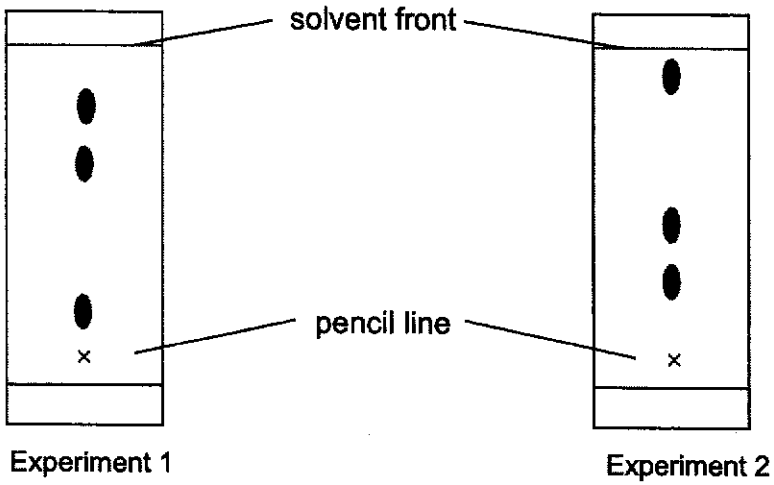
1 A student carried out two chromatography experiments to separate the dyes found in a sample of beverage. The two chromatograms obtained are shown below.



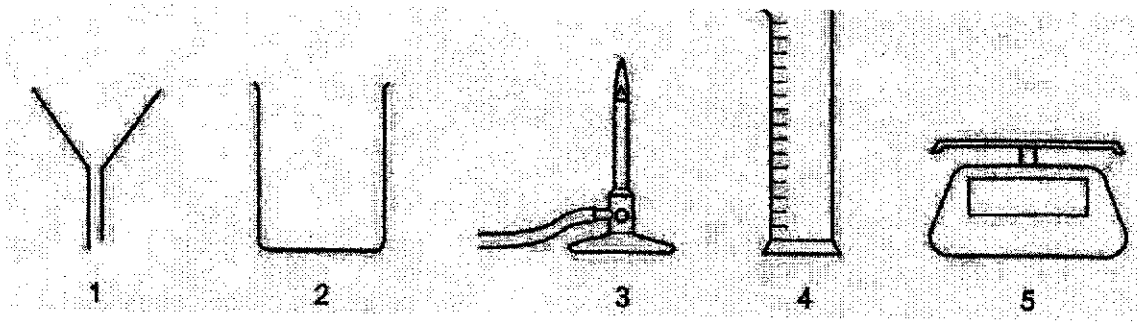
Which statement best explains why the two chromatograms are different?

A The sample for Experiment 2 was contaminated.
B The sample for Experiment 2 was more concentrated.
C The solvent used in Experiment 2 was different from that in Experiment 1.
D The solvent used in Experiment 2 was more viscous.

2 Methanol boils at 65 °C and butanol boils at 118 °C.
Methanol and butanol are completely miscible with each other.
Which method is used to separate a mixture of these two liquids?

A evaporation
B filtration
C fractional distillation
D paper chromatography

3 Silver chloride is insoluble in water.
Silver chloride is made by adding 25 cm^3 of aqueous silver nitrate to dilute hydrochloric acid.
Which pieces of apparatus are needed for the making of and separating solid silver chloride from the reaction mixture?



A 1, 2 and 4
B 1, 4 and 5
C 2, 3 and 4
D 2, 4 and 5

4 A salt is dissolved in water. The results of two separate tests on the solution are shown below.

test		result
1	add aqueous ammonia	a white precipitate which dissolves when an excess of aqueous ammonia is added
2	add dilute nitric acid then aqueous barium nitrate	a white precipitate

What is the salt?

A copper(II) chloride
B copper(II) sulfate
C zinc chloride
D zinc sulfate

5 Which row correctly describes the movement of particles in the three physical states?

	solid	liquid	gas
A	stationary	vibrating	free to move past each other
B	stationary	free to move past each other	moving independently of each other
C	vibrating	free to move past each other	moving independently of each other
D	vibrating	vibrating violently	moving independently of each other

6 The nucleon number and proton number of an atom of **X** and an atom of **Y** are shown.

	X	**Y**
nucleon number	40	40
proton number	18	20

Which statement about **X** and **Y** is correct?

