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**FUCHUN SECONDARY SCHOOL
PRELIMINARY EXAMINATION 2019
SECONDARY FOUR EXPRESS AND FIVE NORMAL (ACADEMIC)**

SCIENCE (CHEMISTRY/PHYSICS)

Paper 1 Multiple Choice

5076/01

5078/01

19 September 2019

Paper 1 : 1 hour

Additional materials: Multiple Choice Answer Sheet

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.

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

Write your name, index number and class on the Answer Sheet in the spaces provided.

There are **forty** questions on this paper. Answer **all** questions. For each question, there are four possible answers **A, B, C** or **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.

A copy of the Periodic Table is printed on page **10**.

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

Setter: Mdm Yogeswari

This document consists of 10 printed pages.

- 21** Bromine is a liquid at 20 °C.

What is the melting point and boiling point for bromine?

	melting point/ °C	boiling point/°C
A	-22	-3
B	-8	-33
C	-7	59
D	25	103

- 22** A label is missing from a bottle of colourless solution **Q**.

In order to identify the solution two chemical tests are carried out.

test 1: When magnesium is added to solution **Q**, bubbles of colourless gas is given off which extinguishes a lighted splint with a pop sound.

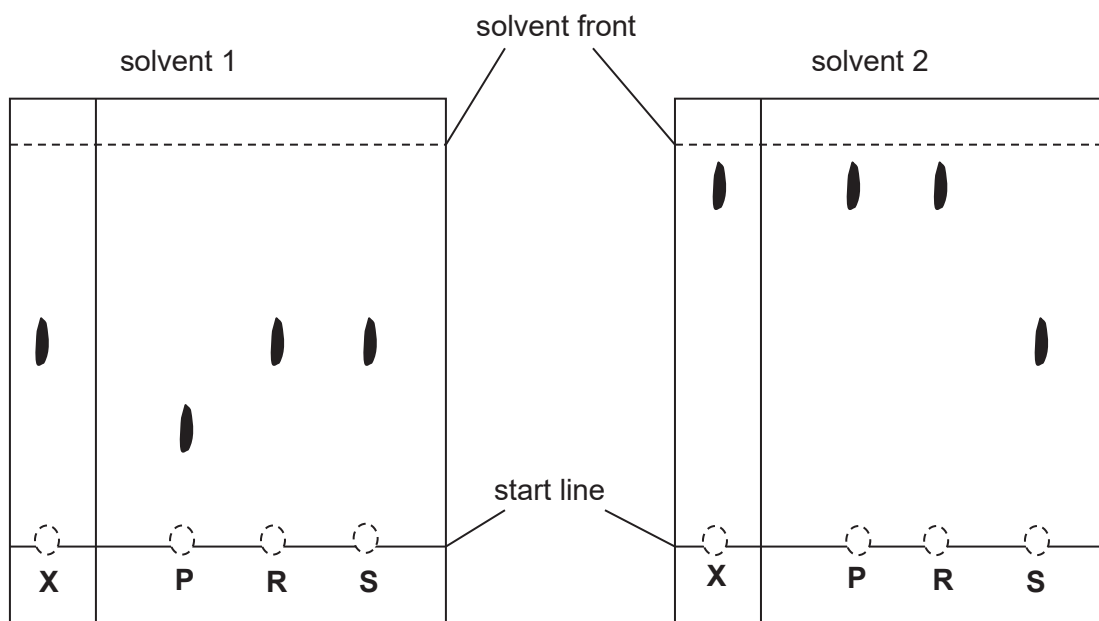
test 2: 1 cm³ of nitric acid is added to another sample of **Q**. The a few drops of silver nitrate solution is added. A white precipitate is formed.

What is **Q**?

- A** calcium hydroxide
 - B** hydrochloric acid
 - C** iron(II) carbonate
 - D** zinc(II) hydroxide
- 23** An element Y has two isotopes, ²³⁸Y and ²³⁵Y.
- How does ²³⁸Y differ from ²³⁵Y?
- A** It has 3 more neutrons and 3 more electrons.
 - B** It has 3 more neutrons.
 - C** It has 3 more protons and 3 more electrons.
 - D** It has 3 more protons.

- 24 Substance **X** contains one of the three substances **P**, **R** or **S**.

