shows the atomic numbers of elements **X** and **Y**.

element	atomic number
X	6
Y	8

Which of the following statements about elements **X** and **Y** is true?
X and **Y** form _____.

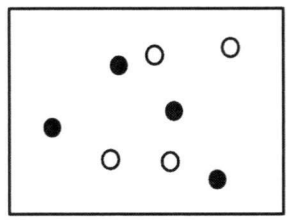
A an ionic compound with the formula of $\mathbf{X_2Y}$
B an ionic compound with the formula of $\mathbf{XY_2}$
C a covalent compound with the formula of $\mathbf{X_2Y}$
D a covalent compound with the formula of $\mathbf{XY_2}$

10 How many elements can be found in one molecule of angelic acid, C_4H_7COOH?

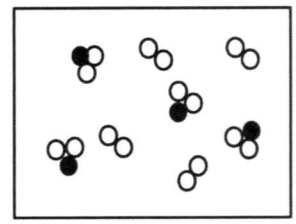
A 3 **B** 6 **C** 13 **D** 15

11 Which of the following diagrams show a mixture of elements?

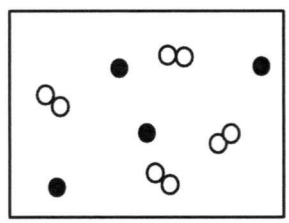
I



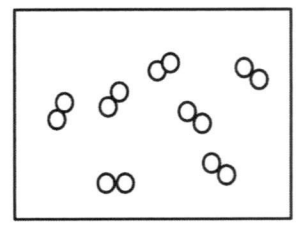
II



III



IV



A I and III only
B II and IV only
C I, II and III only
D I, III and IV only

12 What is the mass of potassium hydroxide, KOH, present in 0.25 dm^3 of 2 mol/dm^3 of potassium hydroxide solution? [relative atomic masses: K, 39; O, 16; H, 1]

A 0.5 g **B** 5.0 g
C 28.0 g **D** 280 g

13 10 cm^3 of ethene, C_2H_4, is burned.
The equation for the reaction is as shown.

$$C_2H_4\ (g) + 3O_2\ (g) \rightarrow 2CO_2\ (g) + 2H_2O\ (l)$$

What is the volume of carbon dioxide produced at the end of the reaction?
(all volumes are measured at room temperature and pressure)

A 20 cm^3 **B** 30 cm^3 **C** 40 cm^3 **D** 50 cm^3

14 The relative atomic mass of nitrogen is 14 and the relative molecular mass of ammonium nitrate, NH_4NO_3, is 80.
What is the percentage of nitrogen in ammonium nitrate?

A 14% **B** 17.5% **C** 28% **D** 35%

15 A farmer realised that his field was getting more acidic due to acid rain and was affecting the yield of his crops. Which of the following substances can he use to decrease the acidity of the soil?

A nitric acid **B** calcium hydroxide
C magnesium sulfate **D** potassium chloride

16 Which of the following is the ionic equation for the reaction between nitric acid and sodium hydroxide?

A $H^+ + OH^- \rightarrow H_2O$ **B** $2H^+ + O^{2-} \rightarrow H_2O$
C $Na^+ + NO_3^- \rightarrow NaNO_3$ **C** $H^+ + NO_3^- \rightarrow HNO_3$

17 The table below gives information about three indicators.

indicator	colour at pH 1	pH at which colour changes	colour at pH 14
thymol blue	red	3	yellow
congo red	blue	5	red
phenolphthalein	colourless	10	red

Which colours would be obtained when each indicator was added separately to pure water?

	thymol blue	congo red	phenolphthalein
A	red	blue	red
B	yellow	blue	colourless
C	yellow	blue	red
D	yellow	red	colourless

18 Which of the following substance **cannot** be used with dilute hydrochloric acid to prepare iron (II) chloride?

A iron
B iron (II) hydroxide
C iron (II) sulfate
D iron (II) carbonate

19 Which of the following salts cannot be produced by the precipitation method?

A barium sulfate
B silver chloride
C sodium carbonate
D lead (II) chloride

20 Solutions of two chemicals are mixed in a beaker.

A reaction occurs and an increase in temperature is observed.

Which statement is correct?