A An atom of **X** has more electrons than an atom of **Y**.
B An atom of **X** has more neutrons than an atom of **Y**.
C **X** is above **Y** in the same group of the Periodic Table.
D **X** is the same period in the Periodic Table as **Y**.

7 Which statements correctly describe the properties of mixtures of iron and sulfur, and the compound iron(II) sulfide, FeS?

	mixtures of iron and sulfur	iron(II) sulfide
1	iron and sulfur mix without chemically reacting	iron and sulfur combine in a chemical reaction to form iron(II) sulfide
2	the mixtures do not have the properties of iron or sulfur	iron(II) sulfide has the properties of iron and sulfur
3	the ratio of iron to sulfur in mixtures can vary	the ratio of iron to sulfur in iron(II) sulfide is always the same

A 1 only **B** 1 and 3 **C** 2 and 3 **D** 1, 2 and 3

8 30 cm^3 of methane is are reacted with 150 cm^3 of oxygen.
The equation for the reaction is shown below.

$$CH_4(g) + 3O_2(g) \rightarrow CO_2(g) + 2H_2O(l)$$

What is the **total** volume of gas remaining at the end of the reaction?
(All volumes are measured at r.t.p.)

A 30 cm^3 **B** 90 cm^3 **C** 120 cm^3 **D** 180 cm^3

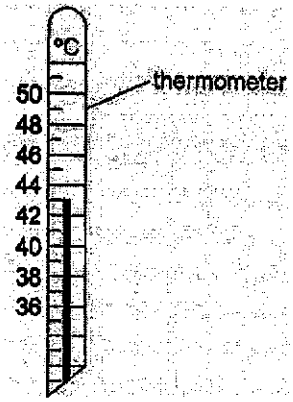
9 Acid rain contains sulfuric acid.
30 cm^3 of acid rain is neutralised by 32 cm^3 of 0.7 mol/dm^3 aqueous potassium hydroxide.
The equation for the reaction is shown.

$$H_2SO_4 + 2KOH \rightarrow K_2SO_4 + 2H_2O$$

What is the concentration of sulfuric acid in the acid rain?

A 0.37 mol/dm^3 **B** 0.75 mol/dm^3 **C** 1.49 mol/dm^3 **D** 32.00 mol/dm^3

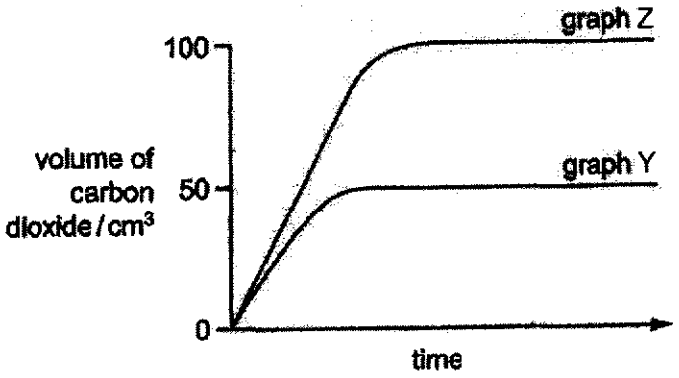
10 A thermometer is placed in water and the temperature is measured as shown.



An exothermic change takes place as a solid is dissolved in the water. The temperature changes by 2.5°C.
What is the final temperature?

A 40.0°C **B** 40.5°C **C** 45.0°C **D** 45.5°C

11 Some crystals of sodium carbonate were added to an excess of hydrochloric acid at room temperature.
The volume of carbon dioxide produced was measured over a period of time. The results are shown in graph Y.
The experiment was repeated and graph Z was obtained.



