DAMAI SECONDARY SCHOOL
End-of-Year Examination 2019

CANDIDATE NAME

CLASS | | | | INDEX NUMBER | |

SCIENCE (CHEMISTRY) **5076/01**

Paper 1 **14 October 2019**

Secondary 3 Express **30 minutes**

Setter: Ms Nur Diyana Osman **20 marks**

Additional Materials: Answer sheet

READ THESE INSTRUCTIONS FIRST

Write your name, index number and class on all the work you hand in.
Do not use staples, paper clips, highlighters, glue or correction fluid.
The use of an approved scientific calculator is expected, where appropriate.

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 **2B pencil** on the **Answer Sheet.**
Each correct answer will score one mark. A mark will not be deducted for a wrong answer.

A copy of the Data Sheet is printed on page 11.
A copy of the Periodic Table is printed on page 12.
The number of marks is given in brackets [ ] at the end of each question or part question.

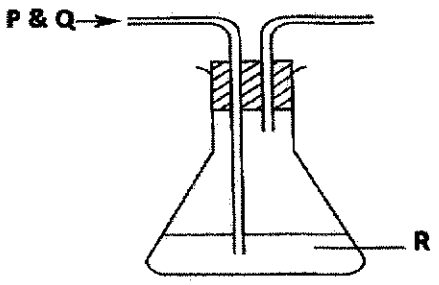
This document consists of **12** printed pages.

[Turn over

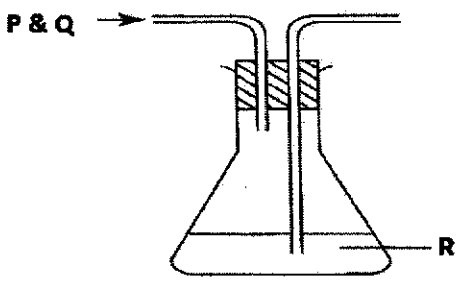
21 A chemical reaction produces a mixture of gas **P** and gas **Q**. Gas **Q** can be removed from the mixture by using solution **R**.

Which of the following techniques is most suitable in removing gas **Q**?

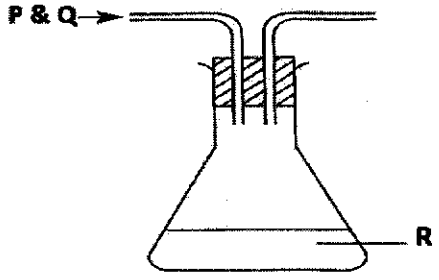
A



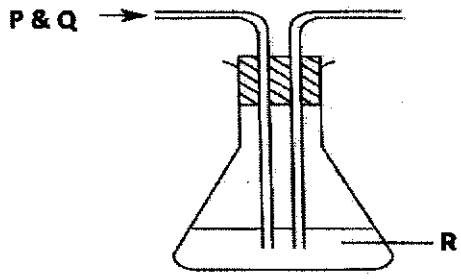
B



C



D



22 Measurements are made on some pure water.

- its boiling point, b.p.
- its melting point, m.p.
- its pH

Sodium chloride is now dissolved in the water and the measurements are repeated.

Which measured values will change?

	b.p	m.p	pH
A	√	√	√
B	√	√	×
C	×	×	√
D	×	×	×

23 Which of the following best supports the fact that matter is made up of tiny particles in random motion?

A Air has no definite volume.

B Steam occupies much more space than water in the liquid state.

C A drop of oil occupies a large surface area when placed in water.

D If a bottle of perfume is opened, the smell is quickly detected in all parts of the room.

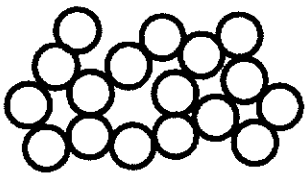
24 A student wishes to add 13.2 cm^3 of acid to 25.0 cm^3 of alkali as part of an experiment.

Which pair of apparatus is most suitable to measure the volume of acid and alkali accurately?

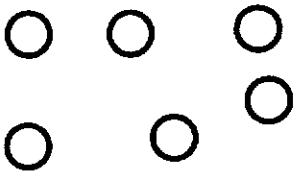
	acid	alkali
A	burette	pipette
B	burette	measuring cylinder
C	measuring cylinder	pipette
D	pipette	burette

25 The diagrams show the arrangement of particles in a substance at a pressure of 1 atmospheric pressure, but at two different temperatures.