A An endothermic reaction occurs and the reacting chemicals gain energy.
B An endothermic reaction occurs and the reacting chemicals lose energy.
C An exothermic reaction occurs and the reacting chemicals gain energy.
D An exothermic reaction occurs and the reacting chemicals lose energy.

End of Section A

Section B [45 marks]
Answer all questions in the spaces provided.

B1 Name the pieces of apparatus most suitable to complete the following laboratory actions:

(a) add 23.4 cm^3 of dilute sulfuric acid, **[1]**

.....

(b) collect and measure the volume of a water-soluble gas, **[1]**

.....

B2 Figure B2.1 shows the heating curve of substance **R**.

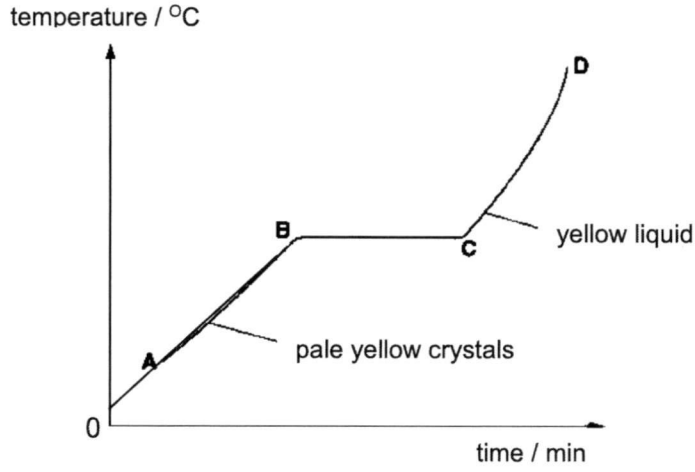


Figure B2.1

(a) Describe the arrangement and movement of the particles of substance **R** between **A** and **B**. **[2]**

.....

.....

(b) Explain why the temperature remains constant between **B** and **C**. **[1]**

.....

.....

B3 **(a)** Complete Table B3.1 which shows the relative charge and mass of the sub-atomic particles in an atom. **[3]**

	relative charge	**relative mass**
proton	1+	1
electron		
neutron		1

Table B3.1

(b) A berylium ion can be represented as follows: **[2]**

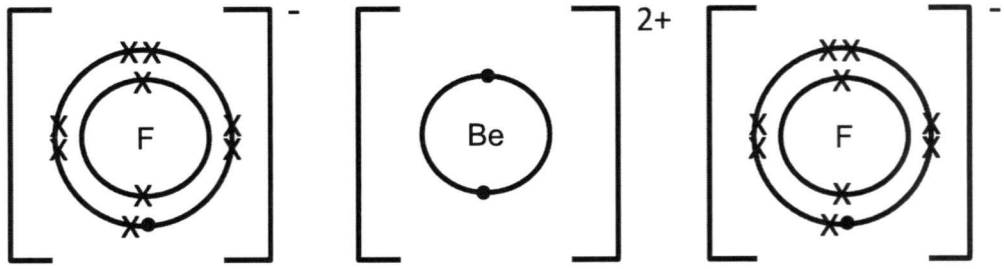
$$^{9}_{4}Be^{2+}$$

Determine the number of electrons present in an atom and an ion of beryllium.

number of electrons in an atom of Be: .....

number of electrons in an ion of Be^{2+}: .....

(c) Figure B3.2 shows the electronic configuration of the ions in beryllium fluoride.



fluoride ion beryllium ion fluoride ion

Figure B3.2

When beryllium reacts with fluorine, neutral beryllium atoms form beryllium ions, each with a 2+ charge.
Use Figure 3.2 to explain **how** and **why** this change has taken place. **[3]**

.....

.....

.....

.....

.....

(d) Explain why beryllium fluoride is able to conduct electricity in aqueous state. **[1]**

.....

.....

B4 Figure B4.1 shows the particles in substances **A** to **F**.

