Bukit Batok Secondary School

GCE 'O' LEVEL PRELIMINARY EXAMINATION 2020

Secondary 4 Express / 5 Normal Academic

SCIENCE (PHYSICS, CHEMISTRY) **5076/01**

Paper 1 Multiple Choice **2 September 2020**

0845 to 0945

1 hour

Additional Materials: Multiple Choice Answer Sheet (OAS)

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** and **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 Data Sheet is printed on page
A copy of the Periodic Table is given on page
The use of an approved scientific calculator is expected, where appropriate.

21 Which statement is true of a pure compound?

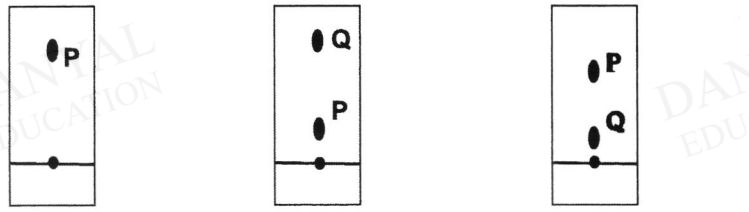
A It can be separated by distillation.

B It consists of one type of atoms chemically combined.

C It has properties different from the elements it is made up of.

D It melts and boils over a range of temperature.

22 A scientist suspects that some canned drinks contain a mixture of two toxic dyes, P and Q. He analyses the mixtures using chromatography with three different solvents. The results of the analysis are shown below.



water as solvent ethanol as solvent acetone as solvent

What can you conclude about the solubility of P and Q?

A P is insoluble in water but Q is soluble.

B P is more soluble in ethanol than in acetone.

C Q is soluble in ethanol but insoluble in acetone.

D Q is less soluble in acetone than in ethanol.

23 The table shows the boiling points of some of the gases present in air.

gas	boiling point / °C
argon	-186
helium	-269
neon	-246
nitrogen	-196
oxygen	-183

When air is cooled to -200 °C, some of these gases liquefy.

Which of the gases liquefy when air is cooled to -200 °C?

A argon, helium and neon

B argon, nitrogen and oxygen

C helium and neon only

D helium, neon and nitrogen

24 An element X has two isotopes, ^{238}X and ^{235}X.

How does ^{238}X differ from ^{235}X?

A It has 3 more protons and 3 more electrons.

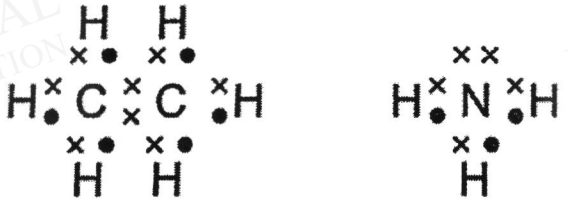
B It has 3 more protons.

C It has 3 more neutrons and 3 more electrons.

D It has 3 more neutrons.

25 Ethane, C_2H_6, and ammonia, NH_3, are covalent compounds.

The dot and cross diagrams of these compounds are shown.



Which statements are correct?

1 A molecule of ethane contains twice as many hydrogen atoms as a molecule of ammonia.

2 An uncombined nitrogen atom has five outer electrons.

3 In a molecule of ethane, the bond between the carbon atoms is formed by sharing two electrons, one from each atom.

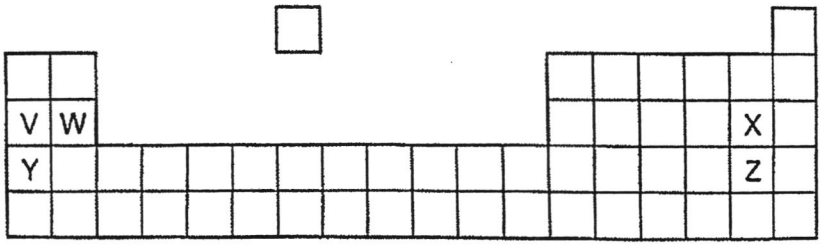
A 1 and 2 only **B** 1 and 3 only **C** 2 and 3 only **D** 1, 2 and 3

26 A metal X and a non-metal Y react together to form an ionic compound X_2Y_3.

Which row is correct?

	electrons given away by each atom of X	electrons received by each atom of Y
A	1	3
B	2	3
C	3	1
D	3	2

27 Part of the Periodic Table is shown.



The letters are not the symbols of the elements.

Which statement is correct?

A V is more reactive than Y.

B W has more metallic character than V.

C Y has lower melting point than V.

D Z is more reactive than X.

28 The table shows some properties of four metals.

Which metal is in Group I of the Periodic Table?

	density	hardness
A	high	high
B	high	low
C	low	high
D	low	low

29 An excess of zinc is added to 100 cm^3 of 1.0 mol/dm^3 hydrochloric acid.

The equation of the reaction is

$$Zn + 2HCl \rightarrow ZnCl_2 + H_2$$

What is the maximum volume of hydrogen evolved at room temperature and pressure?