-130°C



-100°C

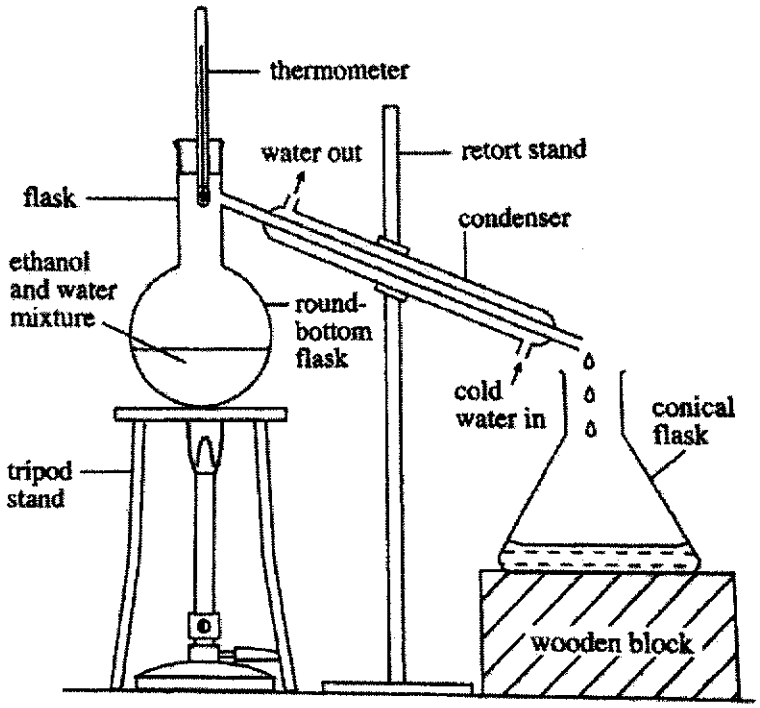


Which substance could the diagrams represent?

substance	melting point / °C	boiling point / °C
A	-189	-69
B	-169	-104
C	-135	-109
D	-115	-85

[Turn over

26 A student intends to separate a mixture of ethanol and water using the following apparatus.



Ethanol has a boiling point of 78.5°C and water has a boiling point of 100°C. He found that the liquid collected in the conical flask boils in the range of 82-84°C.

He decides to make some changes and repeats the experiment. What change should he make to the experiment?

A Increase the rate of heating.

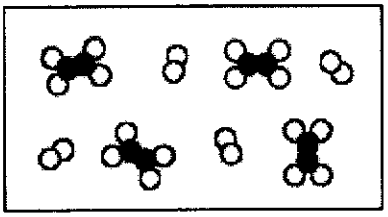
B Change the direction in which water enters the condenser.

C Add some porcelain chips to the liquid mixture in the round-bottom flask.

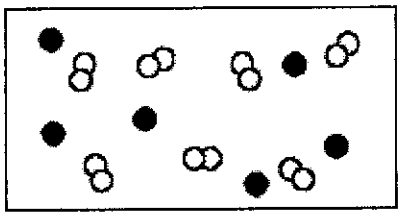
D Insert a fractionating column between the round-bottom flask and the condenser.

27 Which model best represents a mixture of sulfur dioxide gas and hydrogen gas?

A



B



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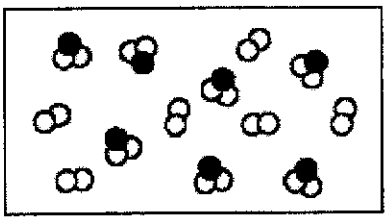
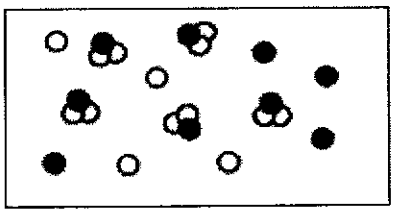


D



28 **X**, **Y** and **Z** are different atoms. **X** and **Y** have the same number of protons, while **X** and **Z** have the same number of neutrons.

Which of the following statements regarding these atoms is true?

A **X** and **Z** are both isotopes.

B **Y** and **Z** are both isotopes of **X**.

C **Y** is an isotope of **X**, but **Z** is not.

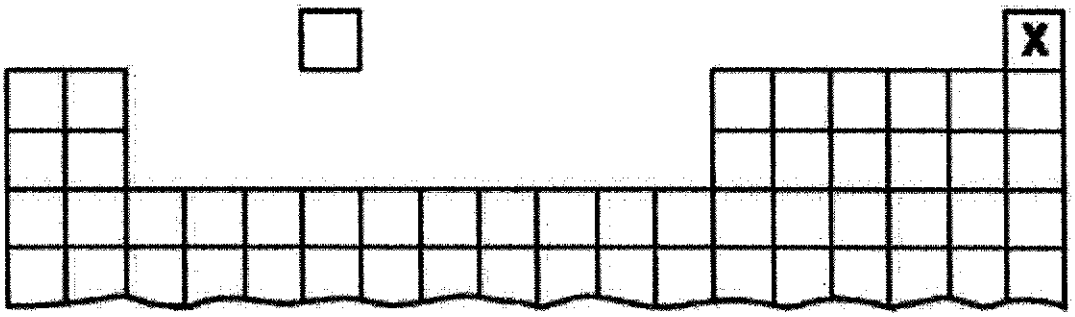
D **Z** is an isotope of **X**, but **Y** is not.

29 What is the number of particles found in a Zn^{2+} ion?

	electrons	protons	neutrons
A	32	35	30
B	32	30	35
C	28	30	35
D	28	35	30

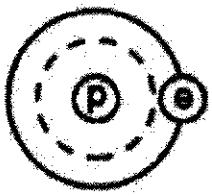
[Turn over

30 The diagram shows an outline of the Periodic Table.

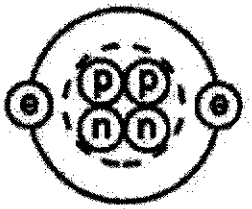


Which diagram shows an atom of element **X**?