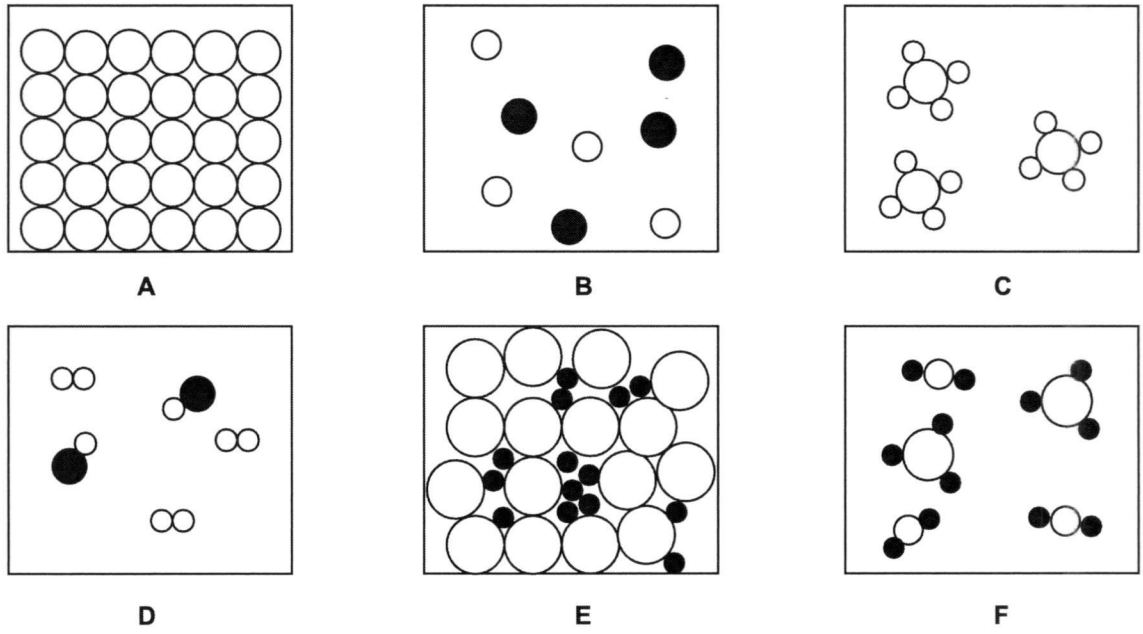


Figure B4.1

Which of the diagrams, **A** to **F,** best represents

(a) copper, **[1]**

.....

(b) methane, **[1]**

.....

(c) a mixture of gaseous elements, **[1]**

.....

(d) a mixture of an element and a compound, **[1]**

.....

B5 Column chromatography can be used to separate larger amount of substances. The stationary phase in column chromatography has the same function as the chromatography paper.

In a particular experiment, dye **H** is separated using column chromatography. After the chromatography column has been prepared, dye **H** is loaded at the top of the column. The burette clip is then released and the solvent, ethanol, moves down due to gravity. The dye will then travel downwards. Over time, the two dyes in dye **H** will be collected in separate beakers.

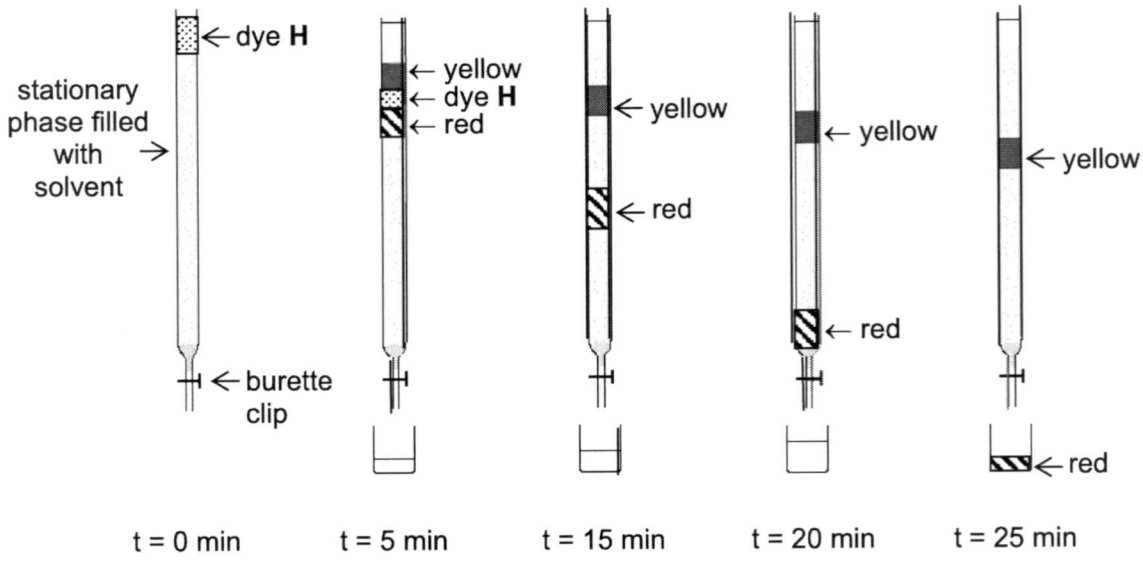


Figure B5.1

(a) Using Figure B5.1, deduce whether the yellow or red dye is more soluble in the solvent used. Explain your answer. **[2]**