A 1.2 dm^3 **B** 2.0 dm^3 **C** 2.4 dm^3 **D** 24 dm^3

30 The tables show the pH ranges of two indicators, methyl orange and methyl red.

methyl orange	red		yellow		
pH	2	3	4	5	6

methyl red	red				yellow
pH	2	3	4	5	6

The table below shows the pH of four solutions:

solution	W	X	Y	Z
pH	2.0	3.0	4.0	6.0

In which of the solutions are both indicators yellow?

A W only
B Z only
C W and X
D X and Y

31 The oxide of an element M was added separately to hydrochloric acid and aqueous sodium hydroxide.

The word equations for the reactions are shown

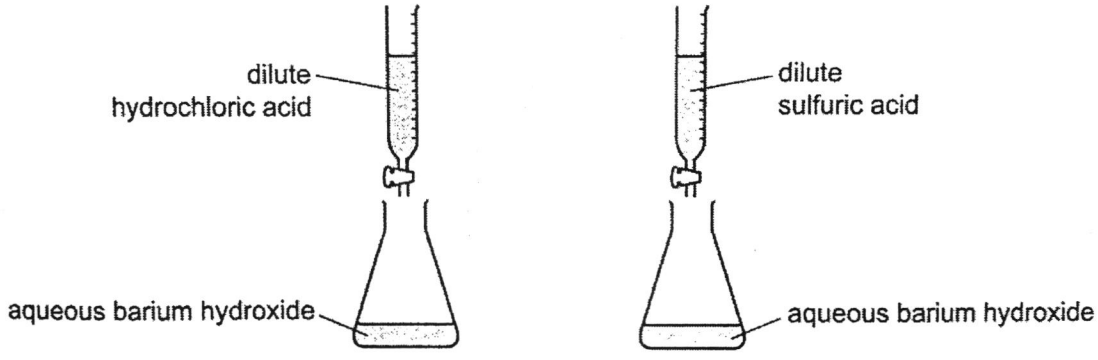
M oxide + hydrochloric acid → M chloride + water

M oxide + sodium hydroxide → no reaction

Which row describes M and its oxide?

	M	M oxide
A	metal	acidic
B	metal	basic
C	non-metal	amphoteric
D	non-metal	acidic

32 The diagrams show two experiments, one to make barium chloride and the other to make barium sulfate.



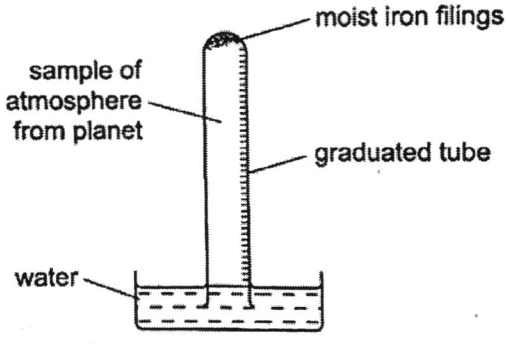
In each experiment, the acid is run into the conical flask until the pH is 7.
Which are the next steps needed to obtain the solid salts?

	barium chloride	barium sulfate
A	crystallisation	crystallisation
B	crystallisation	filtration
C	filtration	crystallisation
D	filtration	filtration

33 The atmosphere of a newly discovered planet contains the following gases.

carbon dioxide	20 %
nitrogen	40 %
noble gases	10 %
oxygen	30 %

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



What volume of the sample of the atmosphere would remain?

A 10 cm^3 **B** 30 cm^3 **C** 40 cm^3 **D** 70 cm^3

34 Which statements about the pollutant carbon monoxide are correct?

1 It is a colourless, odourless gas.

2 It is formed by incomplete combustion of natural gas.

3 It reacts with haemoglobin in the blood.

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

35 Limestone is decomposed to lime in the production of iron in the Blast Furnace.
Which substance does lime react with?

A carbon
B haematite
C oxygen
D sand

36 Excess aqueous sodium hydroxide is added to salt X and the solution is heated. A gas is given off which turns damp red litmus blue.

When this reaction is complete, aluminium foil is added to the solution. A gas is again given off which also turns damp red litmus blue.

What is salt X?

A ammonium nitrate
B ammonium sulfate
C zinc nitrate
D zinc sulfate

37 The reaction between iron(III) ions and iodide ions is represented by the equation.

$$2Fe^{3+}(aq) + 2I^{-}(aq) \rightarrow 2Fe^{2+}(aq) + I_2(aq)$$

Which statement is correct?

A Fe^{3+} ions are oxidised by the loss of electrons.
B Fe^{3+} ions are reduced by the gain of electrons.
C I^- ions are reduced by the loss of electrons.
D I^- ions are oxidised by the gain of electrons.