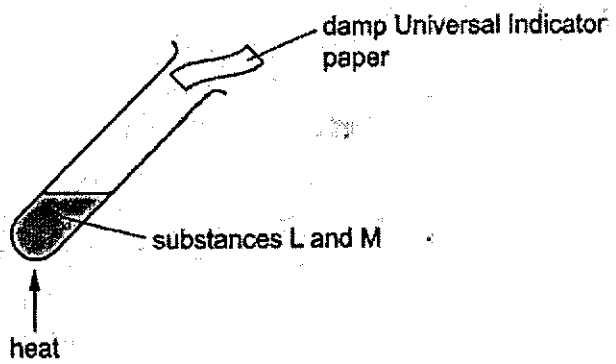
Which change was used to obtain the results shown in graph Z?

A Acid of the same concentration and double the original volume was used.
B Double the mass of sodium carbonate was used.
C Finer sodium carbonate crystals were used.
D Using a lower temperature.

12 Substance X produces iodine from aqueous potassium iodide and changes acidified aqueous potassium manganate(VII) from purple to colourless.
What is the behaviour of X described?

	oxidising agent	reducing agent
A	no	no
B	no	yes
C	yes	no
D	yes	yes

13 The diagram shows two substances, L and M, being heated together.



The damp Universal Indicator paper turns blue during the experiment.
What could L and M be?

A nitric acid and ammonium chloride
B nitric acid and potassium carbonate
C sodium hydroxide and ammonium chloride
D sodium hydroxide and potassium carbonate

14 Which method of preparation of a pure salt solution requires the use of a pipette and a burette?

A $Ba(NO_3)_2(aq) + Na_2SO_4(aq) \rightarrow BaSO_4(s) + 2NaNO_3(aq)$
B $CuO(s) + 2HCl(aq) \rightarrow CuCl_2(aq) + H_2O(l)$
C $MgCO_3(s) + H_2SO_4(aq) \rightarrow MgSO_4(aq) + CO_2(g) + H_2O(l)$
D $NaOH(aq) + HCl(aq) \rightarrow NaCl(aq) + H_2O(l)$

15 The table shows the reactions of some oxides.

oxide	reaction with hydrochloric acid	reaction with sodium hydroxide
P	no reaction	salt formed
Q	salt formed	salt formed
R	salt formed	no reaction

Which row shows the type of oxides P, Q and R are?

	acidic	amphoteric	basic
A	P	Q	R
B	Q	R	P
C	R	P	Q
D	R	Q	P

16 Four elements have the following electronic configurations.

W 2,8,2
X 2,8,3
Y 2,8,4
Z 2,8,5

Which statement about these elements is correct?

A All four elements are in the same group in the Periodic Table.
B All four elements are in the same period in the Periodic Table.
C W forms a positive ion but X, Y and Z form negative ions.
D X forms a positive ion but W, Y and Z form negative ions.

17 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 displaces bromine from aqueous 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.

18 The reactivity series for some metals is shown.

most reactive ⟶					least reactive
Mg	Al	Zn	Fe	Cu	Ag

Which reaction can take place?

A aluminium sulfate + iron → aluminium + iron(III) sulfate
B copper(II) chloride + silver → copper + silver chloride
C iron(II) nitrate + magnesium → iron + magnesium nitrate
D zinc oxide + copper → zinc + copper(II) oxide

19 Most aluminium cans are made from recycled aluminium.
Why are some aluminium cans still made from aluminium extracted from its ore?

A Aluminium ore produces better quality aluminium.
B Demand is not met by the recycling of aluminium.
C Extraction from the ore uses electricity and is expensive.
D There are only a limited number of times that aluminium can be recycled.

20 Common pollutants of the air are shown.

1. carbon monoxide
2. methane
3. nitrogen dioxide
4. sulfur dioxide

Which pollutants cause the erosion of buildings?

A 1 and 3 **B** 1 and 4 **C** 2 and 3 **D** 3 and 4

FUCHUN SECONDARY SCHOOL
PRELIMINARY EXAMINATION 2020
SECONDARY FOUR EXPRESS / FIVE NORMAL (ACADEMIC)

CANDIDATE NAME		CLASS	
CENTRE NUMBER	S	INDEX NUMBER	

SCIENCE (PHYSICS, CHEMISTRY) **5076/03**
SCIENCE (CHEMISTRY, BIOLOGY) **5078/03**
Paper 3 Chemistry
14 September 2020
1 hour 15 minutes

Candidates answer on the Question Paper.
No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, index number, name and class 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 pen.
Do not use staples, paper clips, 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.
Write your answers in the spaces provided on the question paper.