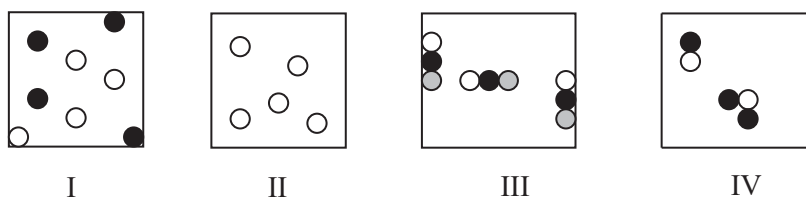
Two chromatograms of the four substances were obtained using different solvents. The diagram below shows the results obtained.



What does **X** contain?

- A **P** only
 - B **R** only
 - C either **P** or **R**
 - D either **R** or **S**
- 25 Which of the following changes will result in the particles moving at a higher speed?
- A $\text{Br}_2 (\text{g}) \rightarrow \text{Br}_2 (\text{l})$
 - B $\text{I}_2 (\text{g}) \rightarrow \text{I}_2 (\text{s})$
 - C $\text{H}_2\text{O} (\text{l}) \rightarrow \text{H}_2\text{O} (\text{s})$
 - D $\text{CO}_2 (\text{s}) \rightarrow \text{CO}_2 (\text{g})$

- 26 The diagrams below show atoms of different elements represented by ○, ● and ●.



Which diagram shows a pure compound and a mixture of elements respectively?

	pure compound	mixture of elements
A	III	I
B	III	II
C	IV	I
D	IV	II

- 27 A newly discovered element, Xylonium (Xy), is placed in Group II of the Periodic Table. Which is the correct chemical formula for its sulfate?

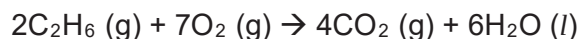
- A** Xy_2SO_4
B $\text{Xy}(\text{SO}_4)_2$
C $\text{Xy}_2(\text{SO}_4)_2$
D XySO_4

- 28 The table below shows the melting point and the electrical conductivity when in molten state and in solid state of substances **A**, **B**, **C** and **D**.

Which substance best represents a compound formed between a metal and non-metal?

	melting point	conducts electricity	
		when in solid state	when in molten state
A	Low	Good	Good
B	High	Poor	Good
C	Low	Poor	Poor
D	High	Poor	Poor

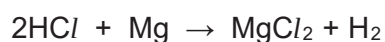
- 29** Ethane burns completely in oxygen as shown in the equation.



If 15 cm³ of ethane is burnt in excess oxygen, calculate the volume of the carbon dioxide obtained at the end of the reaction, measured at room temperature and pressure.

- A** 20.0 cm³
- B** 30.0 cm³
- C** 40.0 cm³
- D** 50.0 cm³

- 30** The reaction between hydrochloric acid and magnesium is shown.



Which volume of 1.0 mol/dm³ hydrochloric acid is needed to react completely with 2.4 g of magnesium?

- A** 10 cm³
- B** 20 cm³
- C** 100 cm³
- D** 200 cm³

- 31** The following equation shows the reaction of zinc sulfide forming zinc and sulfur in the extraction of zinc from its ore.



Which statement about this reaction is correct?

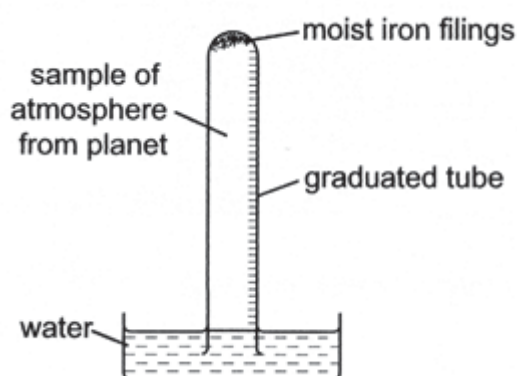
- A** Zinc gains electrons to form zinc ions.
- B** Zinc loses electrons to form zinc ions.
- C** Zinc ions gain electrons to form zinc atoms.
- D** Zinc ions lose electrons to form zinc atoms.