.....

.....

(b) Explain why the solvent ethanol is suitable in separating the dyes in dye **H**. **[1]**

.....

.....

(c) Another dye, dye **J**, was also separated using the same column chromatography procedures. However dye **J** remained at the top of the column. Explain why dye **J** remained at the top of the column at the end of the experiment. **[1]**

.....

B6 **(a)** Figure B6.1 describes some of the properties of an acid and an alkali. Fill in the empty boxes. **[7]**

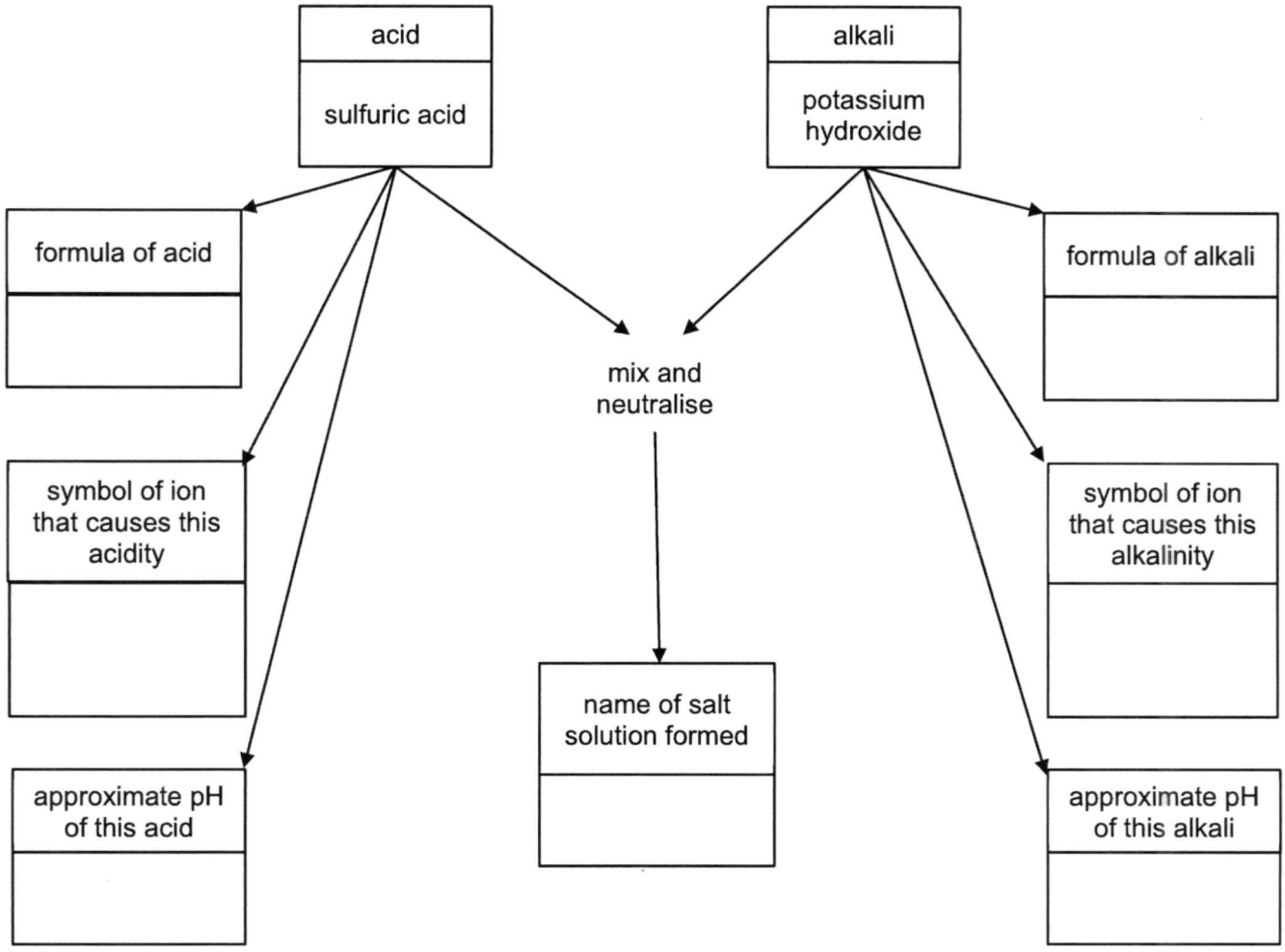


Figure B6.1

(b) Barium meals are given to patients to help visualize the digestive tract during x-ray test. Barium meals contain barium sulfate which passes through the body without being absorbed. This is because barium sulfate is insoluble in water.

(i) Barium sulfate can be obtained by mixing sulfuric acid with substance **N**.

Identify substance **N**. **[1]**

.....

(ii) Describe how a pure sample of powdered barium sulfate can be obtained from the mixture resulting from **(b)(i)**. **[2]**

.....

.....

.....

.....

B7 A student wanted to prepare calcium chloride. He added excess calcium carbonate to an acid. During the reaction, he noticed there were bubbles of gas being given off.

(a) Name the acid used to prepare calcium chloride. **[1]**

.....

(b) Explain why excess calcium carbonate was added to the acid. **[1]**

.....

(c) Name the gas produced and describe a test to confirm the identity. **[2]**

name of gas:.....

test: .....

.....

B8 Dilute nitric acid is made by reacting nitrogen dioxide gas with water as shown in the following equation.

$$3NO_2\ (g) + H_2O\ (l) \rightarrow 2HNO_3\ (aq) + NO\ (g)$$

(a) **(i)** Define *relative molecular mass.* **[1]**

.....

.....

(ii) Calculate the relative molecular mass of nitrogen dioxide, NO_2. **[1]**

