Name	Reg. No	Class

4EX/5NA

Science (Chemistry) **5076/1**
(with Biology/Physics Component) **5078/1**
Paper 1

SEMESTRAL ASSESSMENT ONE
May 2018
1 hour

Additional Materials:
Electronic calculator
OTAS Answer Sheet

INSTRUCTIONS TO CANDIDATES:

Do not open this booklet until you are told to do so.
Write your name, index number and class in the spaces at the top of this page and on any separate answer paper used.
Write in soft pencil.
You may use a soft pencil for any diagrams, graphs, tables or rough working.
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 OTAS answer sheet.

Read carefully the instructions on the answer sheet.

At the end of the examination, hand in your OTAS sheet and question paper separately.

Any rough working should be done in this booklet.

A copy of the Periodic Table is printed on page 9.

This question paper consists of **9** printed pages.

Setter: Mr Timothy Chen
Vetter: Mdm Jarina Banu

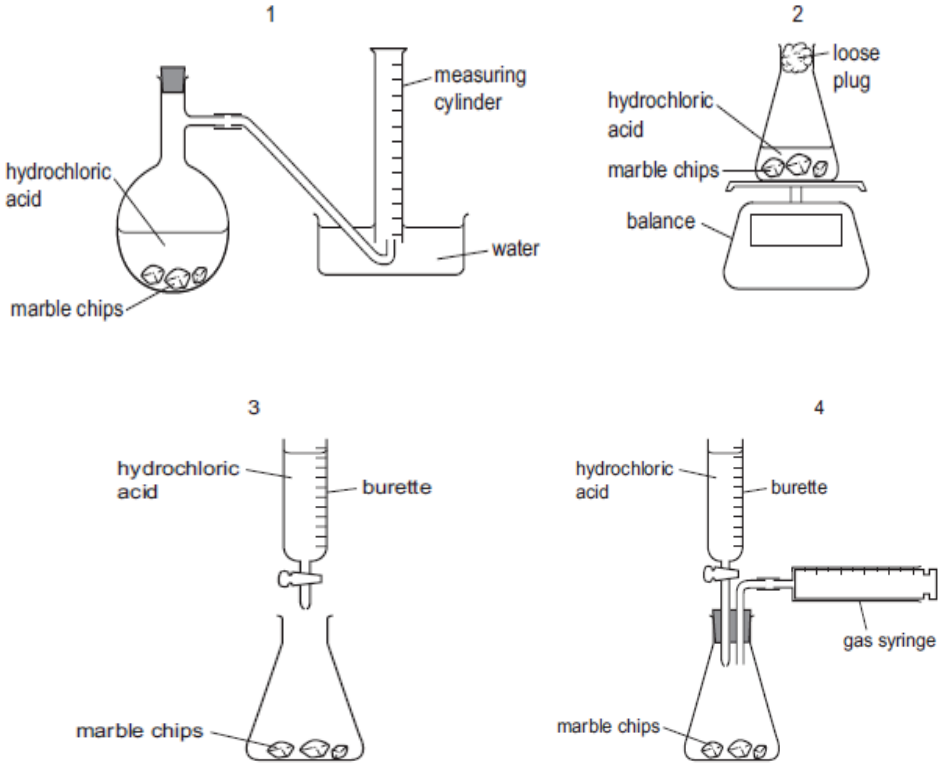
Paper 1 (Multiple Choice Questions)

Answer **all** the questions on the **OTAS**.

21 A student follows the rate of the reaction between marble chips, $CaCO_3$, and dilute hydrochloric acid, by measuring the amount products produced or the amount of reactants reacted.

$CaCO_3 + 2HCl \rightarrow CaCl_2 + CO_2 + H_2O$

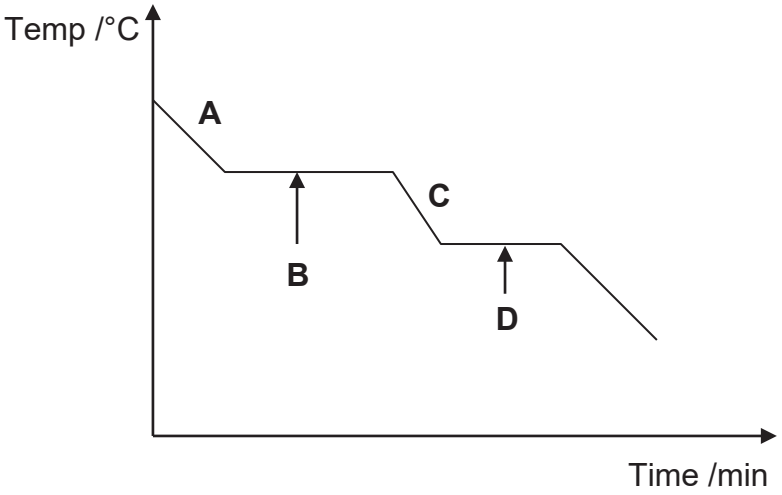
Which diagrams show apparatus that is suitable for this experiment?