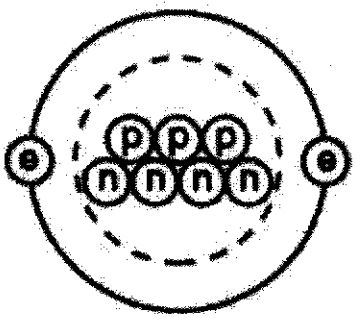
A



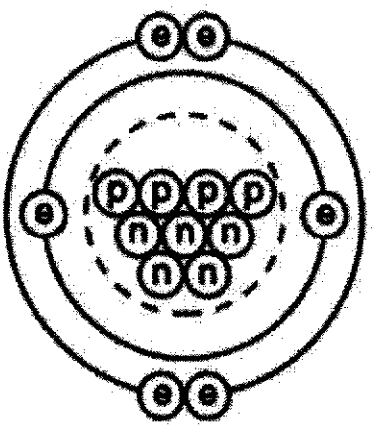
B



C



D



key

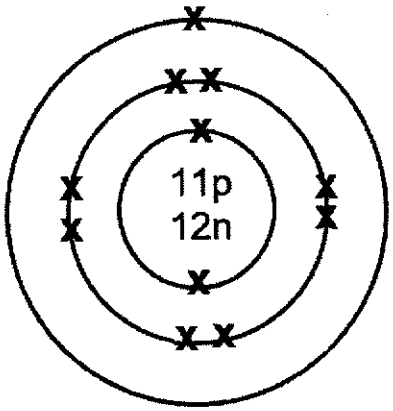
(e) = an electron

(n) = a neutron

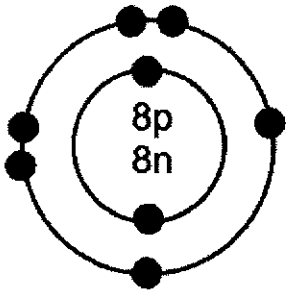
(p) = a proton

( ) = a nucleus

31 The diagram below illustrates the structures of **X** and **Y**.



X



Y

When **X** and **Y** react together to form a compound, what is the formula and mass of one mole of the compound?

	formula	mass of one mole / g
A	XY_2	43
B	X_2Y	62
C	XY_2	62
D	X_2Y	105

32 Which one of the following substances conducts electricity by the movement of ions?

A molten iron

B solid copper

C molten sugar

D molten sodium chloride

33 The following gases are present in car exhaust fumes.

- carbon dioxide
- nitrogen dioxide
- carbon monoxide
- water vapour
- nitrogen

Which of these gases are also present in unpolluted air?

A nitrogen only

B nitrogen and water vapour only

C nitrogen, carbon monoxide and water vapour only

D nitrogen, carbon monoxide, carbon dioxide and water vapour only

34 T_2O is a basic oxide.

What is the likely formula of the sulfate of T?

A TSO_4

B T_2SO_4

C $T(SO_4)_2$

D $T_2(SO_4)_2$

35 Which reactants could be used to safely prepare lithium chloride?

A lithium and dilute hydrochloric acid

B lithium and aqueous sodium chloride

C aqueous lithium hydroxide and dilute hydrochloric acid

D aqueous lithium nitrate and aqueous sodium chloride

36 What is the mass of sodium hydroxide used to make a 100 cm^3 of 0.5 mol dm^3 solution?

A 1.0 g

B 2.0 g

C 5.0 g

D 10.0 g

37 The action of concentrated nitric acid on copper is represented by the following equation.

$$x\text{Cu} + y\,\text{HNO}_3 \rightarrow x\text{Cu(NO}_3)_2 + 2\text{H}_2\text{O} + 2\text{NO}_2$$

What are the values of x and y?

	x	y
A	1	4
B	1	8
C	3	4
D	3	8

38 Consider the reaction,

$$\text{H}_2(\text{g}) + \text{Cl}_2(\text{g}) \rightarrow 2\text{HCl(g)}$$

What will be the final volume of the gas mixture when 100 cm^3 of hydrogen, H_2, is allowed to react with 200 cm^3 of chlorine, Cl_2?

(All gas volumes are measured under the same conditions.)

A 80 cm^3

B 100 cm^3

C 200 cm^3

D 300 cm^3

39 Different forms of steel contain differing amounts of carbon. Steel **P** contains a high proportion of carbon. Steel **Q** contains a low proportion of carbon.

Which statement is correct?

A **P** is stronger but less brittle than **Q**.

B **P** is stronger but more brittle than **Q**.

C **P** is less strong but less brittle than **Q**.

D **P** is less strong but more brittle than **Q**.

40 Methods used to stop iron from rusting include

- coating iron with tin;
- coating iron with zinc;
- connection of iron to magnesium rods.