Section B
Answer **both** questions.
Write your answers in the spaces provided on the question paper.

A copy of the Data Sheet is printed on page 12.
A copy of the Periodic Table is printed on page 13.

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.

For Examiner's Use	
Section A	/45
Section B	/20
TOTAL	/65

Setter: Mr Justin Lee

This document consists of **13** printed pages.

Section A

Answer all the questions in the spaces provided.

1 Briefly describe the method you would use and the results you would expect in distinguishing between

(a) a solution of pH 1 and a solution of pH 14,

method .....

result for solution of pH 1 .....

result for solution of pH 14 ..... [1]

(b) an endothermic and an exothermic reaction,

method .....

result for an endothermic reaction .....

result for an exothermic reaction ..... [1]

(c) dilute hydrochloric acid and dilute sulfuric acid,

method .....

result for dilute hydrochloric acid .....

result for dilute sulfuric acid ..... [1]

(d) the gases chlorine and ammonia.

method .....

result for chlorine gas .....

result for ammonia gas ..... [1]

2 In Fig. 2.1, **A**, **B**, **C**, **D**, **E** and **F** represents the particles in different substances.

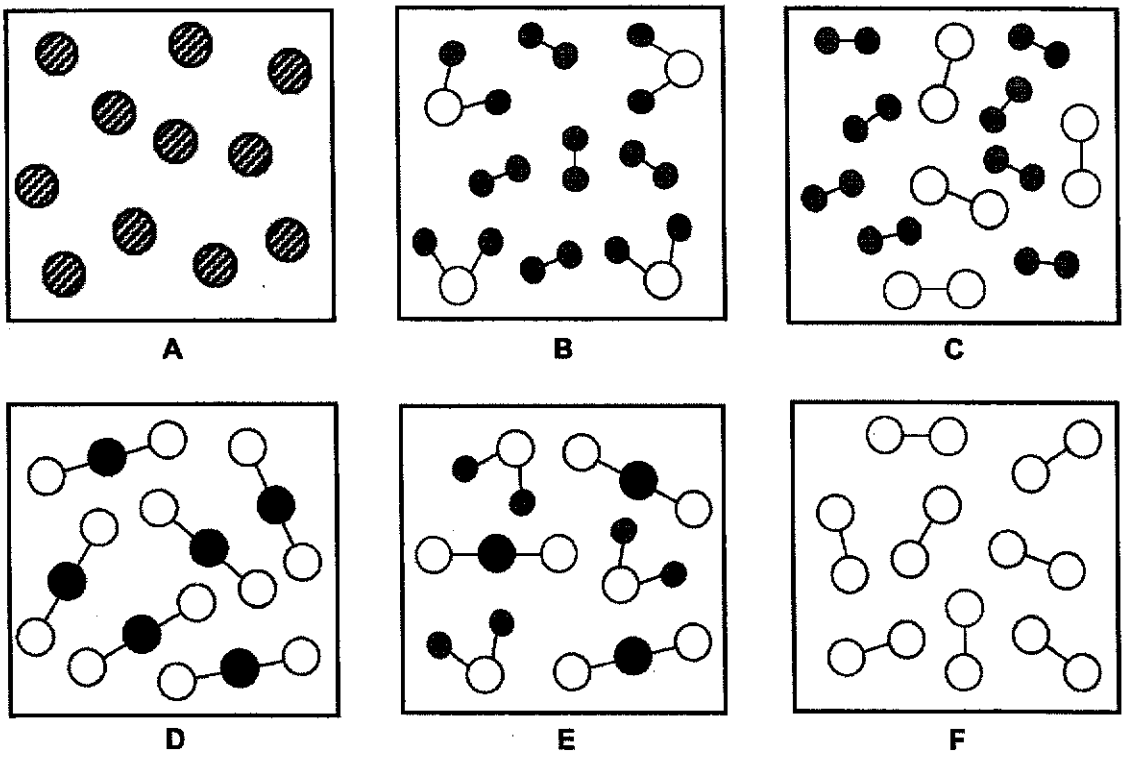


Fig. 2.1

Which one of **A**, **B**, **C**, **D**, **E** and **F** *best* represents

(a) pure argon, ... [1]