A 1 and 2
B 2 and 4
C 1, 2 and 4
D All of the above

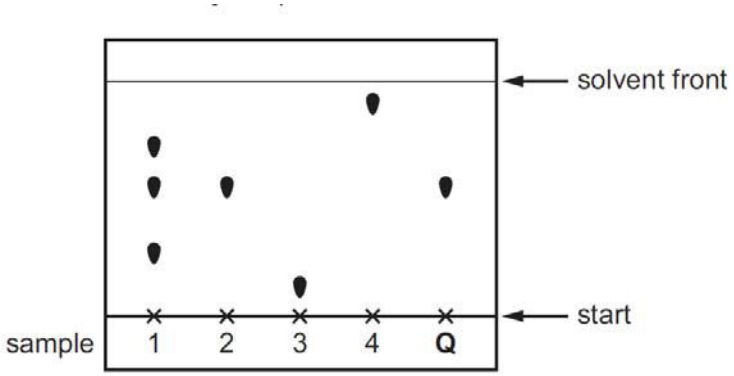
22 A gas is being cooled to room temperature.

Which part of the cooling curve below shows that both the gas and liquid exist together?



23 Four samples are spotted onto chromatography paper. It is known that one of these samples is pure compound **Q**. A separate sample of pure compound **Q** is also spotted onto the paper. The paper is placed in a solvent.

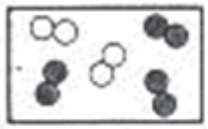
The diagram shows the chromatogram produced.



Which statement is correct?

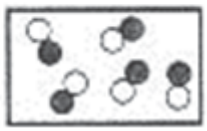
A Sample 2 has travelled the furthest and sample 3 is pure compound **Q**.
B Sample 3 has travelled the furthest and sample 2 is pure compound **Q**.
C Sample 4 has travelled the furthest and sample 1 is pure compound **Q**.
D Sample 4 has travelled the furthest and sample 2 is pure compound **Q**.

24 Which diagram shows a compound made up of two different elements?

A 

B 

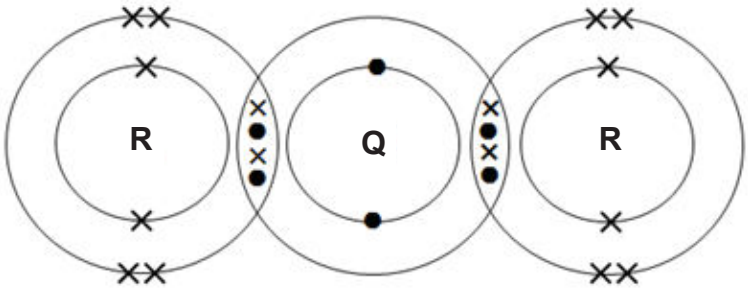
C 

D 

25 Which statement about the particles, F^-, Ne and Na^+ is correct?

A They all contain more electrons than protons.
B They all contain more neutrons than protons.
C They all contain the same number of electrons.
D They all contain the same number of protons.

26 The figure below shows a compound formed by elements **Q** and **R**.



Which of the following is true?

A The compound has a low boiling point.
B The compound has mobile electrons and therefore can conduct electricity.
C The atoms of **R** gain electrons from the atom of **Q** to form an ionic compound.
D The atoms of **Q** and **R** share valence electrons to form a covalent compound with formula $\mathbf{Q_2R}$.

27 Which statement is correct about all ionic compounds?

A They are formed when metals share electrons with non-metals.
B They conduct electricity in the molten state.
C They conduct electricity in the solid state.
D They dissolve in water.

28 Nitrogen monoxide and oxygen react to form nitrogen dioxide.

$$2NO(g) + O_2(g) \rightarrow 2NO_2(g)$$

What is the maximum volume of nitrogen dioxide that could be obtained when 1 dm^3 of nitrogen monoxide reacts with 2 dm^3 of oxygen?