Which metal is most often used to protect iron in food containers, in oil pipelines and in roofing sheets?

	food containers	oil pipelines	roofing sheets
A	magnesium	tin	zinc
B	tin	zinc	magnesium
C	tin	magnesium	zinc
D	zinc	magnesium	tin

END OF PAPER

DATA SHEET

Colours of Some Common Metal Hydroxides

Calcium hydroxide	white
Copper(II) hydroxide	light blue
Iron(II) hydroxide	green
Iron(III) hydroxide	red-brown
Lead(II) hydroxide	white
Zinc hydroxide	white

The Periodic Table of Elements

Group I	Group II											Group III	Group IV	Group V	Group VI	Group VII	Group 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.).

DAMAI SECONDARY SCHOOL
End-of-Year Examination 2019

CANDIDATE NAME

CLASS | | | | INDEX NUMBER | |

SCIENCE (CHEMISTRY) 5076/03

Paper 3 **4 October 2019**

Secondary 3 Express **1 hour 15 minutes**

Setter: Ms Nur Diyana Osman **65 marks**

Additional Materials: Nil

READ THESE INSTRUCTIONS FIRST

Write your name, index number and class on all the work you hand in.
Write in dark blue or black ink.
You may use a soft pencil for any diagram, graphs or rough working.
Do not use staples, paper clips, highlighters, glue or correction fluid.
The use of an approved scientific calculator is expected, where appropriate.
You may lose marks if you do not show your working or if you do not use appropriate units.

Section A
Answer **all** questions.

Section B
Answer only **two** questions.

A copy of the Data Sheet is printed on page 13.
A copy of the Periodic Table is printed on page 14.
The number of marks is given in brackets [ ] at the end of each question or part question.

This document consists of **14** printed pages.

[Turn over

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

1 Choose from the following substances to answer the questions below.

argon
methane
nitrogen monoxide
potassium fluoride
sulfur dioxide
ammonium chloride
ozone

Each substance can be used only once.

Name a substance which

(a) is a greenhouse gas produced by the decay of vegetable matter.

..... [1]

(b) dissolves in water to form a solution which neutralises sodium hydroxide.

..... [1]

(c) is soluble in water and has a high melting point.

..... [1]

(d) is a vehicular pollutant that can be removed using a catalytic converter.

..... [1]

(e) can be obtained from a mixture of solids.

..... [1]

2 The melting and boiling points of four different substances are shown in the table below.

Substance	A	B	C	D
Melting point /°C	-219	-114	-73	114
Boiling point /°C	-183	78	-10	183

(a) Which substance is a liquid at a temperature of 20°C?

..... [1]

(b) Which of the substances are gases at 0°C?

..... [1]

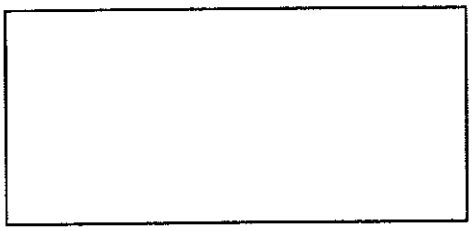
(c) Describe what happens to the arrangement and movement of particles in substance **B**, when it is placed into a beaker of boiling water from room temperature.

.....

.....

..... [2]

(d) Draw the arrangement of the particles of substance **D** at room temperature and write down its physical state.



Physical state ..... [2]

[Turn over

3 **(a)** Complete the table below for the two isotopes of magnesium. [2]

Isotope	Number of	
	protons	neutrons
magnesium-24		
magnesium-26		

(b) Draw the electronic structure of a magnesium–26 atom, showing all electrons.

[1]

(c) Explain how an atom of magnesium-26 can form a magnesium ion. State the charge on the ion formed.

.....

.....

..... [2]

(d) Magnesium reacts with oxygen to form a compound commonly named as magnesia, which is used to line the inner surface of a blast furnace.

(i) Draw a "dot and cross" diagram to show the arrangement of valence electrons in magnesia.

[2]

(ii) Based on your answer in **(d)(i)**, suggest why magnesia is used to line the inner surface of a blast furnace.

.....

.....

..... [2]

4 Methane burns in oxygen to form water and carbon dioxide.

The equation for the reaction is shown below.

$$CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$$

(a) What type of bonding is present in all four substances?

..... [1]

(b) State one physical property that is true for all the four substances.

..... [1]

(c) Draw a 'dot and cross' diagram to show the arrangement of electrons in a molecule of methane. Show all electrons. [2]

(d) Calculate the mass of water produced when 32 g of methane is burnt in excess oxygen. [2]

(e) Calculate the volume of carbon dioxide produced at room temperature and pressure. [2]

5 A student prepared copper(II) sulfate, $CuSO_4$, crystals in the laboratory.

Copper(II) carbonate powder was added bit by bit to 100 cm^3 of dilute sulfuric acid in a beaker until the reaction has stopped.

(a) Write a balanced chemical equation, with state symbols, to show the above reaction.

..... [2]

(b) How would you know that the reaction has stopped?

..... [1]

(c) How would you obtain a **pure and dry** sample of copper(II) sulfate crystals from the reaction mixture obtained?

.....

.....

.....