38 Which of the following is an endothermic process?

A combustion of petrol

B dissolving ammonium nitrate in water

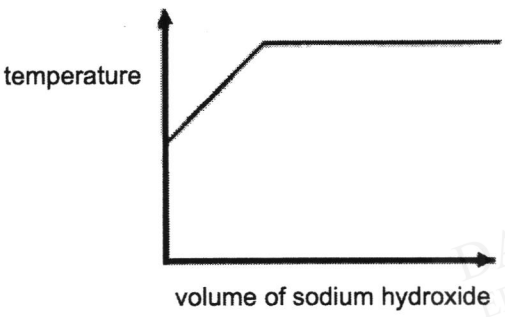
C the oxidation of carbon to carbon dioxide

D the reaction between hydrogen and oxygen

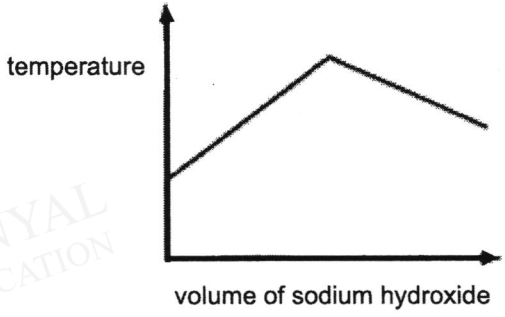
39 The reaction between aqueous barium hydroxide and nitric acid is exothermic.
Both the alkali and acid were initially at room temperature.

Which graph shows the change in temperature when aqueous barium hydroxide is added to nitric acid until the alkali is present in excess?