(b) pure carbon dioxide, ... [1]

(c) a mixture of compounds, ... [1]

(d) a mixture of elements. ..... [1]

3 Oxides of nitrogen and carbon monoxide are two air pollutants. When completed, Table 3.1 gives the source of each pollutant and describes one of the problems that each can cause. Complete the table.

Table 3.1

pollutant	source	problem
oxides of nitrogen	lightning activity	
carbon monoxide		

[3]

4 Table 4.1 shows some information about substances **G**, **H**, **J** and **K**.

Table 4.1

substance	melting point/°C	boiling point/°C	Does it conduct electricity when it is a solid?	Does it conduct electricity when molten?
G	–95	69	no	no
H	1251	1970	no	yes
J	1240	2100	yes	yes
K	1650	2230	no	no

(a) Which substance is most likely to be a metal? ..... [1]

(b) Which substance is a liquid at room temperature? ..... [1]

(c) **(i)** What type of bonding is present in substance **H**? ..... [1]

(ii) Explain your answer to **(c)(i)** using information from Table 4.1.

.....

.....

.....

..... [2]

5 (a) A sample of sulfur contains two different isotopes of sulfur atoms. Each sulfur atom can become a sulfide ion.
Complete Table 5.1 to describe the composition of the sulfur atom and the sulfide ion.

Table 5.1

particle	number of		
	protons	neutrons	electrons
a sulfur atom $^{34}_{16}S$			
a sulfide ion $^{32}_{16}S^{2-}$			

[3]

(b) Sulfur forms compounds with sodium and hydrogen with very different physical properties. Draw 'dot and cross' diagrams to show the bonding for each compound. Only the outer electrons need to be shown.

compound formed between sodium and sulfur

compound formed between hydrogen and sulfur

[4]

6 (a) A solution of nitric acid, HNO_3, has a concentration of 31.5 g/dm^3.
Calculation the concentration of the solution in mol/dm^3.

concentration = ... mol/dm^3 [2]

(b) Magnesium reacts with nitric acid as follows:

$$Mg + 2HNO_3 \rightarrow Mg(NO_3)_2 + H_2$$

Excess magnesium is added to 50 cm^3 of the solution in (a).

(i) Calculate the maximum mass of magnesium nitrate that is produced.

mass of magnesium nitrate = ... g [3]

(ii) State how unreacted magnesium may be removed from the reaction mixture.

..... [1]

(iii) Describe the next two steps that can be taken to obtain magnesium nitrate crystals.

.....

.....

.....

.....

..... [2]

7 Chromium can be used as a protective metal for both steel and pure iron.
Stainless steel is an alloy of iron which contains approximately 20% chromium mixed with iron and some small amounts of other metals.

(a) Fig. 7.1 shows the arrangement of atoms in stainless steel.

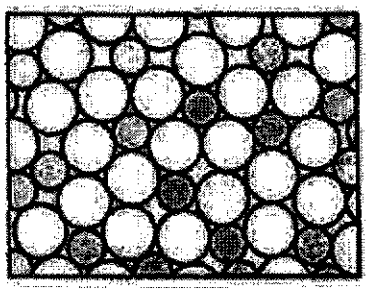


Fig. 7.1

Use ideas about the arrangement of atoms in stainless steel to explain why stainless steel is much harder than pure iron.

.....

.....

.....

..... [2]

The chromium in the stainless steel reacts with oxygen in the air to form chromium oxide. The chromium oxide forms a coating over the surface of stainless steel. This layer stops the iron in the stainless steel from rusting.