A 1.0 dm^3
B 2.0 dm^3
C 3.0 dm^3
D 4.0 dm^3

29 Which sample contains the most atoms?

A 0.5 moles of water
B 0.5 moles of ammonia
C 1.0 moles of carbon dioxide
D 2.0 moles of hydrogen chloride

30 A household cleaning compound is used to remove calcium carbonate from bathroom surfaces.

Bubbles of gas can be seen forming when it is applied to the surface.

What is the pH of this cleaning compound?

A pH 2
B pH 7
C pH 10
D pH 14

31 The table shows the results of adding dilute nitric acid and aqueous sodium hydroxide to four oxides.

Which is the result obtained for aluminium oxide?

	dilute nitric acid	aqueous sodium hydroxide
A	reaction	reaction
B	reaction	no reaction
C	no reaction	reaction
D	no reaction	no reaction

32 A bottle of magnesium carbonate has been contaminated with sodium chloride. How can the pure magnesium carbonate be obtained from this mixture?

A Add acid to the mixture, filter then collect the residue.
B Add acid to the mixture, filter then evaporate the filtrate.
C Add water to the mixture, filter then collect the residue.
D Add water to the mixture, filter then evaporate the filtrate.

33 Which reagent can be used to react with dilute hydrochloric acid to prepare silver chloride?

A solid silver
B solid silver oxide
C solid silver carbonate
D aqueous silver nitrate

34 The results of experiments involving four metals, W, X, Y and Z, and their ions are shown.

$$Y(s) + Z^{+}(aq) \rightarrow Y^{+}(aq) + Z(s)$$
$$W(s) + X^{+}(aq) \rightarrow \text{no reaction}$$
$$Z(s) + X^{+}(aq) \rightarrow Z^{+}(aq) + X(s)$$

What is the order of reactivity of the four metals, most reactive to least reactive?

A W → X → Y → Z
B X → W → Z → Y
C Y → Z → X → W
D Z → Y → W → X

35 Element **Z** is in the same group of the Periodic Table as bromine but has a lower boiling point.

Which statement about **Z** is correct?

A It can displace bromine from an aqueous solution of potassium bromide.
B It has a proton number greater than 35.
C It is a solid at room temperature.
D It loses an electron when it reacts with a metal.

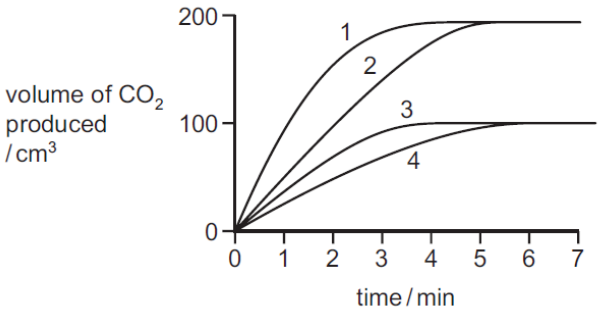
36 Which change always occurs when a metal atom is oxidised?

A It combines with oxygen.
B It gains electrons to form a negative ion.
C It loses electrons to form a positive ion.
D It gains protons to form a positive ion.

37 In four separate experiments, 1, 2, 3 and 4, nitric acid was added to excess marble chips and the volume of carbon dioxide formed was measured.

In all four experiments the same volume of nitric acid was used.
Its concentration, or temperature, or both concentration and temperature, were changed.

The results of the experiments are shown on the graph.



Which statement is correct?

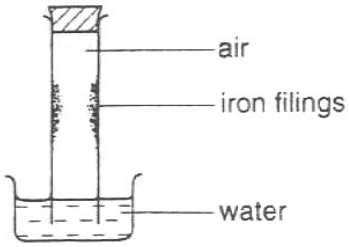
A A lower concentration of acid was used in experiment 3 than in experiment 1.
B Experiment 4 was faster than experiment 3.
C The acid used in experiment 2 was of a lower concentration than in experiment 1.
D The temperature of the acid was the same in experiments 1 and 2.

38 The elements helium, argon and neon are noble gases.

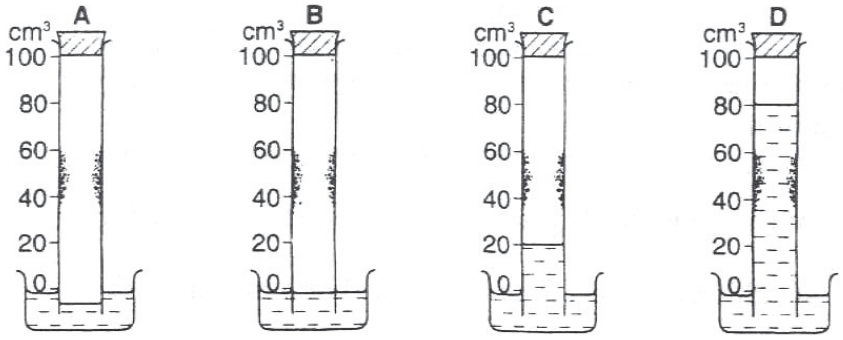
Which statement is correct?