(iii) Calculate the volume of nitrogen dioxide gas needed to react with 90 g of water at room temperature and pressure. **[2]**

(iv) Calculate the mass of dilute nitric acid produced from this reaction. **[2]**

(b) Describe a test and its observation to determine that the solution formed from the reaction is acidic. **[2]**

test: .....

observation: .....

.....

(c) The nitrogen monoxide formed from the reaction can be recycled by reacting with oxygen to form nitrogen dioxide again.

Balance the equation for the reaction between nitrogen monoxide and oxygen. **[1]**

..... NO (g) + ... O_2 (g) → ..... NO_2(g)

End of Section B

Section C [20 marks]

Answer **two** out of three questions in the spaces provided

C1 Calcium oxide is classified as a basic oxide and carbon dioxide is classified as an acidic oxide.

(a) State two other types of oxide. **[2]**

.....

(b) Draw and label the electronic structures of calcium oxide and carbon dioxide. Show the outer electrons only. **[4]**

(c) Use the structures in **(b)** to explain why, at room temperature, calcium oxide is a solid and carbon dioxide is a gas. **[2]**

.....

.....

.....

.....

(d) When exposed to air, calcium oxide will react with carbon dioxide to form calcium carbonate as shown in the following equation:

$$CaO\ (s) + CO_2\ (g) \rightarrow CaCO_3\ (s)$$

Calculate the mass of calcium carbonate that can be obtained from 4.4 g of carbon dioxide. **[2]**

C2 A student wanted to prepare sodium chloride crystals. She added 0.1 mol/dm^3 of dilute hydrochloric acid from a burette to 25.0 cm^3 of aqueous sodium hydroxide in a conical flask.

The graph in Figure C2.1 shows the pH of the solution in the conical flask against the volume of dilute hydrochloric acid added.