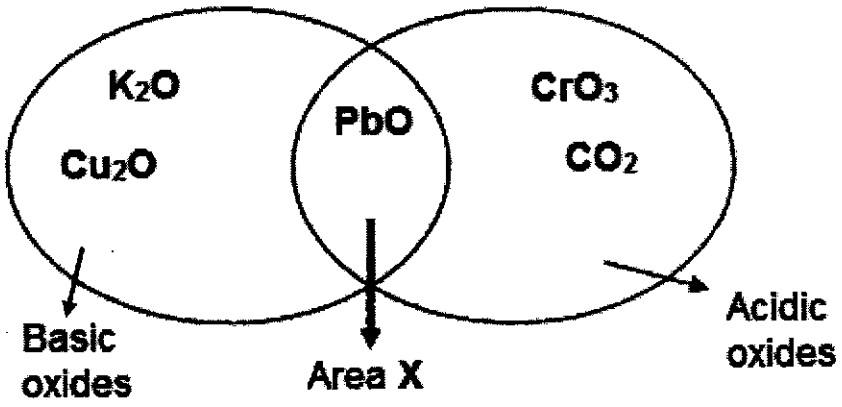
.....

..... [3]

(d) Besides copper(II) carbonate, name another substance which can be used in the preparation of copper(II) sulfate.

..... [1]

6 A Venn diagram is a pictorial way of classifying substances. A Venn diagram for oxides is shown in the diagram. The formulae of five oxides have been written in the Venn diagram as examples.



(a) What label should be given to area **X**?

..... [1]

(b) Write the formulae of the following oxides in their correct positions in the Venn diagram above. [1]

magnesium oxide zinc oxide nitrogen dioxide

(c) From its position in the diagram, what is unusual about chromium(VI) oxide?

.....

..... [1]

(d) An oxide of carbon, CO, cannot be placed in any part of the Venn diagram.

Suggest a reason.

..... [1]

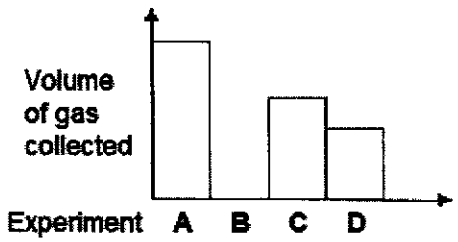
(e) Predict the chemical property of lead(II) oxide that is responsible for its position in the Venn diagram.

.....

..... [1]

[Turn over

7 In four experiments, **A**, **B**, **C** and **D**, equal amounts of four different powdered metals were separately added to equal volumes of dilute hydrochloric acid. The volume of gas collected in the first few seconds is shown below.



(a) The four metals were zinc, magnesium, copper and iron.

Name the metals used in;

Experiment **A** .....

Experiment **B** .....

Experiment **C** .....

Experiment **D** ..... [2]

(b) **(i)** Name the gas produced in the above experiments.

..... [1]

(ii) Describe the chemical test and its result for this gas.

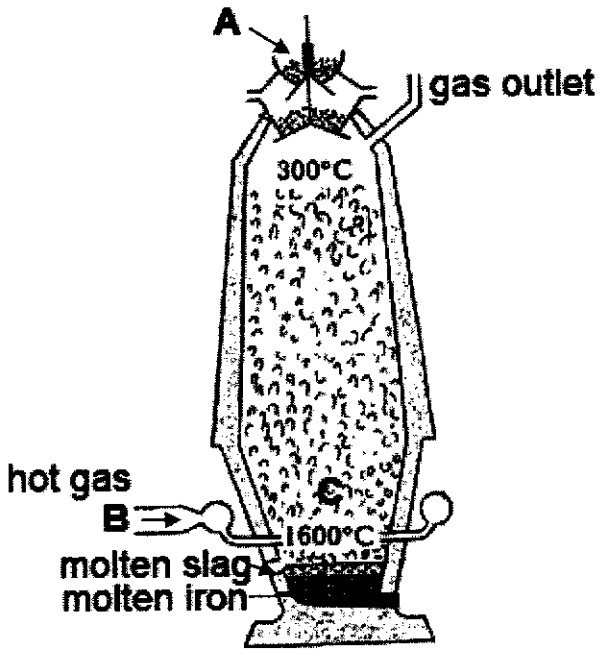
Test .....

Results ..... [2]

END OF SECTION A

Section B [20 marks]
Answer any **two** questions from this section in the spaces provided.

8 The diagram below shows a blast furnace.



(a) What two substances, other than haematite, are added at **A**?

..... [1]

(b) Name the hot gas that is passed into the bustle pipe at **B**.

..... [1]

(c) Write a balanced chemical equation, with state symbols, for the reaction that occurs at **C** in the furnace accounting for the production of iron from the haematite.

..... [2]

(d) The iron obtained from the blast furnace is also used to make stainless steel.

(i) Name the element that is mixed with iron to make steel.

..... [1]

(ii) Draw a labelled diagram to show the arrangement of particles in steel. [1]

[Turn over

(iii) Steel, instead of iron, is used to build many structures such as bridges because they are stronger and harder.

Explain, in terms of its structure, why steel is stronger and harder than iron.

.....

.....

.....

..... [2]

(iv) Some bridges have blocks of magnesium attached to them.

Explain why.

.....

.....

.....

..... [2]

9 (a) The following is an abstract from the internet.