A All these elements have an octet configuration.
B Argon is used to react with impurities in the manufacture of steel.
C Helium is used in balloons as it is more dense than air.
D Neon is used in light bulbs to give an inert atmosphere.

39 The inside of a tube is coated with iron filings. The tube is placed in a trough of Water as shown.



Which diagram represents the likely appearance of the apparatus after one week?



40 When a volcano erupts, which gas is produced in significant amounts?

A carbon monoxide
B methane
C oxides of nitrogen
D sulfur dioxide

-- End of paper 1 --

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		**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
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.).

Name | Reg. No | Class

MAYFLOWER SECONDARY SCHOOL MAYFLOWER SECONDARY SCHOOL MAYFLOWER SECONDARY SCHOOL MAYFLOWER SECONDARY SCHOOL

4EX/5NA

Science (Chemistry)

5076/3
5078/3

[65 marks]

SEMESTRAL ASSESSMENT ONE
May 2018
1 hour 15 minutes

Additional Materials: Electronic calculator

INSTRUCTIONS TO CANDIDATES:

Do not open this booklet until you are told to do so.
Write your name, index number and class in the spaces at the top of this page and on any separate answer paper used.
Write in dark blue or black pen on both sides of the paper. You may use a soft pencil for any diagrams, graphs or 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 **all** questions on the spaces provided.
Answers any **two** questions out of the three questions given.

FOR EXAMINER'S USE	
Section	**Marks**
Paper 1 MCQ	**/ 20**
Paper 3 Section A	**/ 45**
Paper 3 Section B	**/ 20**
Paper 5	**/15**
Total	**/ 100**

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
A copy of the Periodic Table is printed on page 13.
The use of an approved scientific calculator is expected, where appropriate.

This question paper consists of **13** printed pages.

Setter: Mr Timothy Chen | Vetter: Mdm Jarina Banu

Paper 3

Section A (45 marks)

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

1 The apparatus shown in Fig 1.1 can be used to separate a mixture of 3 liquids, **A**, **B** and water.
A has a boiling point of 50 °C while **B** has a boiling point of 78 °C.

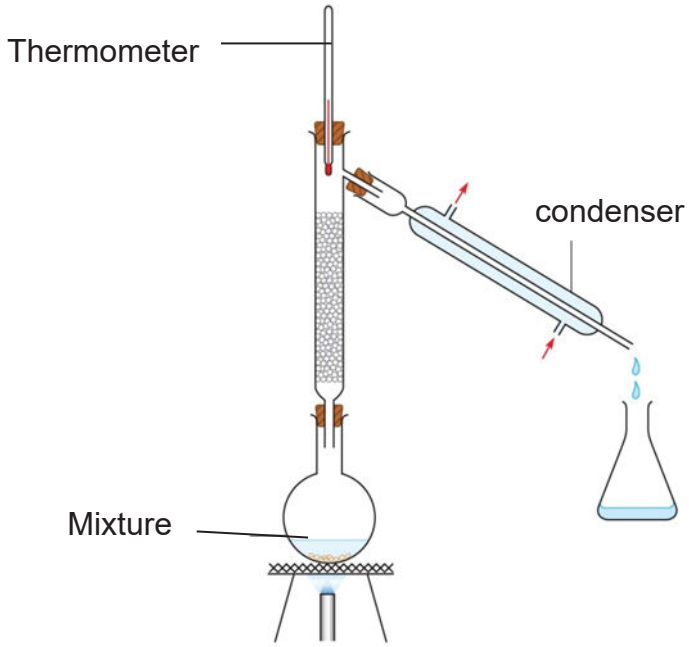


Fig. 1.1

(a) State the name of this method of separation.

……..[1]

(b) What is the purpose of the water in the condenser?

……..[1]

(c) Predict the temperature of the thermometer when the first distillate appears in the beaker.

Explain why.

……...

……...

……..[2]

2 Table 2.1 shows the number of protons, electrons and neutrons of five particles **Q** to **V**.

Table 2.1

Particle	Number of protons	Number of neutrons	Number of electrons
Q	5	5	4
R	7	7	10
S	8	8	8
T	9	11	9
U	10	10	10
V	16	16	16

Which of the particles, **Q** to **V** in Table 2.1, fit each of the following descriptions?