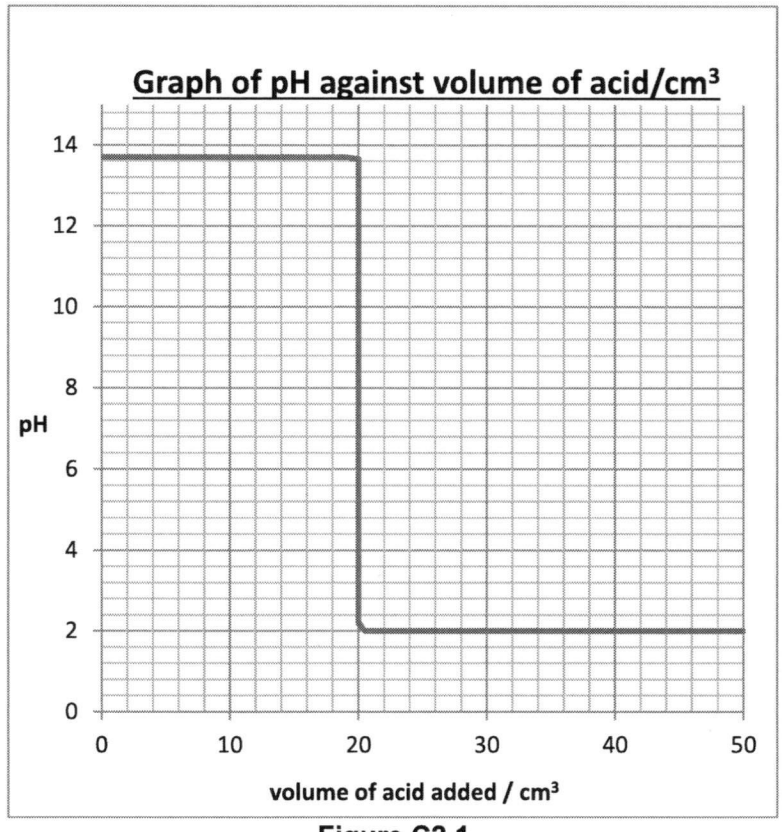


Figure C2.1

(a) Name the type of reaction between aqueous sodium hydroxide and dilute hydrochloric acid. **[1]**

.....

(b) Based on Figure C2.1, state the volume of dilute hydrochloric acid required to neutralise 25.0 cm^3 of aqueous sodium hydroxide. **[1]**

.....

(c) Write a balanced chemical equation, with state symbols, for the reaction between aqueous sodium hydroxide and dilute hydrochloric acid. **[2]**

.....

(d) **(i)** Calculate the concentration in g/dm^3 of 0.1 mol/dm^3 hydrochloric acid. **[1]**

(ii) Hence, calculate the mass of 500 cm^3 of dilute hydrochloric acid. **[1]**

(e) Another student wants to prepare pure crystals of magnesium sulfate from magnesium and dilute sulfuric acid. **[4]**
Describe how the crystals can be prepared using magnesium and dilute sulfuric acid.

.....

.....

.....

.....

.....

.....

.....

.....

C3 **(a)** Not all of the atoms of nitrogen are identical. All nitrogen atoms have the same chemical properties but they can have different masses.
Two common isotopes of nitrogen are nitrogen -14 and nitrogen -15.

(i) Define *isotopes*. **[1]**

.....

.....

(ii) Describe a similarity and a difference in the nuclei of nitrogen -14 and nitrogen -15. **[2]**

.....

.....

.....

.....

(iii) Using the electronic configuration of nitrogen, explain why nitrogen -14 and nitrogen -15 have the same chemical properties. **[1]**

.....

.....

(b) Nitrogen is obtained from the fractional distillation of air. Air is first cooled to a liquid at -200°C and slowly heated to obtain the different components of air

Table C3.1 shows the boiling points of the different components of air.

components of air	boiling point/°C
nitrogen	-196
xenon	-108
oxygen	-183
argon	-186

Table C3.1

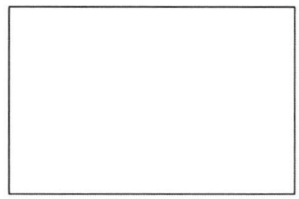
(i) Using Table C3.1, state which gas will be collected last. **[1]**

.....

(ii) State which gas(es) will be obtained if liquid air is heated from -200°C to -185°C. **[1]**

.....

(iii) Draw the arrangement of particles of argon at 0°C in the box below. **[1]**



(iv) Describe how the **movement** of the particles of nitrogen changes as it is heated from -200°C to 0°C. **[1]**

.....

.....

(v) State and explain whether air is an element, compound or mixture. **[2]**

.....

.....