Nitrogen is an element with a melting point of -210°C and boiling point of -186°C.

Nitrogen is a colourless, odourless, tasteless and mostly inert diatomic gas at standard conditions. The extremely strong bond in nitrogen dominates nitrogen chemistry, causing difficulty for both organisms and industry in breaking the bond to convert the nitrogen into useful compounds.

However, when these compounds burn, explode, or decay back into nitrogen gas, they release large amounts of often useful energy.

(i) The website uses the words "element" and "compound".

Define the terms "element" and "compound".

.....

.....

.....

..... [2]

(ii) Draw the electronic arrangement in a nitrogen molecule. Show the outershell electrons only. [2]

(iii) Explain, in terms of structure and bonding, why nitrogen is a gas at room temperature and pressure.

.....

.....

.....

..... [3]

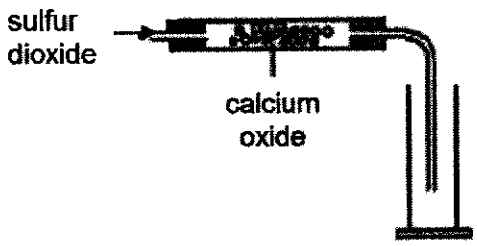
(b) (i) Sulfur dioxide can be produced by reacting sodium sulfite (Na_2SO_3) with hydrochloric acid. The other products of the reaction are water and sodium chloride.

Write a balanced chemical equation for the reaction.

..... [1]

(ii) Calcium oxide is a drying agent which removes water vapour.

A student wanted to collect a dry sample of the sulfur dioxide produced.



He used the apparatus above but was unsuccessful in collecting any gas.
Explain why.

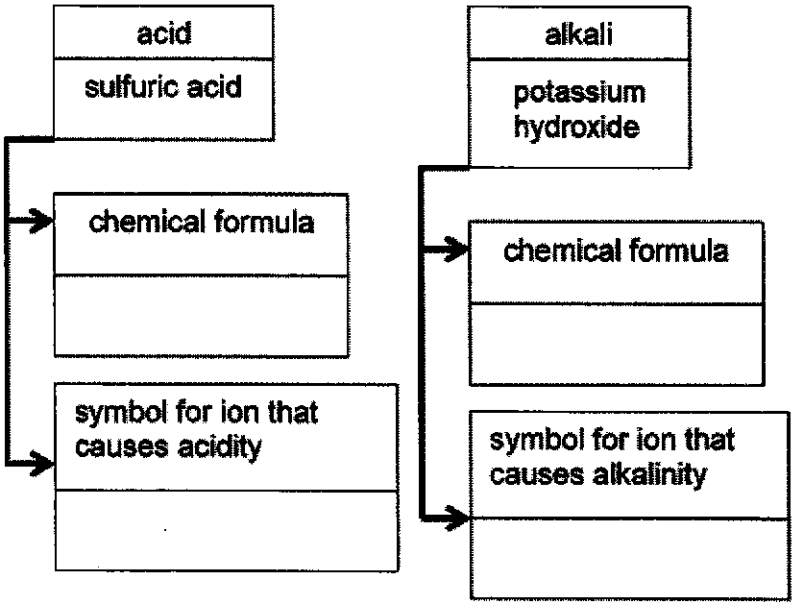
.....

.....

..... [2]

10 **(a)** The figure describes some of the properties of an acid and an alkali. [2]

Complete the empty boxes in the figure below.



(b) Write the balanced chemical equation for the reaction between sulfuric acid and aqueous potassium hydroxide, including the state symbols.

..... [2]

(c) Explain why acids and alkalis can conduct electricity when dissolved in water

.....

..... [1]

(d) 20 cm^3 of 1.0 mol/dm^3 of hydroxide of **X** exactly neutralises 40 cm^3 of 0.25 mol/dm^3 of sulfuric acid.

(i) Find the number of moles of hydroxide of **X** used. [1]

(ii) Find the number of moles of sulfuric acid used. [1]

(iii) State the reacting ratio between hydroxide of **X** and sulfuric acid.

..... [1]

(iv) Calculate the mass of the salt formed. [2]

END OF PAPER

DATA SHEET

Colours of Some Common Metal Hydroxides

Calcium hydroxide	white
Copper(II) hydroxide	light blue
Iron(II) hydroxide	green
Iron(III) hydroxide	red-brown
Lead(II) hydroxide	white
Zinc hydroxide	white

[Turn over

The Periodic Table of Elements

Group I	Group II											Group III	Group IV	Group V	Group VI	Group VII	Group 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 –

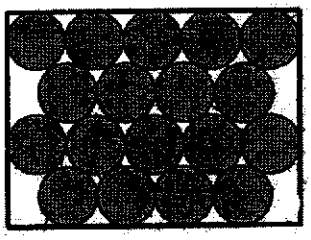
The volume of one mole of any gas is 24 dm^3 at room temperature and pressure (r.t.p.).