(a) **(i)** an atom with mass number of 16 …….

(ii) a positive ion …….

(iii) an atom that has 8 valence electrons …….

(iv) two atoms in the same group ……. and …….

[4]

(b) Particle **T** is an isotope of an element found in the Periodic Table.

Name the element and explain why **T** is an isotope of that element.

……...

……...

……...

……..[2]

3 Fig. 3.1 shows the extraction of iron from iron ore.

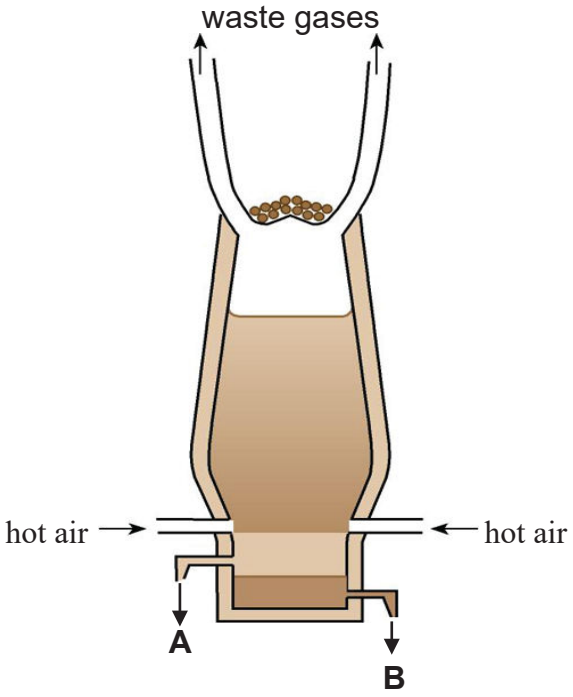


Fig. 3.1

(a) Haematite is the source of iron produced in the Blast Furnace.

(i) Name the reducing agent for the reduction of haematite.

……..[1]

(ii) With the aid of a chemical equation, describe how your answer in **3(a)(i)** reduces haematite to molten iron.

……...

……...

……..

……..[3]

(iii) Besides haematite, name the other 2 raw materials that are added to the Blast Furnace.

……..[2]

(b) Name product **A** and state its usefulness as a substance floating above product **B**.

……...

……..[2]

(c) Iron can be used to make stainless steel.

Stainless steel can be made by adding elements such as chromium and nickel to iron to improve its strength.

(i) What is the name given to mixtures such as stainless steel?

……..[1]

(ii) Explain, in terms of the arrangement of atoms, why stainless steel is harder than pure iron.

……...

……

……

……[2]

4 A student titrates 25.0 cm^3 an alkali of metal **X**, **X**OH, with sulfuric acid.

He realizes that 20.0 cm^3 of 0.2 mol/dm^3 of sulfuric acid is required to neutralize the acid fully.

The chemical equation for the reaction is shown below:

$$2\mathbf{X}OH + H_2SO_4 \rightarrow \mathbf{X}_2SO_4 + 2H_2O$$

(a) Name an indicator that can determine the endpoint of the reaction and describe the colour change seen.

……...

……..[2]

(b) **(i)** Calculate the number of moles present in 20.0 cm^3 of the sulfuric acid used.

…….. mol [1]

(ii) Determine the concentration, in mol/dm^3, of **X**OH used.

…… mol/dm^3 [2]

(iii) If the concentration of **X**OH used is 12.8 g/dm^3, calculate the relative mass of **X**OH and, hence, determine the identity of **X**.

Relative mass of **X**OH: …… Identity of **X**: …….. [2]

(c) When **X**OH is added to ammonium chloride, a gas is formed.

Name the gas formed and describe how to test for its identity.

…….....

…….....

…….....[2]

5 Hydrogen can form compounds with both metals and non-metals.

For example, it can form lithium hydride with lithium and also ammonia with nitrogen.

(a) What is the bonding found in lithium hydride?

……..[1]

(b) **(i)** Draw the dot-and-cross diagram to show the arrangement of valence electrons found in lithium hydride and ammonia in the space below.

Lithium hydride:

[2]

Ammonia:

[2]

(ii) Explain, in terms of bonding, why lithium hydride exist as a solid while ammonia exist as a gas at room temperature.

……...

……...

……...

……...