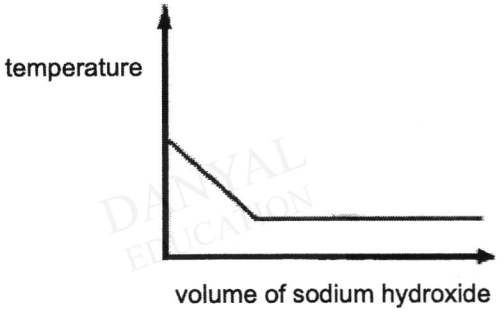
A



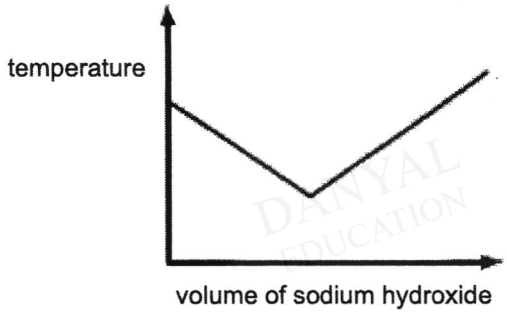
B



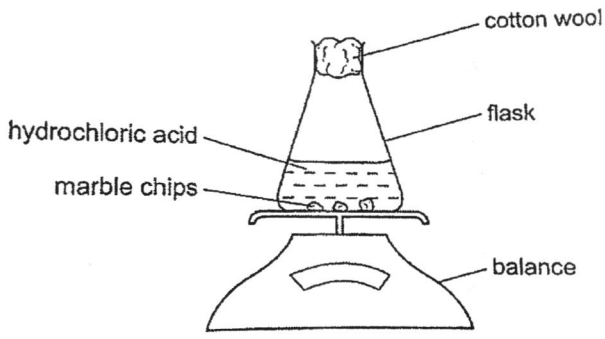
C



D



40 Two experiments were carried out using the apparatus below.

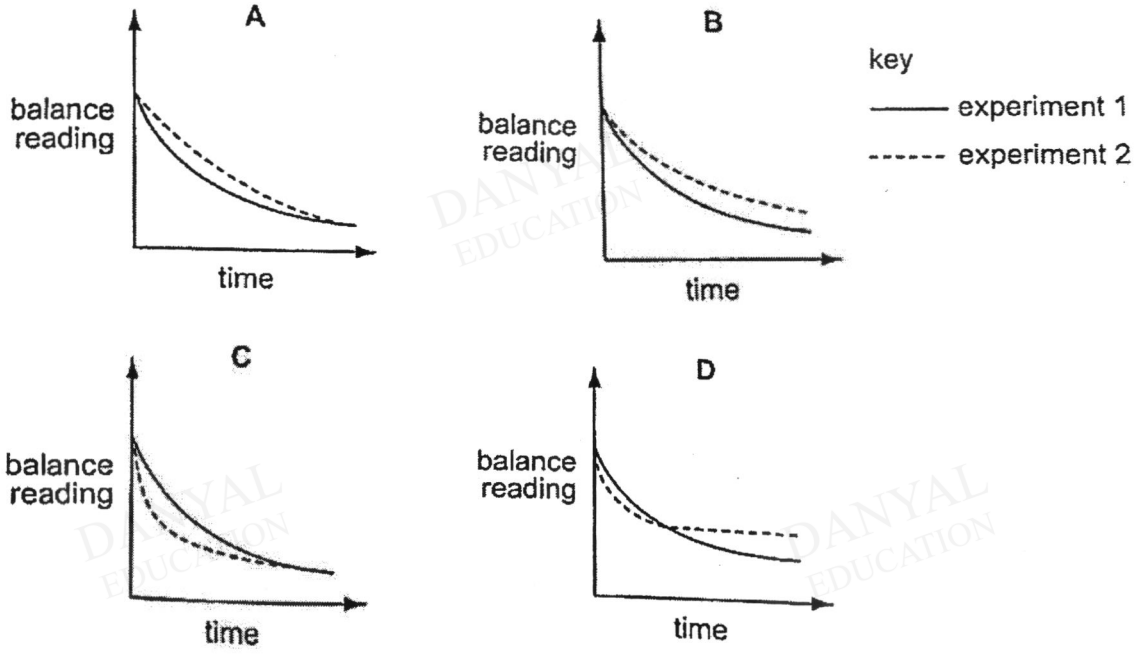


In experiment 1, dilute hydrochloric acid is used.

In experiment 2, concentrated hydrochloric acid is used.

All other conditions are the same. In both experiments all the marble chips completely reacted.

Which diagram shows the results obtained?



End of Paper

Name: ..... Index No. ..... Class: .....

Bukit Batok Secondary School

GCE 'O' LEVEL PRELIMINARY EXAMINATION 2020

Secondary 4 Express / 5 Normal Academic

SCIENCE (CHEMISTRY)

Paper 3

5076/03
27 August 2020
0800 to 0915
1 hour 15 minutes

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

READ THESE INSTRUCTIONS FIRST

Write your name, index number and class in the spaces provided at the top of this page.
You may use a pencil for any diagrams, graphs or rough working.
Write in dark blue or black pen.
Do not use staples, paper clips, highlighters, glue or correction fluid.

Section A

Answer **all** 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.

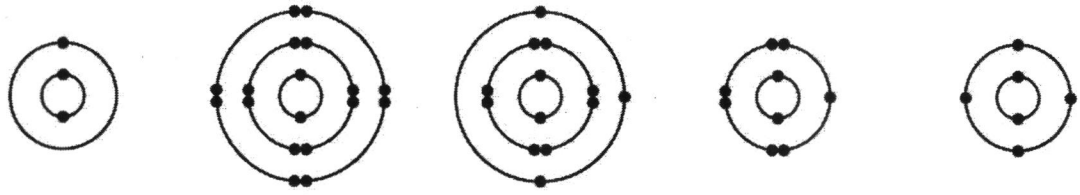
A copy of the Data Sheet is printed on page 19.
A copy of the Periodic Table is given on page 20.

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	
Section B	
Total	

Section A [45 marks]
Answer **all** the questions.
Write your answers in the spaces provided on the question paper.

1 The electronic structures of five atoms, **A**, **B**, **C**, **D** and **E**, are shown.



Answer the following questions about these electronic structures.
Each electronic structure may be used once, more than once or not at all.

State which electronic structure, **A**, **B**, **C**, **D** or **E**, represents an atom

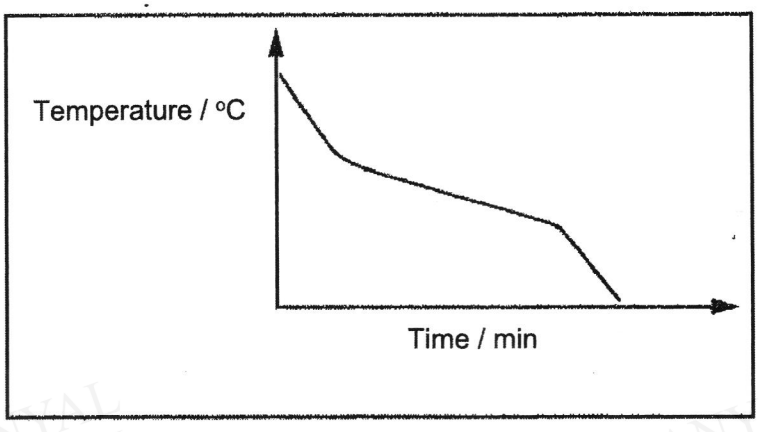
(a) of an element in Group I of the Periodic Table, ... [1]

(b) of a monatomic gas, ... [1]

(c) of carbon, ... [1]

(d) which has 13 protons. ..... [1]

2 This curve resulted when liquid **H** was cooled.



(a) Suggest whether liquid **H** is an element, a compound or a mixture. Explain your answer.