End of Paper

The Periodic Table of Elements

Group																	
I	II											III	IV	V	VI	VII	0
		Key proton (atomic) number atomic symbol name relative atomic mass					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 –		

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.).

2017 2SE
Sec 3 E Science (Chemistry) Mark Scheme

Section A [20m]

A1	A2	A3	A4	A5	A6	A7	A8	A9	A10
A	D	C	D	D	A	C	B	D	A
A11	A12	A13	A14	A15	A16	A17	A18	A19	A20
A	C	A	D	B	A	D	C	C	D

Section B [45m]

<table>
<tr><th>Question</th><th>Answer</th><th>Mark</th></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td>B1a</td><td>Burette</td><td>1</td></tr>
<tr><td>B1b</td><td>Gas syringe</td><td>1</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td>B2a</td><td>The particles <u>vibrate about fixed positions.</u>
The particles are <u>very closely packed in an orderly/regular manner.</u></td><td>1
1</td></tr>
<tr><td>B2c</td><td><u>Energy</u> <u>absorbed/taken in</u> to <u>overcome forces of attraction between particles.</u></td><td>1</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td>B3a</td><td>
<table>
<tr><th></th><th>relative charge</th><th>relative mass</th></tr>
<tr><td>proton</td><td>1+</td><td>1</td></tr>
<tr><td>electron</td><td><u>1-</u></td><td>$\frac{1}{1836}$ / $\frac{1}{1840}$</td></tr>
<tr><td>neutron</td><td><u>0</u></td><td>1</td></tr>
</table>
</td><td>1M each

(3)</td></tr>
<tr><td>B3b</td><td>number of electrons in one atom of Be: <u>4</u>

number of electrons in one ion of Be^{2+}: <u>2</u></td><td>1

1</td></tr>
<tr><td>B3c</td><td><u>Each beryllium atom loses two electrons</u> to form <u>beryllium ion</u> with a <u>double/two positive charge</u> which has a <u>stable noble gas electronic configuration</u>.

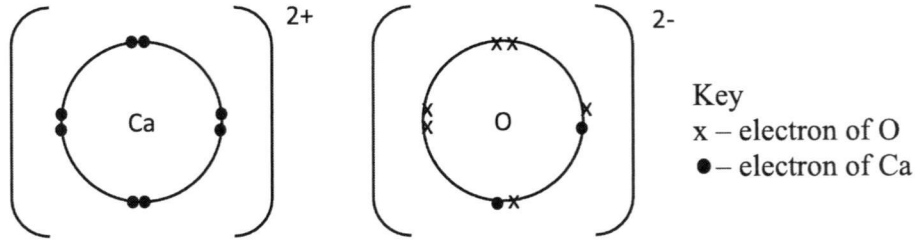
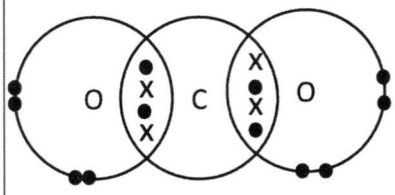
<u>Each fluorine atom gained one electron from beryllium</u> to form a <u>fluoride ion with a single/one negative charge</u> in order to achieve a <u>stable noble gas electronic configuration.</u></td><td>1 (Be)

1 (F)
1 (SNGEC)</td></tr>
</table>

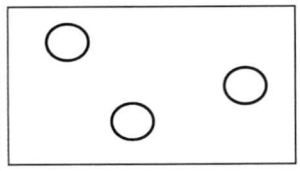
B3d	The giant ionic lattice structure breaks down. There are **free-moving/mobile ions** present to conduct electricity	1
B4a	**A**	1
B4b	**C**	1
B4c	**B**	1
B4d	**D**	1
B5a	**Red dye.** It is **collected first** from the column./ Red dye **moves faster** than yellow dye.	1 1
B5b	The red and yellow dyes have **different solubility** in the solvent	1
B5d	The dye **cannot dissolve/ is insoluble** in the solvent.	1
B6a	Formula of acid: **H_2SO_4** Symbol that causes acidity: **H^+** Approximate pH of acid: **1** Formula of alkali: **KOH** Symbol that causes alkalinity: **OH^-** Approximate pH of alkali: **14** Name of salt solution formed: **potassium sulfate**	1 1 1 1 1 1 1
	Barium nitrate/barium chloride	1
B6c	**Filter** the mixture to obtain barium sulfate as the **residue.** **Wash** the residue with **distilled water**. **Dry** the residue between **filter paper**. **Reject** filter solution]	3c- 2 1-2c - 1
B7a	dilute hydrochloric acid	1
B7b	To ensure **all** the **acid has reacted**.	1
B7c	Test: **Carbon dioxide** Observation: **Bubble** the **gas** into **limewater**. A **white precipitate** is formed.	1 1
B8ai	The relative molecular mass is the **average mass of one molecule of a substance as compared to 1/12 of the mass of a carbon-12 atom.**	1
B8aii	M_r of NO_2 = 46 [No marks awarded if units are present]	1