……...[3]

6 Fig. 6.1 describes the reactions of metal **A**.

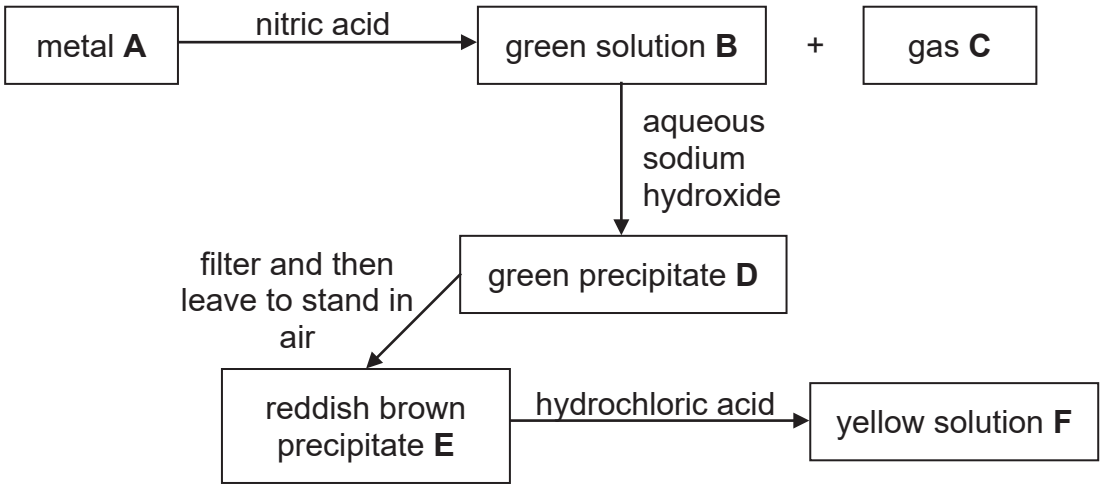


Fig 6.1

(a) Identify the following substances.

A ……

B ……

C ……

D ……

E ……

F ……

[6]

(b) Describe how to test for gas **C** that is formed in the above reactions.

……..

……..[1]

-- End of paper 3 section A --

Paper 3 Section B (20 marks)

Answer any **two** questions in this section.
Write your answer in the spaces provided.

7 **(a)** **(i)** Name an element from Period 3 and explain how the electronic structure of this element can be used to determine the group the element belongs.

……

……

……

……

……[3]

(ii) Moving from Group I to Group VII across period 3, the character of the elements change.

Describe and explain this change.

……

……

……

……

……[3]

(b) The element with an atomic number of 87 is extremely rare and only about 30 g exist throughout the Earth crust.

Predict one physical and one chemical property of this element.
Write a balanced chemical equation, with state symbols, to represent the chemical property that you have described.

……...

……...

……...

……...

……...

……...

……..[4]

8 Coal contains sulfur. When coal is burnt at power stations in an excess of oxygen, sulfur dioxide is formed according to the reaction shown below.

$$S + O_2 \rightarrow SO_2$$

(a) **(i)** Explain why sulfur is considered to be oxidised in this reaction.

……

……[1]

(ii) Find the mass of sulfur burnt if 320 dm^3 of sulfur dioxide is formed at room temperature and pressure.

[3]

(iii) Describe how the release of sulfur dioxide can indirectly cause damage to buildings made of limestone.

……

……

……[2]

(b) Two pollutants can be produced in the internal combustion engines of automobiles.

Name the pollutants and describe how they are produced in the engines of automobiles.

……...

……...

……...

……...

……...

……[4]

9 **(a)** Explain, in terms of collision theory, how the temperature of reactants affect the speed of reaction.

……

……

……[2]

(b) A student wants to investigate the **rate** of reaction involving particle size.

Given that he has magnesium strips and magnesium powder with some hydrochloric acid, describe how he can conduct a laboratory experiment to do his investigation.

Your description should include the measurement obtained to measure the rate of reaction.

……

……

……

……

……

……

……

……

……[5]

(c) Magnesium can also react with copper(II) sulfate as shown below.

$$Mg + CuSO_4 \rightarrow MgSO_4 + Cu$$

(i) During this reaction, the temperature of the solution increases.
Based on this observation, state what kind of reaction this is.

……[1]

(ii) Explain why this reaction is also considered a displacement reaction.