.....

..... [2]

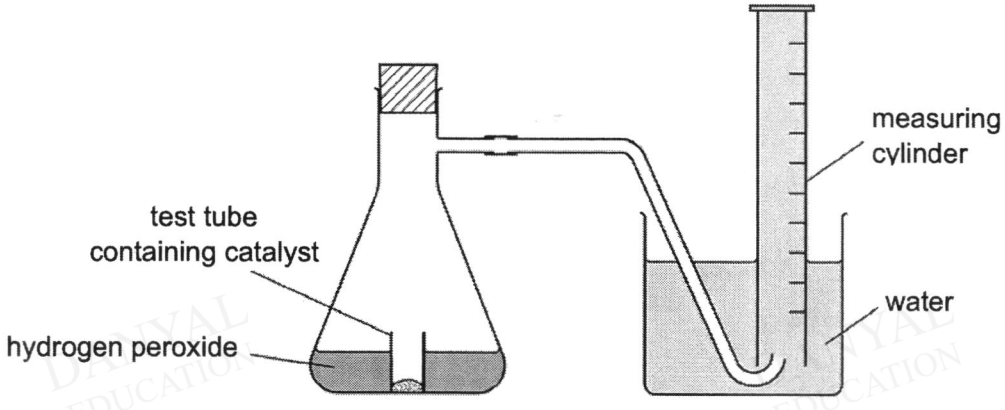
(b) Describe, using kinetic particle theory, what happens to the spacing and movement of the particles as liquid **H** cools to become a solid.

.....

.....

..... [2]

3 A catalyst is a substance that speeds up a reaction but itself does not take part in it. Hydrogen peroxide decomposes to produce oxygen in the presence of a catalyst. A student uses the apparatus shown to investigate the rate of decomposition of hydrogen peroxide.



The experiment starts when the test tube is tipped so that the catalyst comes into contact with the hydrogen peroxide. The oxygen gas is then collected in the measuring cylinder.

(a) Explain why oxygen is collected using this method.

.....

..... [1]

(b) Name another apparatus that could be used to measure the volume of oxygen.

..... [1]

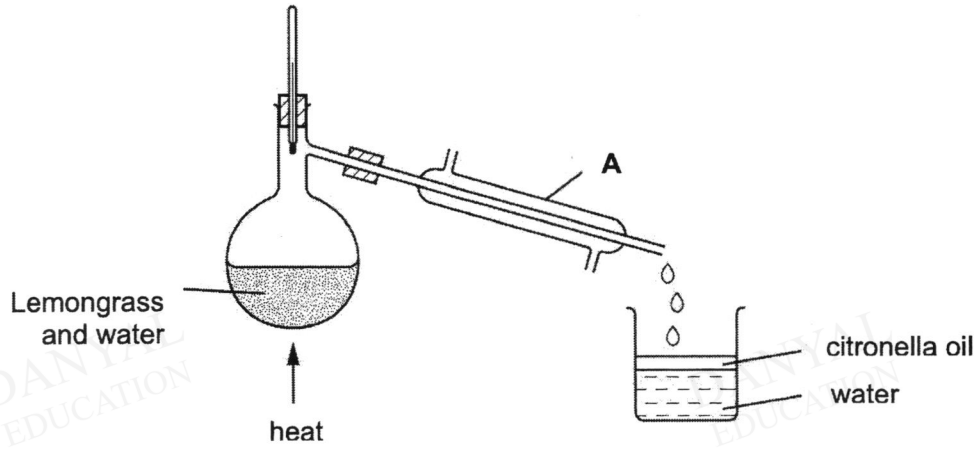
(c) Describe a test to identify oxygen gas.

.....

..... [1]

[Total 3 marks]

4 Citronella oil can be extracted from lemongrass by distillation using the following apparatus shown below. The citronella oil is carried off in small droplets with the steam.



(a) **(i)** State why the oil condenses in the piece of apparatus labelled **A**.

.....

..... [1]

(ii) The citronella oil and water are collected in the beaker.
What information in the diagram shows that citronella oil is less dense than water?

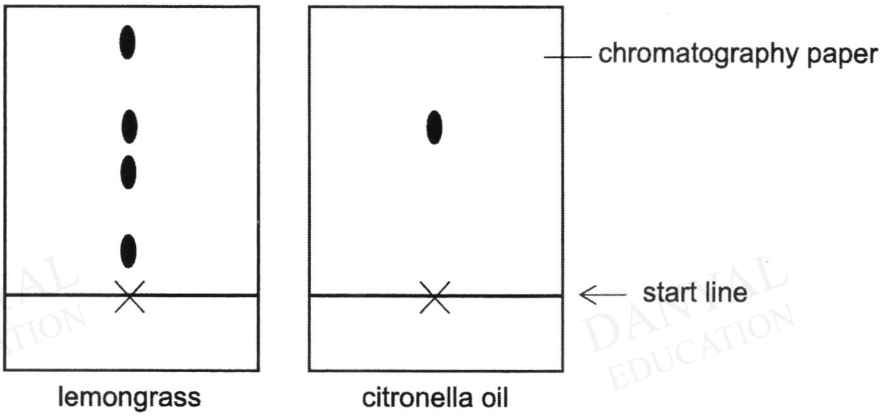
..... [1]

(iii) Based on the diagram and information given, suggest how the citronella oil can be separated from the water after distillation.