- 32** Which oxide reacts with both acids and alkalis?
- A** carbon monoxide
 - B** sulfur dioxide
 - C** lead(II) oxide
 - D** calcium oxide
- 33** Which element can only be extracted by electrolysis?
- A** lead
 - B** silver
 - C** sodium
 - D** zinc
- 34** Which process is exothermic?
- A** burning petrol in a car engine
 - B** cracking of petroleum fractions
 - C** fractional distillation of petroleum
 - D** melting bitumen for roads

- 35** The air taken from a newly discovered planet contains the following gases.

gas	concentration (%)
carbon dioxide	20
hydrogen	40
ammonia	10
oxygen	30

The apparatus below was set up with a 100 cm^3 sample of the air taken from the planet in the graduated tube. The volume of the sample was measured at regular time intervals until no further change in volume took place.



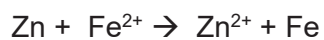
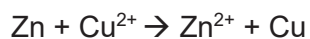
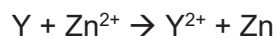
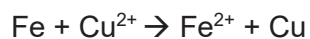
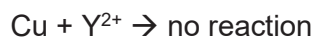
What is the volume of gas left in the tube?

- A** 20 cm^3
 - B** 30 cm^3
 - C** 70 cm^3
 - D** 80 cm^3
- 36** Substance **Y** turns a solution of acidified potassium manganate (VII) from purple to colourless.

What must solution **Y** contain?

- A** an alkali
- B** an ammonium salt
- C** a reducing agent
- D** an oxidising agent

- 37 Some metals will react with the solutions of the salts of another metal. The following ionic equations illustrate the reactions of metals copper, iron, zinc and Y.

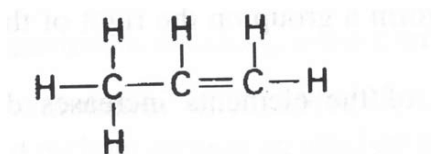


From the ionic equations, deduce the correct order of reactivity of the metals.

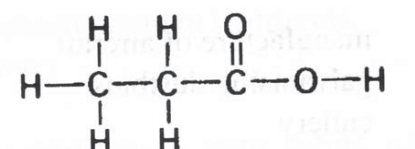
	most reactive	$\longrightarrow$			least reactive
A	Cu	Fe	Zn	Y	
B	Y	Fe	Zn	Cu	
C	Y	Zn	Fe	Cu	
D	Zn	Y	Cu	Fe	

- 38 Which compound is unsaturated and reacts with sodium carbonate?