3E Science Chemistry 5076 End of Year Examination 2019 Marking Scheme

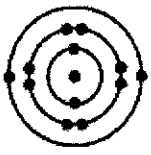
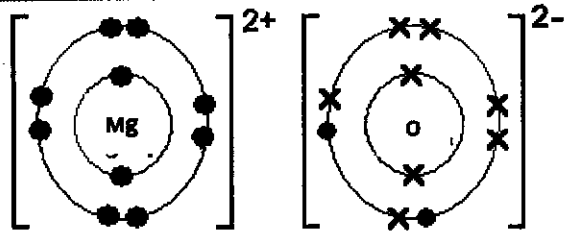
Paper 1

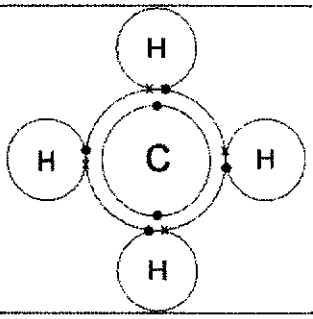
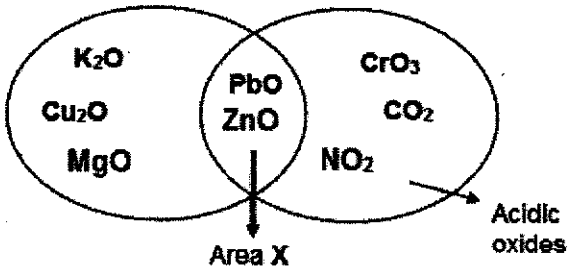
21	A	**26**	D	**31**	B	**36**	B
22	B	**27**	C	**32**	D	**37**	A
23	D	**28**	C	**33**	B	**38**	D
24	A	**29**	C	**34**	B	**39**	B
25	B	**30**	B	**35**	C	**40**	C

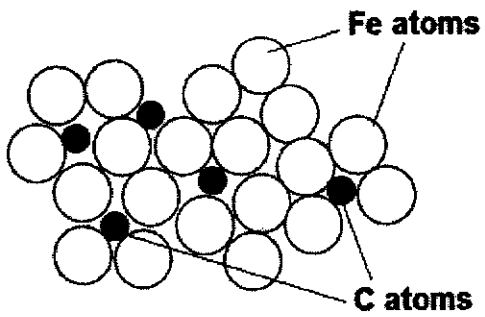
Paper 3 Section A

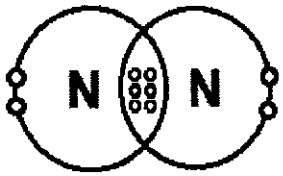
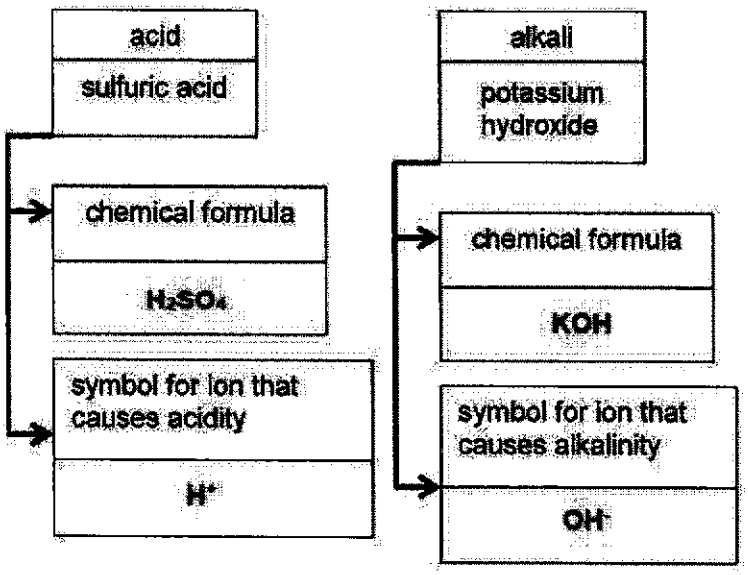
1	**(a)**	methane	[1]
	(b)	sulfur dioxide	[1]
	(c)	potassium chloride	[1]
	(d)	nitrogen monoxide	[1]
	(e)	ammonium chloride	[1]
2	**(a)**	B	[1]
	(b)	A & C	[1]
	(c)	At room temperature, B exist as a liquid. When placed in boiling water of 100˚C, the particles gained heat energy, moved faster and more randomly and have sufficient energy to become gaseous particles immediately. At a boiling temperature of 100˚C, it has already past substance B boiling point of 78˚C.	[1] arrangement [1] motion
	(d)	Solid 	[1] [1]
3	**(a)**		[2], 3-4 correct; [1], 1-2 correct

Isotope	Number of	
	proton	**neutron**
Magnesium-24	**12**	**12**
Magnesium-26	**12**	**14**

	(b)	 2.8.2	[1]
	(c)	Magnesium-26, has 12 electrons with an electronic structure of 2.8.2. It does not have a stable electronic structure and will lose 2 valence electrons, resulting as a positive ion with a charge of +2.	[1] [1]
	(d) (i)		[1] correct Mg^{2+} ion [1] correct O^{2-} ion