……

……

……[2]

-- End of section B --
-- End of paper –

Blank Page

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 –

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

Name | Reg. No | Class

FLOWER SECONDARY SCHOOL MAYFLOWER SECONDARY SCHOOL MAYFLOWER SECONDARY SCHOOL MAYFLOWER SECONDARY SCHOOL

4EX5NA

Sci (Chem) **5076 /5078**

[65 marks]

SEMESTRAL ASSESSMENT One
May 2018

ANSWER SCHEME

Setter: Mr Timothy Chen Yanhui Vetter: Mdm Jarina

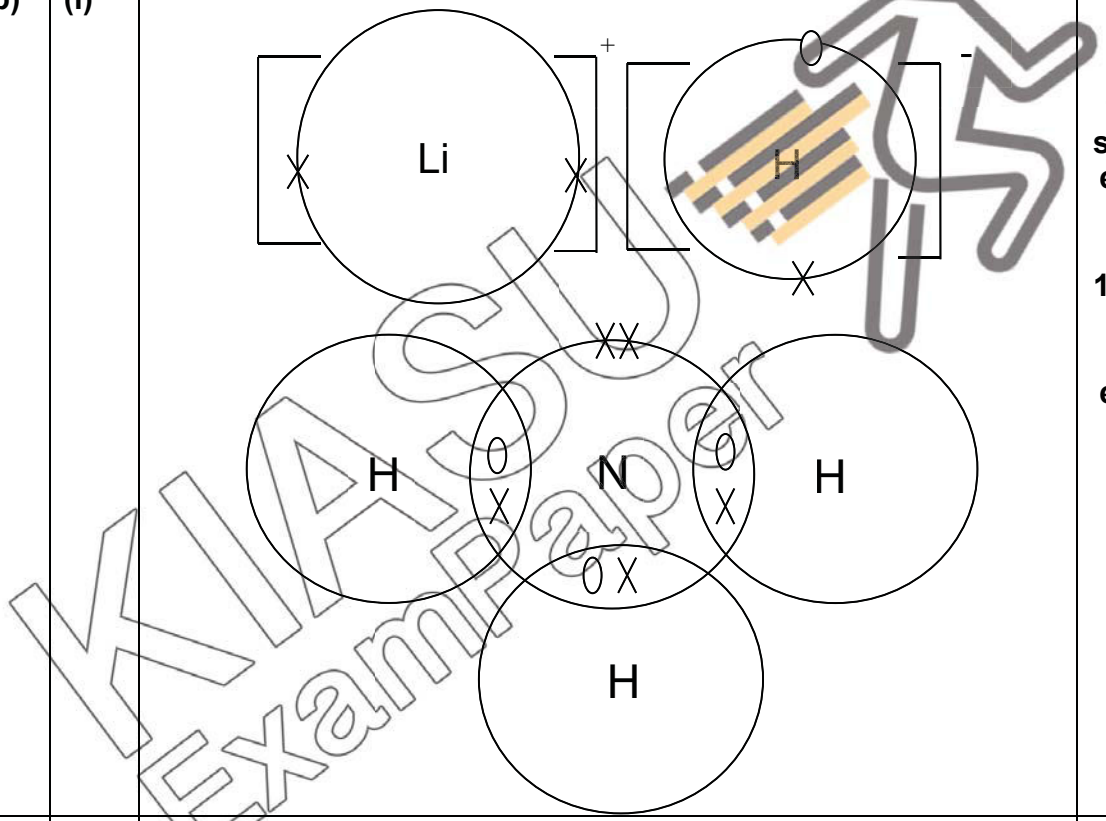
Paper 1 (20m)

21	22	23	24	25	26	27	28	29	30
B	**B**	**D**	**D**	**C**	**A**	**B**	**A**	**D**	**A**
31	32	33	34	35	36	37	38	39	40
A	**C**	**D**	**C**	**A**	**C**	**A**	**D**	**C**	**D**

Paper 2
Section A (45m)

Qn	Part	Answer	Marks
1	(a)	Fractional distillation	1
	(b)	To condense the vapour entering the condenser as the distillate.	1
	(c)	50 °C.	1
		It is the boiling point of A which has the lowest boiling point of the 3 substances	1
2	(a)	(i) S	1
		(ii) Q	1
		(iii) U	1
		(iv) V and S	1
	(b)	It is fluorine.	1
		Both have 9 protons, however,	
		Fluorine has 10 neutrons while T has 11 neutrons.	1
3	(a)	(i) carbon monoxide	1
		(ii) $Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$	1
		Fe_2O_3 loses oxygen to carbon monoxide,	1
		And is thus reduced to form iron /	1
		The oxidation state of Fe decreases from +3 in haematite to 0 in iron.	
		(iii) Limestone and	1
		coke.	1
	(b)	Molten slag.	1
		It covers the molten iron, preventing it from oxidising with oxygen.	1
	(c)	(i) Alloys	1
		(ii) Since the sizes of particles in stainless steel are different,	1
		this disrupts the regular arrangement of iron, making it harder to slide when a force is applied. (ERC)	1
4	(a)	Universal indicator.	1
		There will be a colour change from purple to green.	1