..... [1]

(b) Lemon grass contains a variety of different pigments. These pigments can be separated using paper chromatography with ethanol as the solvent.

The chromatograms of lemongrass and citronella oil are shown in the diagram below.



(i) How many pigments does lemongrass contain?

..... [1]

(ii) Deduce one conclusion from these two chromatograms.

..... [1]

5 The Periodic Table contains an element with proton number 9 and another element with proton number 17.

(a) **(i)** Explain why both elements appear in the same group of the Periodic Table.

.....

..... [1]

(ii) Other than colour, state one trend in the properties of this group of elements.

.....

..... [1]

(b) The colours of several substances are shown in the table below.

substance	colour
chlorine (aqueous)	pale yellow
iodine (aqueous)	brown
iodine (solid)	purplish-black
magnesium chloride (aqueous)	colourless
magnesium iodide (aqueous)	colourless

Aqueous iodine was added to a solution of magnesium chloride.

Describe the change that would be observed. Explain your answer.

Description .....

.....

Explanation .....

..... [2]

6 A sample of 400 g of titanium(IV) oxide, TiO_2, is mixed with carbon and heated in a reaction chamber through which chlorine gas is passed into. One of the products formed is gaseous titanium(IV) chloride, $TiCl_4$.

$$TiO_2(s) + 2C(s) + 2Cl_2(g) \rightarrow TiCl_4(g) + 2CO(g)$$

(a) Calculate the number of moles in 400 g of TiO_2.

moles of TiO_2 = ... [1]

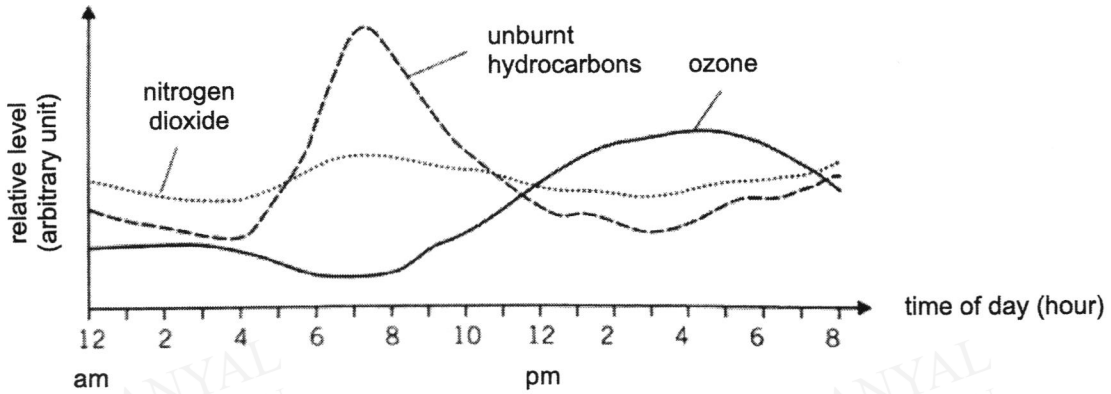
(b) Determine the number of moles of Cl_2 that has reacted with 400 g of TiO_2.

moles of Cl_2 = ...mol [1]

(c) Calculate the volume of Cl_2 gas that has reacted with 400 g of TiO_2 at room temperature and pressure.

volume of Cl_2 = ... dm^3 [1]

7 The graph shows the relative levels of three air pollutants on major traffic roads of a city measured over a period of 20 hours on a particular day.



(a) State the possible source of nitrogen dioxide that is shown in this graph.

.....

..... [1]

(b) Unburnt hydrocarbons are produced by incomplete combustion of petrol.
Explain why the concentration of unburnt hydrocarbons reach the maximum level from 6 am to 10 am.

.....

..... [1]

(c) Suggest another possible air pollutant that can be found in the city.

..... [1]

8 Sulfur dioxide, an air pollutant, dissolves in water and reacts with oxygen to form sulfuric acid that falls as acid rain and damage the soil.

(a) **(i)** Describe a laboratory test that can be used to test for the pH levels of the water from the soil.

.....

..... [1]

(ii) Describe how the soil that has been damaged by acid rain can be treated.

.....