	(d) (i)	Magnesia; MgO, or magnesium oxide is an ionic compound with strong ionic bond / electrostatic forces of attraction. Hence it will have high melting point and will not melt when subjected to high temperatures in the furnace.	[1] [1]
4	(a)	covalent	[1]
	(b)	Low melting and boiling point / insoluble in water / cannot conduct electricity in any states.	[1];any one
	(c)		[1];all electrons shown [1]; overlap shells
	(d)	Mole of methane = 32/16 = 2 mol Mole of water : Mole of methane = 2 : 1 Mole of water = 4 mol Hence, mass of water = 4 x 18 = 72.0g	[1] working [1]final answer
	(e)	Mole of methane = 2 mol Mole of carbon dioxide : Mole of methane = 1 : 1 Mole of carbon dioxide = 2 mol Hence, volume of carbon dioxide = 2 x 24 = 48.0dm^3	[1] working [1]final answer
5	(a)	$H_2SO_4(aq) + CuCO_3(s) \rightarrow CuSO_4(aq) + CO_2(g) + H_2O(g)$	[1] correct formula, products & reactant [1] balanced equation
	(b)	No bubbles seen / no effervescence	[1]
	(c)	- filter the mixture and obtain the filtrate - heat the filtrate till saturated / heat until one-third of volume - remove heat and allow the solution to cool and crystallise - wash the crystals formed with cold distilled water - dry in between filter paper	[3] all 5 pt [2] 4-3 pt [1] 2 pt [0] 1-0pt
	(d)	copper(II) oxide	[1]
6	(a)	amphoteric oxide	[1]
	(b)		[1] all 3

	(c)	Chromium oxide is metal oxide and it should be placed together with K_2O and Cu_2O who are basic instead of in the acidic oxide category.	[1]
	(d)	CO is a neutral oxide and cannot be place within / inside the Venn diagram.	[1]
	(e)	Lead(II) oxide is a a metal oxide and is amphoteric in nature and can neutralise both acids & bases, to form salt and water.	[1]
7	(a)	**A** = magnesium **B** = copper **C** = zinc **D** = iron	[2], 3-4 correct; [1],1-2 correct
	(b) (i)	Hydrogen gas	[1]
	(b) (ii)	Test = insert a lighted splint Results = lighted splint extinguish with 'pop' sound	[1] [1]
Paper 3 Section B			
8	(a)	Limestone and coke	[1] for both
	(b)	Oxygen / Air	[1]
	(c)	Fe_2O_3 (s) + 3CO (g) → 2Fe (l) + $3CO_2$ (g)	[1] balanced equation; [1]for correct state symbols
	(d)(i)	carbon	[1]
	(d)(ii)		[1] must be labelled / Fe atoms to be larger than C
	(d)(iii)	Steel is an alloy with different size atoms that disrupts the orderly arrangement of pure iron. This prevents the layers of atoms from sliding past each other when an external force is applied. Hence, steel is stronger and harder than pure iron.	[1] [1]
	(d)(iv)	Magnesium is a more reactive metal than the iron found in steel. Hence, when placed with iron, magnesium will corrode in place of iron, through sacrificial protection and this prevent the steel bridge from rusting and being damaged.	[1] [1]

9	(a) (i)	Element is the simplest form of substance that cannot be broken down by any means Compound is two or more elements chemically combined together.	[1] [1]
	(a) (ii)		[1] outershell only with 3 shared pairs of electrons; [1] lone pair of electrons on each N atom
	(a) (iii)	Nitrogen is a covalent molecule. With weak intermolecular forces of attraction Hence, little or no heat energy needed for nitrogen to overcome these forces resulting in low melting and boiling point.	[1] [1] [1]
	(b) (i)	$Na_2SO_3 + 2HCl \rightarrow SO_2 + 2NaCl + H_2O$	[1] correct formula and balanced
	(b) (iii)	The calcium oxide is both a drying agent and a basic oxide. The acidic sulfur dioxide gas will be neutralise by the basic calcium oxide in the tube and hence no sulfur dioxide gas will be collected as both water present is absorbed and while the gas is removed.	[1] [1]
10	(a)		[2], 3-4 correct; [1],1-2 correct
	(b)	H_2SO_4 (aq) + 2KOH (aq) → K_2SO_4 (aq) + $2H_2O$ (l)	[1] balanced equation; [1]for correct state symbols

	(c)	Acids and alkalis dissolved in water to produce ions (H^+ & OH^-) respectively. These ions are mobile free to move and carry charges and hence can conduct electricity.	[1]
	(d)(i)	Mole of hydroxide X = 0.02 mol	[1]
	(d)(ii)	Mole of sulfuric acid = 0.01 mol	[1]
	(d)(iii)	Ratio between hydroxide of **X** and sulfuric acid = 2:1 ** If student did not indicate the statement, the ratio will be as per qns asked ie 2:1 CANNOT be 1:2*	[1]
	(d)(iv)	Mole of hydroxide X = 0.02 mol Mole of hydroxide : Mole of salt, K_2SO_4 = 2 : 1 Mole of salt, K_2SO_4 = 0.01 mol Hence, mass of salt, K_2SO_4 = 0.01 x 174 = 1.74g	[1] working [1]final answer

END OF PAPER