(b) The formula of chromium oxide is Cr_2O_3.
What is the formula for the chromium ion? ..... [1]

(c) Explain how the layer of chromium oxide stops the iron in stainless steel from rusting.

.....

..... [1]

8 Fig. 8.1 shows an experiment set up to heat excess copper in air.

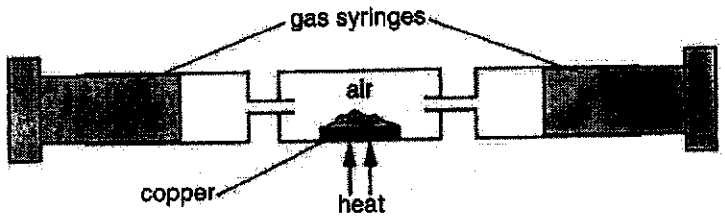


Fig. 8.1

At the start of the experiment, the apparatus contained a total of 200 cm^3 of air.
During heating, the copper reacted with oxygen in the air to form black copper(II) oxide.
The copper was heated until the volume of gas, measured at room temperature and pressure, remained constant.

(a) Explain why it was important to continue heating until the volume remained constant.

.....

..... [1]

(b) **(i)** Name the gas that is left in the gas syringes, in the largest amount, at the end of the experiment.

..... [1]

(ii) Calculate the total volume of gas left in the gas syringes at the end of the experiment. Show your working clearly.

[2]

9 Fig. 9.1 describes some of the reactions of an aqueous metal salt **P**.

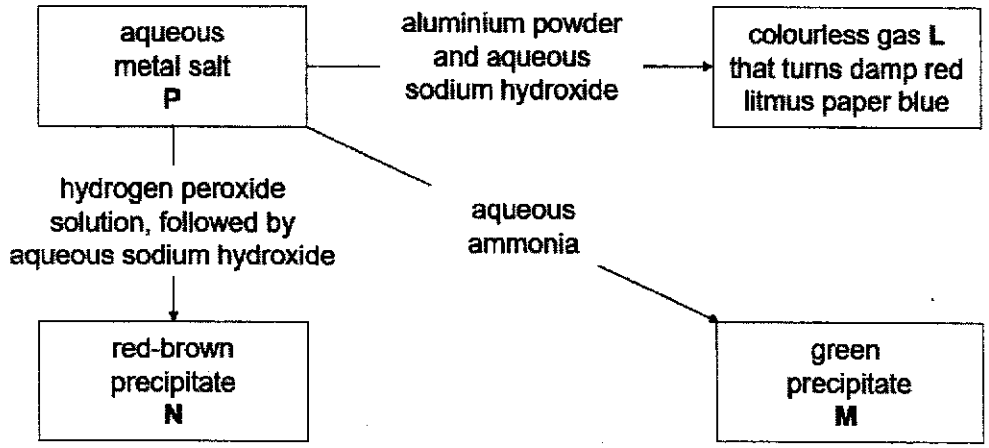


Fig. 9.1

(a) Name the

(i) colourless gas **L**, ... [1]

(ii) green precipitate **M**, ... [1]

(iii) red-brown precipitate **N**, ... [1]

(iv) aqueous metal salt **P**. ..... [1]

(b) When dilute sulfuric acid is added to the red-brown precipitate **N**, a yellow solution is formed. Write a balanced chemical equation for this reaction. State symbols are **not** required.

..... [2]

Section B

Answer **both** questions in this section.
Write your answers in the spaces provided.

10 **(a)** Metals are extracted in many different ways. Use the reactivity series, **with examples**, to explain the following

(i) some metals can occur in the ground as the uncombined metal,

.....

..... [1]

(ii) several metals occur as oxides. The metal can be extracted from some of these oxides by heating with carbon. For other oxides, this method cannot be used.

.....

.....

.....

.....

..... [3]

Tin is produced in a blast furnace by heating tin(II) oxide, coke and limestone with air.

(b) Include suitable chemical equations in your answer to the following.

(i) How are carbon dioxide and carbon monoxide formed in the furnace?

.....

.....

.....

..... [2]

(ii) How is limestone used to remove impurities from the tin?

.....

.....

.....