..... [1]

(b) Describe how a pure and dry sample of calcium sulfate can be prepared in the laboratory, using sulfuric acid as one of the reactants.

.....

.....

.....

..... [3]

9 In separate experiments, powdered samples of metal **I** and metal **J** reacted with solutions of nickel(II) sulfate and iron(II) sulfate. The following table shows how the colours of the solutions changed.

	metal **I**	metal **J**
nickel(II) sulfate	solution turns from green to colourless	solution turns from green to colourless
iron(II) sulfate	solution remains pale green	solution turns from pale green to colourless

(a) **(i)** Predict the order of reactivity for the four metals: **I**, **J**, nickel and iron.

most reactive .....

.....

.....

least reactive ..... [1]

(ii) Metal **J** does not react with cold water but burns in steam to produce a solid. What is the identity of metal **J**?

..... [1]

(b) **(i)** Iron is currently one of the most commonly used metals. However, it tends to rust easily when in contact with water and air.

Suggest **one** method of preventing iron from rusting.

..... [1]

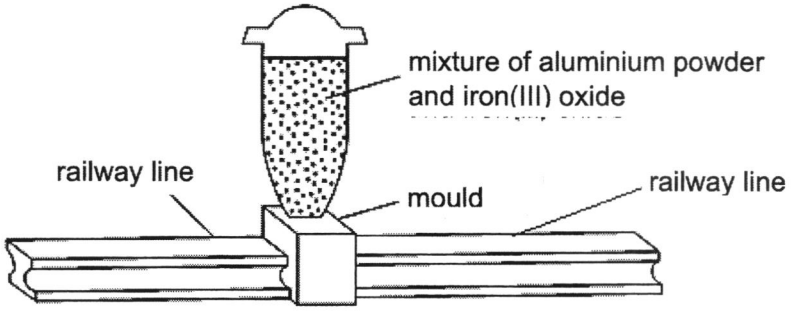
(ii) With the present rate of extraction of iron and its high demands for industrial and domestic use, it is estimated that the reserves of iron will run out within 300 years. Global efforts to recycle metals are more crucial now than ever.

Suggest **one** way to promote recycling of iron in your community.

.....

..... [1]

(c) The diagram shows how the reaction between aluminium and iron(III) oxide can be used to repair cracks in railway lines.



The mixture is ignited and an exothermic reaction takes place. The molten iron formed is collected in the mould. The molten iron solidifies and repairs the crack between the rails. The mould is then removed.

The chemical equation for the reaction that took place is:

$$2Al + Fe_2O_3 \rightarrow Al_2O_3 + 2Fe$$

(i) Explain why iron is produced in the reaction that took place.

.....

..... [2]

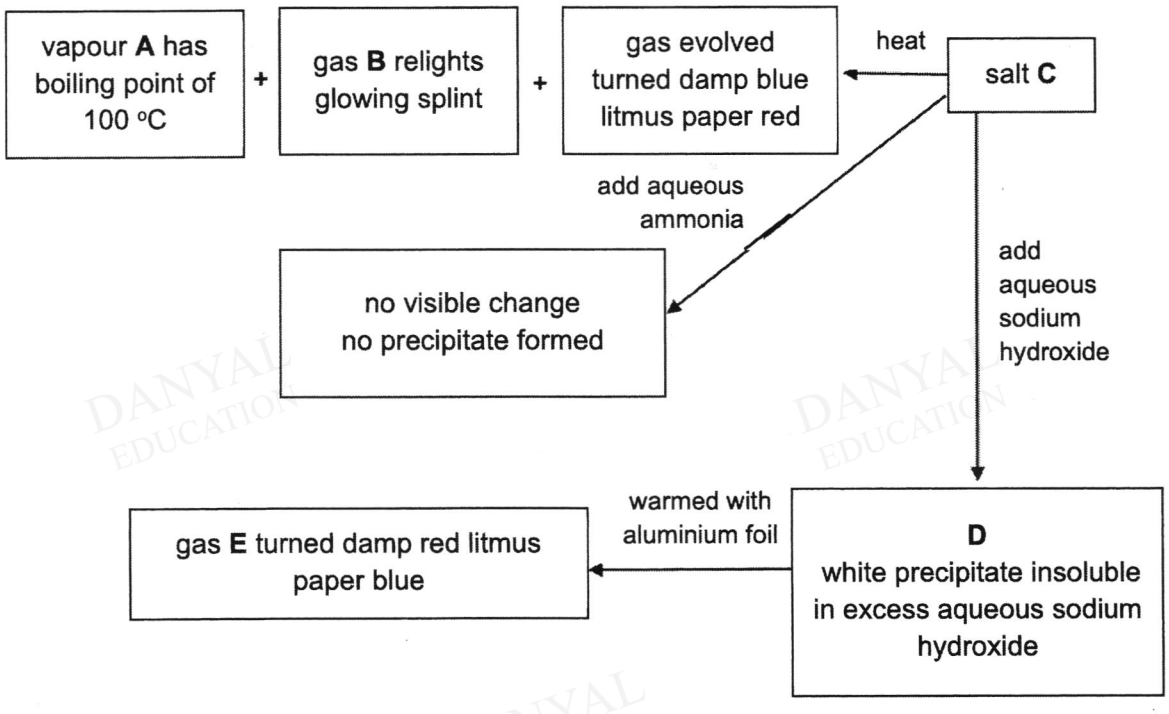
(ii) State the substance that is oxidised in the reaction.
Explain your answer in terms of changes in oxidation state.

substance oxidised .....

explanation .....