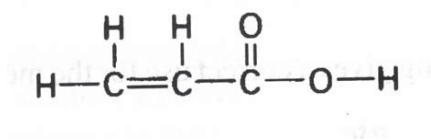
A



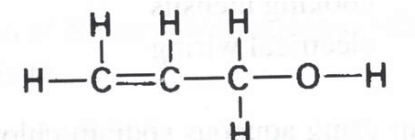
B



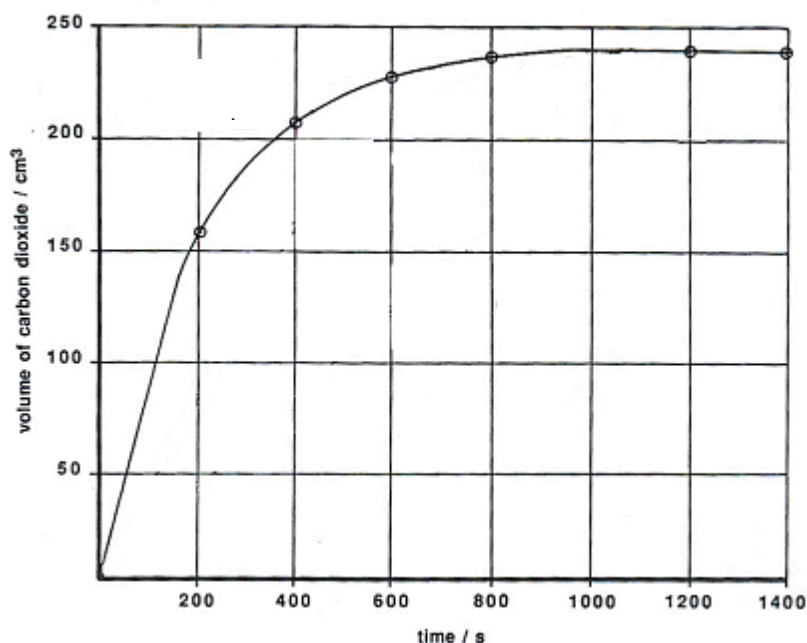
C



D

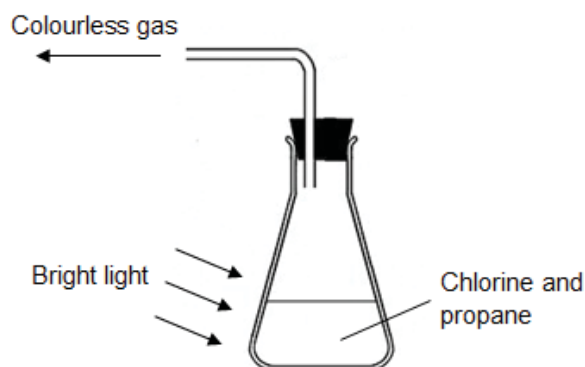


- 39 Calcium carbonate is placed in a flask on weighing balance and dilute hydrochloric acid is added. The total mass of the flask and its content is recorded every 200 seconds.



At which time is the reaction the fastest?

- A 100 s
B 200 s
C 400 s
D 800 s
- 40 A mixture of chlorine and excess propane was exposed to bright light. When the light was switched on, the mixture in the flask began to bubble, giving off a colourless gas.



What is the colourless gas?

- A chlorine B hydrogen
C hydrogen chloride D propane

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	europtium	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
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.)



**FUCHUN SECONDARY SCHOOL
PRELIMINARY EXAMINATION 2019
SECONDARY 4 EXPRESS/ 5 NORMAL ACADEMIC**

NAME:

CENTER NO: INDEX NO:

CLASS:

**SCIENCE (CHEMISTRY)
Paper 3**

**5076/03 and 5078/03
17 September 2019
1 hr 15 min
Max mark: 65**

READ THESE INSTRUCTIONS FIRST

Write your name, class and index number on all the work you hand in.
You may use an HB pencil for any diagrams, graphs, tables or rough working.
Write in dark blue or black pencil.
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** the questions in the spaces provided.
Write your answers in the spaces provided on the question paper.

Section B

Answer any **two** 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 Data Sheet is printed on page **15**.
A copy of the Periodic Table is printed on page **16**.

Marks Obtained	
Paper 3 Sect A	
Paper 3 Sect B ____	
B ____	
Total	

Name of Setter: Mdm Yogeswari

This paper consists of **16** printed pages.

Section A (45 marks)

Answer **ALL** the questions in the spaces provided in this section.

- 1 Table 1.1 lists the number of protons, neutrons and electrons in several different particles.

Table 1.1

particle (not chemical symbols)	number of protons	number of neutrons	number of electrons
C	1	0	1
D	3	3	2
E	7	7	7
F	8	9	8
G	8	10	8
H	9	10	10

Which of the particles, **C**, **D**, **E**, **F**, **G** and **H** in Table 1.1, fit into each of the following descriptions

(a) an atoms with mass number of 18 [1]

(b) an atom with 5 electrons in its outer shell [1]

(c) an ion of a metal [1]

(d) atoms of isotopes of the same element and [1]

(e) a negatively charged ion [1]

[Total: 5]

- 2 Table 2.1 gives the melting points and boiling points of Group I and Group VII elements.

Table 2.1

	element	melting point/ °C	boiling point/ °C
Group I	lithium	180	1330
	sodium	97.8	890
	potassium	64	774
Group VII	chlorine	-101	-35
	bromine	-7	59
	iodine	114	184

- (a) (i) The trends in melting points and boiling points for elements in Group I differ from those in Group VII.
Describe the trend down each group.

.....
.....
.....[2]

- (ii) Describe two other trends down Group VII.

.....
.....[2]

- (b) (i) All of the elements in Group VII are diatomic.

Explain the meaning of *diatomic*.

.....
.....[1]

- (ii) Draw a “dot and cross” diagram to show the bonding in a chlorine molecule.
Show the outer electrons only.

[2]

- (c) (i) Sodium and chlorine react together to form sodium chloride.

Draw the “dot and cross” diagram to show the bonding in sodium chloride.

[2]

- (ii) Explain why sodium chloride can conduct electricity in molten and aqueous state but not in solid state.

.....
.....
.....[2]

[Total: 11]

- 3 The boxes in Fig 3.1 contain descriptions of five different substances **K**, **L**, **M**, **N** and **O**.