..... [2]

(c) Using the equation

$$SnO + CO \rightarrow Sn + CO_2$$

state which substance is reduced and give a reason for your answer.

substance reduced .....

reason .....

..... [2]

11 Zinc carbonate reacts with dilute sulfuric acid to produce carbon dioxide gas.

(a) (i) Describe how the particle size of zinc carbonate will affect the speed of this reaction.

.....

..... [1]

(ii) Explain your answer in **(a)(i)** using ideas of colliding particles.

.....

.....

.....

..... [2]

(b) (i) Describe an experiment to measure the speed of this reaction, including a diagram of the experimental set-up. Describe how you would use the data collected from the experiment.

.....

.....

.....

.....[3]

(ii) Describe how you would determine the average speed of this reaction. State the units in which the speed of reaction can be measured.

.....

.....

..... [2]

(c) Explain how you could extend your experiment in **(b)** to show the effect of concentration of sulfuric acid on the speed of reaction.

.....

.....

.....

..... [2]

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.)

FUCHUN SECONDARY SCHOOL
PRELIMINARY EXAMINATION 2020
SECONDARY FOUR EXPRESS / FIVE NORMAL (ACADEMIC)
SCIENCE (CHEMISTRY) 5076 / 5078
MARK SCHEME

PAPER 1 (20 MARKS)

Each correct answer scores one mark. A mark will not be deducted for an incorrect answer.

1	2	3	4	5	6	7	8	9	10
C	C	A	D	C	B	B	B	A	D

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

PAPER 3 (65 MARKS)

SECTION A (45 MARKS)

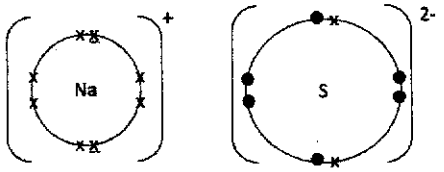
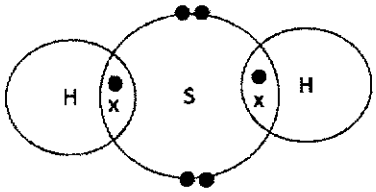
Candidates must answer **all** questions in this section.

1 (a)	method: dip blue and red litmus papers into each solution result for solution with pH 1: blue litmus paper turns red result for solution with pH 14: red litmus paper turns blue or method: add a few drops of Universal Indicator result for solution with pH 1: green Universal Indicator turns red result for solution with pH 14: green Universal Indicator turns violet	[1]
(b)	method: measure the temperature using a thermometer result for endothermic reaction: temperature decreases result for exothermic reaction: temperature increases	[1]
(c)	method: add aqueous silver nitrate result for dilute hydrochloric acid: white precipitate result for dilute sulfuric acid: no visible reaction or method: add aqueous barium nitrate result for dilute hydrochloric acid: no visible reaction result for dilute sulfuric acid: white precipitate	[1]
(d)	method: use moist litmus papers result for chlorine gas: bleaches moist litmus papers result for ammonia gas: moist red litmus paper turns blue	[2]

2 (a)	A	[1]
(b)	D	[1]
(c)	E	[1]
(d)	C	[1]

3	problem of oxides of nitrogen – dissolve in rainwater to form acid rain source of carbon monoxide – incomplete combustion of petrol in car engines problem of carbon monoxide – binds with red-blood cells to stop transport of oxygen	[1] [1] [1]

4 (a)	J	[1]
(b)	G	[1]
(c) (i)	Ionic	[1]
(c) (ii)	High melting and boiling points Does not conduct electricity when solid, but conducts when molten.	[1] [1]

5 (a)	a sulfur atom $^{34}_{16}S$: 16 p, 18 n, 16 e		
	a sulfide ion $^{32}_{16}S^{2-}$: 16 p, 16 n, 18 e	correct no. of each sub-atomic particle for both	[3]
(b)	2 	correct number of electrons around Na and S correct charge and ratio	[1] [1]
		correct number of electrons shared correct number of unshared electrons around S	[1] [1]