[Turn over

	(b)	**(i)**	Mole of sulfuric acid = 0.02 * 0.2 = 0.004 mol	**1**
		(ii)	Mole of sodium hydroxide = 0.004 * 2 = 0.008 mol	**1**
			Concentration of sodium hydroxide = 0.008 / 0.025 = 0.32 mol/dm^3	**1**
		(iii)	Molar mass = conc (g/dm^3) / conc (mol/dm^3) = 12.8 / 0.32 = 40 g/mol	**1**
			Molar mass of X = 40 – 16 -1 = 23 Therefore, X is sodium.	**1**
	(c)	Ammonia gas. The gas evolved will turn damp red litmus paper blue.		**1** **1**
5	**(a)**	Ionic bonding		**1**
	(b)	**(i)**		**1 mark each for correct transfer/ sharing of electrons for both** **1 mark for no inner shell electrons for both**
		(ii)	Since lithium hydride consist of **strong electrostatic forces** of attraction between positive and negative ions while ammonia consists of **weak intermolecular forces** between ammonia molecules. And because **much more energy** is required to overcome the forces of attraction in lithium hydride compared to ammonia, Therefore, lithium hydride has a much higher melting and boiling point, hence it exist as a solid while ammonia exist as a gas under room temperature.**(ERC)**	**1** **1** **1**

[Turn over

6	(a)	A: iron B: iron(II) nitrate C: hydrogen gas D: iron(II) hydroxide E: iron(III) hydroxide F: iron(III) chloride	1 1 1 1 1 1
	(b)	Test the gas evolved using a burning / lighted splint. It should extinguish with a pop sound	1

Section B (20m)

Qn	Part		Answer	Remarks
7	(a)	(i)	Name 1 element from sodium to argon. Since sodium has an electronic configuration of 2.8.1, showing that it has 1 valence electron. Therefore, it is in Group I.	1 1 1
		(ii)	Across Period 3, the metallic character of the element decreases. Since the tendency of the elements to form positive ions by losing electrons decreases while The tendency increases for elements to gain electrons, forming negative ions as the number of valence electrons increases, Therefore, elements show less metallic character across the period.	1 1 1
	(b)		It is soft / can conduct electricity / low density. It can react with water to form alkali and hydrogen gas. / It can react with halogens to form halides. $2Fr\ (s) + 2H_2O\ (l) \rightarrow 2FrOH\ (aq) + H_2\ (g)$ / $Fr\ (s) + Cl_2\ (g) \rightarrow 2FrCl_2\ (s)$	1 1 **1 mark for balanced chemical equation 1 mark for state symbols**
8	(a)	(i)	Sulfur gains oxygen to form sulfur dioxide / the oxidation state of sulfur increases from 0 to +2.	1
		(ii)	Mole of sulfur dioxide = 320 / 24 = 13.33 mol Mole ratio of SO_2 : S = 1:1 = 13.33:13.33 Mass of sulfur burnt = 13.33 * 32 = 426.6 = 427g	1 1 1
		(iii)	sulfur dioxide can react with the water to form sulfurous acid. Sulfurous acid oxidises in the air to sulfuric acid which forms acid rain which can damage buildings made of limestone.	1 1

[Turn over

	(b)	Oxides of nitrogen Carbon monoxide Oxides of nitrogen are formed through the reaction of nitrogen and oxygen under high temperature in the engine. Carbon monoxide is formed through the incomplete combustion of petrol / fuel in the engine.		**1** **1** **1** **1**
9	**(a)**	The smaller the particle size, the larger the surface area for reaction to occur. This increases the frequency of collisions between reactant particles, resulting in a faster reaction.		**1** **1**
	(b)	Add **a fixed mass** of magnesium strip to hydrochloric acid of fixed concentration. Collect the **volume** of hydrogen gas collected using a gas syringe and measure the volume of hydrogen gas collected at **regular time intervals** (eg. 30 seconds). Record the values collected and **plot a graph** of volume of hydrogen gas collected against time. Repeat the experiment using magnesium powder instead of magnesium ribbon. Compare the **slopes of the graph** obtained for both ribbon and powder to investigate the rate of reaction.		**1** **1** **1** **1** **1**
	(c)	**(i)**	Exothermic	**1**
		(ii)	Since magnesium is a more reactive metal than copper, Therefore it displaces copper from its sulfate to form magnesium sulfate and copper metal.	**1** **1**

End of Answer Scheme

○

[Turn over