Fig 3.1

A solid, **K**, which melts on heating to a yellow liquid that cannot be made into a simpler substance.

A chemical reaction takes places and heat is liberated when this white solid, **L**, is formed.

When this blue liquid, **M**, is distilled, a colourless liquid is collected.

A white solid, **N**, that can be separated into two different substances by adding water and filtering.

A colourless substance, **O**, with a fixed melting point and a fixed boiling point.

Decide whether each substance should be classified as an element, compound, mixture or either an element or compound. Show your decision by putting a tick (✓) in one box correct box for each substance in Table 3.1.

Table 3.1

substance	element	compound	mixture	either an element or a compound
K				
L				
M				
N				
O				

[5]

[Total: 5]

4 Salts can be prepared by using reactions of acids.

(a) The table shows some names and formulae of salts.

Complete the Table 4.1 by filling in the missing information.

Table 4.1

name of salt	formula of salt	name of acid used to make the salt	name of the other compound used to make the salt
potassium sulfate	K_2SO_4		
sodium chloride	$NaCl$	hydrochloric acid	
magnesium nitrate	$Mg(NO_3)_2$	nitric acid	
copper(II) sulfate		sulfuric acid	copper(II) oxide

[5]

(b) Write a balanced chemical equation for the reaction between copper(II) oxide and sulfuric acid.

.....[2]

(c) Describe how to obtain pure, dry crystals of copper(II) sulfate from the resulting solution in the reaction in (b).

.....
.....
.....
.....[2]

(d) Name two salts that are prepared by precipitation.

.....

.....

[2]

[Total:11]

5 Poisonous oxides of nitrogen and carbon monoxide are released from car exhausts and cause major pollution issues.

(a) State one harmful effect of each pollutant on human health.

(i) oxides of nitrogen

.....

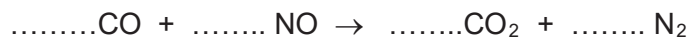
.....[1]

(ii) carbon monoxide

.....

.....[1]

(b) The harmful gases are converted to less harmful ones before they are released from car exhausts as shown in the chemical equation below.



(i) Balance the chemical equation above.

[1]

(ii) State which substance is reduced and give the reason for your answer.

substance reduced

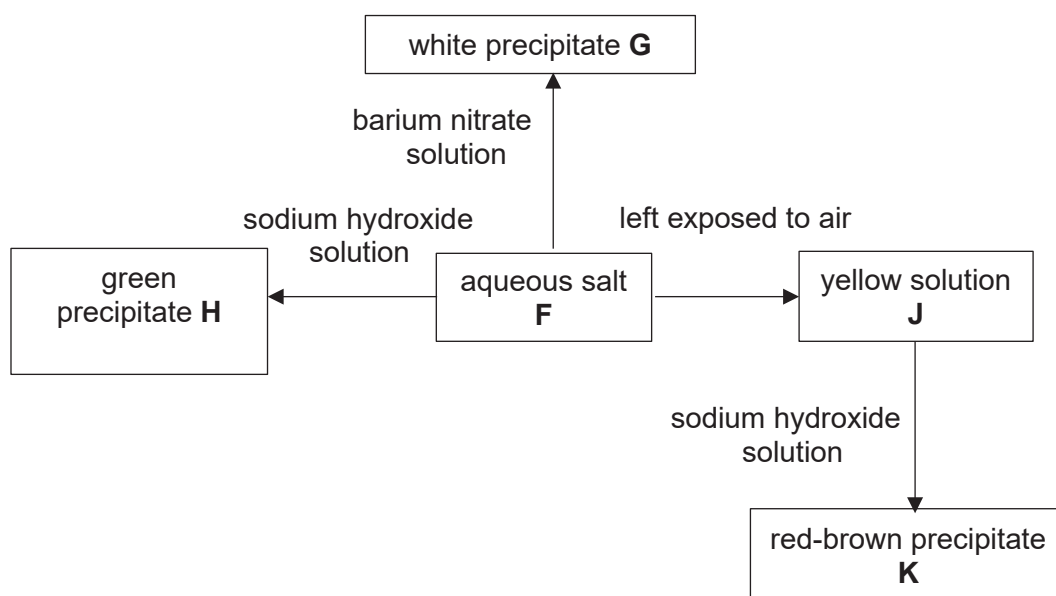
reason.....