6 (a)	M_r of HNO_3 = 1 + 14 + 3 x 16 = 63 concentration = 31.5 ÷ 63 = **0.5 mol/dm^3**	[1] [1]
(b) (i)	n(HNO_3) = 0.5 x (50/1000) = 0.025 mol from equation, n($Mg(NO_3)_2$) = ½ x 0.025 = 0.0125 mol so, mass of $Mg(NO_3)_2$ = 0.0125 x 148 = **1.85 g**	[1] [1] [1]
(b) (ii)	Filter	[1]
(b) (iii)	Heat the filtrate to saturation. Allow crystals to form by cooling hot, saturated solution.	[1] [1]

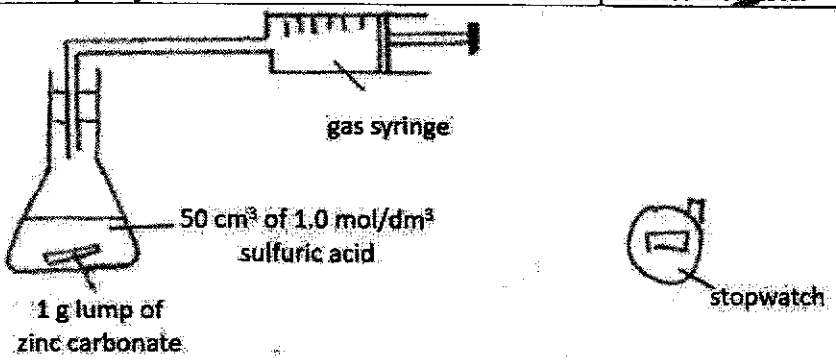
7 (a)	Atoms of different sizes disrupt the orderly arrangement of atoms. Layers of atoms cannot slide over one another easily when a force is applied.	[1] [1]
(b)	Cr^{3+}	[1]
(c)	Prevents iron from coming into direct contact with air and moisture.	[1]

8 (a)	To ensure oxygen is completely reacted.	[1]
(b) (i)	Nitrogen	[1]
(ii)	% of air used up = 21% (due to oxygen) Volume of gas = (79/100) x 200 = **158 cm^3**	[1] [1]

9 (a) (i)	ammonia		[1]
(ii)	iron(II) hydroxide		[1]
(iii)	iron(III) hydroxide		[1]
(iv)	iron(II) nitrate		[1]
(b)	$3Fe(OH)_3 + 3H_2SO_4 \rightarrow Fe_2(SO_4)_3 + 6H_2O$ equation	correct substances in correctly balanced iff correct substances are given	[1] [1]

SECTION B (20 MARKS)

10 (a) (i)	These metals do not react with oxygen/other elements. Example: gold	[1]
(a) (ii)	These metals react with oxygen to form oxides. Carbon can displace metals less reactive than itself from their oxides. Example: zinc/iron/lead/copper/silver Carbon cannot displace metals more reactive than itself from their oxides. Example: potassium/sodium/calcium/magnesium	[1] [1] [1]
(b) (i)	$C + O_2 \rightarrow CO_2$ $CO_2 + C \rightarrow 2CO$	[1] [1]
(b) (ii)	$CaCO_3 \rightarrow CaO + CO_2$ $CaO + SiO_2 \rightarrow CaSiO_3$	[1] [1]
(c)	substance reduced: SnO reason: loss of oxygen atom / oxidation state decreases from +2 in SnO to 0 in Sn	[1] [1]

11 (a) (i)	Speed of reaction increases with decreasing particle size.	[1]
(a) (ii)	Smaller particles have larger total surface area. The frequency of effective collisions between reactant particles increases	[1] [1]
(b) (i)		[1]
	Record the volume of gas in the gas syringe at fixed time interval until the volume of gas remains constant. Plot a graph of volume of gas against time. The gradient of the graph gives the speed of reaction.	[1] [1]
(b) (ii)	Average speed = total volume of gas produced / time taken for reaction to complete Units = cm^3/s	[1] [1]
(c)	Carry out two set of experiments with different concentrations of sulfuric acid. Keep the mass and particle size of zinc carbonate, volume of sulfuric acid and temperature constant.	[1] [1]