B8aiii	Given: Find mol ratio H_2O: NO_2 1 : 3 No. of mole of H_2O = 90/18 = **5 mol** No. of mole of NO_2 = 3 x 5 = 15 moles Volume of NO_2 = 15 x 24 = **360 dm^3**	 M1 A1
B8aiv	Given: Find H_2O: HNO_3 1 : 2 No. of mole of H_2O = 90/18 = 5 moles of mole of NO = **10 mol** Mass of NO_2 = 10 x 63 = **630 g** [Allow ecf from **a(iii)**]	 M1 A1
B8b	Method 1: Place a **damp blue litmus** paper into the solution. Result: **Blue litmus paper turns red.** Or Method 2: **Add** a few drops of **Universal Indicator** to the solution. Result: The Universal indicator turns **red/yellow.**	1 1
B8c	**2**NO (g) + O_2 (g) → **2** NO_2(g)	1

Section C [20M]

C1a	Amphoteric oxide Neutral oxide	1 1
C1b	 	CaO: 1M for each ion CO_2 Correct e.c -1M Correct sharing of electrons - 1M (4)
C1c	Magnesium oxide is an ionic compound. **A large amount of energy** is required to **overcome strong ionic bonds between ions**. Hence it has a **high boiling point** and exist as a solid at room temperature. Carbon dioxide is a covalent compound. A **small amount of energy** is required to **overcome weak intermolecular forces of attraction between molecules**. Hence it has a **low boiling point** and exists as a gas at room temperature.	4c -2 2-3c -1 0-1C -)
C1d	Given: Find Mol ratio CO_2: CaCO 1 : 1 No. of mole of CO_2 = **0.1 mol** No. of mole of $CaCO_3$ = 0.1 mol Mass of $CaCO_3$ = 0.1 x 100 = **10g**	 1 1
C2a	Neutralisation	1
C2b	20 cm^3	1

C2c	$NaOH\ (aq) + HCl\ (aq) \rightarrow NaCl\ (aq) + H_2O\ (l)$	Eqn- 1M S.S- 1M
C2di	Concentration in g/dm^3 = concentration in mol/dm^3 x M_r = 0.1 x 36.5 = **3.65 g/dm³**	1
C2dii	Mass of HCl needed = 3.65 x 0.5 = 1.825 g = **1.83g (3s.f)** [Accept if students give exact figure]	1
C2e	**Add excess magnesium** to dilute **sulfuric acid** with stirring. **Filter** the mixture to obtain (aqueous magnesium sulfate as the) _____ **Heat filtrate** until a **saturated** solution is formed. Allow solution to **cool** for **crystals** to **form**. **Filter** to **obtain crystals** **Dry** crystals between **filter paper**. [**Reject** filter solution to obtain residue]	6C- 4 4-5C -3 2-3C – 2 1C – 1
C3a	Isotopes are **atoms of the same element** with the **same number of protons** but **different number of neutrons**	1
C3b	Nitrogen -14 and nitrogen - 15 both have **7 protons**. Nitrogen -14 has **7 neutrons** but nitrogen -15 has **8 neutrons**.	1 1
C3c	They have the same chemical properties because they have **five valence electrons.** [Reject same number of valence electrons]	1
C3di	Xenon	1
C3dii	Nitrogen and argon	1

C3diii		1
C3div	The movement of particles of nitrogen changes from **sliding past one another** (randomly) to **moving** (randomly) **at high speeds**.	1
C3dv	Air is a mixture. It contains many gases that are **not chemically combined together**./ The components of air can be **separated by fractional distillation.**	1 1