.....[2]

[Total: 5]

- 6 Fig 6.1 below shows some reactions of an aqueous salt, **F**.

Fig 6.1



Name the substances **F**, **G**, **H**, **J** and **K**.

F:

G:

H:

J:

K:

[5]

[Total: 5]

- 7 The properties of a substance make it suitable for particular tasks.
Complete Table 7.1 by naming a suitable substance for each task.

Table 7.1

task	substance needed.
repairing road surfaces	
lowering the acidity of the soil	
making margarine from vegetable oils	

[3]

[Total: 3]

Section B (20 marks)

Answer any **two** questions in this section.

- 8 (a) Explain, including relevant chemical equations, how iron is extracted from its ore in a blast furnace.

.....

.....

.....

.....

.....

.....[4]

- (b) Iron from blast furnaces is usually mixed with other element to form alloys.

Name one of these alloys and give a reason why this alloy is preferred to iron from blast furnaces.

.....

.....[2]

- (c) Calculate the mass in grams, and the volume in dm^3 , measured in room temperature and pressure, of carbon dioxide formed in producing 10 000 g of iron.

[4]

[Total: 10]

- 9 (a)** Crude oil is separated into several useful substances in a fractionating tower. Describe the separation process.

.....
.....
.....
.....
.....
.....
.....[3]

- (b)** Organic compounds are placed in an homologous series.

- (i)** Give two characteristics of an homologous series.

.....
.....[2]

- (ii)** Write the general formula for the homologous series of alkanes.

.....[1]

- (iii)** Name and write the chemical formula of the first member of the homologous series of alkanes.

.....[2]

(c) The alkenes include ethene, C_2H_4 . This compound undergoes addition polymerization to form addition polymers.

(i) Draw the structural formula of ethene.

[1]

(ii) Draw two repeating units of the addition polymer formed by ethene.

[1]

[Total: 10]

10 (a) (i) Explain how coating iron with paint prevents iron from rusting.

[2]

(ii) A student wants to investigate if salt water speeds up the rusting process. Describe a laboratory investigation that can be used to decide if salt water speeds up rusting.

You are provided with the two iron nails.

[4]

(b) Iron reacts with steam to form the dark brown solid Fe_3O_4 and a colourless gas.

(i) Write a balanced chemical equation for this reaction

.....[2]

(ii) Describe a positive test to identify the colourless gas.

.....

.....[2]

[Total: 10]

END OF PAPER 3

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 the Elements

Group																	
I	II											III	IV	V	VI	VII	O
7 Li lithium 3	9 Be beryllium 4	1 H hydrogen 1										11 B boron 5	12	14	16	19	2 He helium 2
													6	7	8	9	
23 Na sodium 11	24 Mg magnesium 12											27 Al aluminium 13	28	31	32	35.5	40 Ar argon 18
													14	15	16	17	
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	75	79	80	84 Kr krypton 36
													32	33	34	35	
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 Ru ruthenium 44	106 Pd palladium 46	108 Ag silver 47	112 Cd cadmium 48	119 Sn tin 50	122 Sb antimony 51	128 Te tellurium 52	127	127	127	131	131 Xe xenon 54
													50	51	52	53	
133 Cs caesium 55	137 Ba barium 56	139 La lanthanum 57	178 Hf hafnium 72	181 Ta tantalum 73	184 W tungsten 74	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	209	209	209	209 Bi bismuth 83
													82	83	84	85	
Fr francium 87	Ra radium 88	Ac actinium 89															Rn radon 86

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

140	141	144	150	152	157	159	162	165	167	169	173	175
Ce cerium 58	Pr praseodymium 59	Nd neodymium 60	Sm samarium 62	Eu europium 63	Gd gadolinium 64	Tb terbium 65	Dy dysprosium 66	Ho holmium 67	Er erbium 68	Tm thulium 69	Yb ytterbium 70	Lu lutetium 71
232	238	238	238	238	238	238	238	238	238	238	238	238
Th thorium 90	Pa protactinium 91	U uranium 92	Np neptunium 93	Pu plutonium 94	Am americium 95	Cm curium 96	Cf californium 98	Es einsteinium 99	Fm fermium 100	Md mendelevium 101	No nobelium 102	Lr lawrencium 103

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

The volume of one mole of any gas is 24 dm³ at room temperature and pressure.