..... [2]

10 The figure below describes some of the reactions of salt **C**.



(a) Identify the substances **A** to **E**.

A .....

B .....

C .....

D .....

E ..... [5]

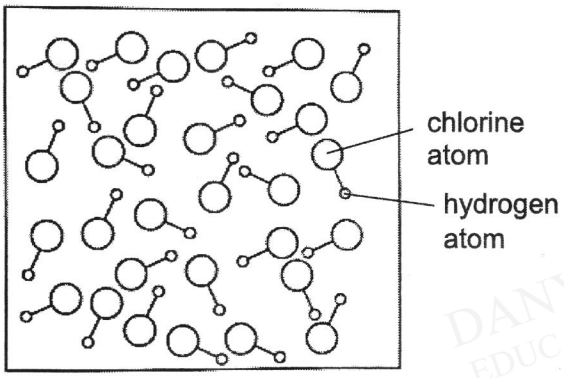
(b) Write a chemical equation for any **one** of the above reactions.

..... [1]

End of Section A

Section B [20 marks]
Answer any **two** questions.
Write your answers in the spaces provided on the question paper.

11 The diagram below show the structure of gaseous hydrogen chloride.



(a) (i) Explain why hydrogen chloride has a low melting point.

.....

..... [2]

(ii) Use 'dot-and-cross' diagram to show the arrangement of electrons in a molecule of hydrogen chloride.

Only the outer shells electrons need to be shown.

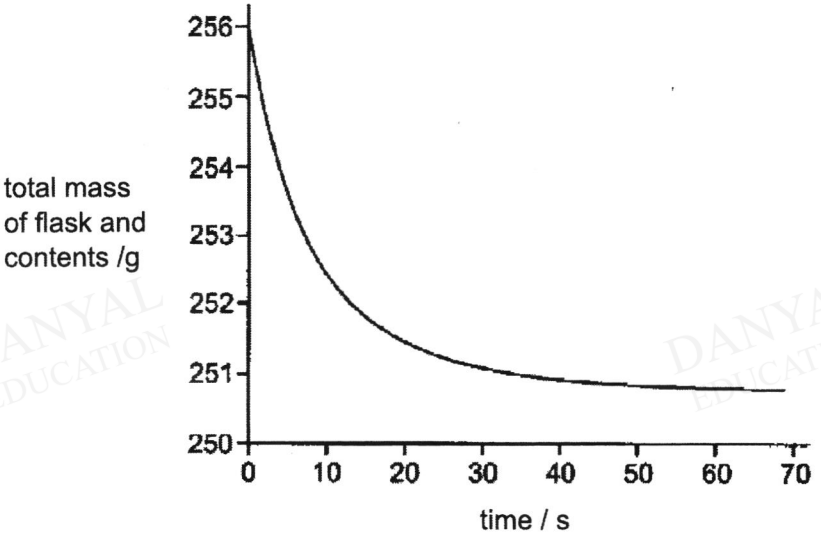
[2]

(iii) Hydrogen chloride dissolves in water to form an acidic solution.
Explain why this solution is acidic.

.....

..... [1]

(b) Indigestion tablets such as magnesium carbonate reduce stomach acidity.
Magnesium carbonate is placed in a flask on a top-pan balance and dilute hydrochloric acid is added. The total mass of the flask and its contents is recorded every ten seconds.



(i) Describe how you would use the graph to determine the speed of the reaction at 20 seconds.

.....

.....

..... [2]

(ii) Suggest **one** condition to increase the speed of this reaction.
Explain your answer.

.....

.....

..... [2]

(iii) Write a balanced chemical equation for this reaction.

..... [1]

12 The table below shows the names and formulae of some compounds.

compound	name	formulae
A		$PbCO_3$
B	sodium hydroxide	NaOH
C	iron(III) sulfate	
D	dilute nitric acid	HNO_3
E	lithium chloride	LiC*l*

(a) Complete the table above. [1]

(b) Use the letters, **A**, **B**, **C**, **D** and **E** to answer the following questions.
You may use the letters once, more than once or not at all.

(i) Which substance, when dissolved in water, turns the Universal indicator purple?

..... [1]

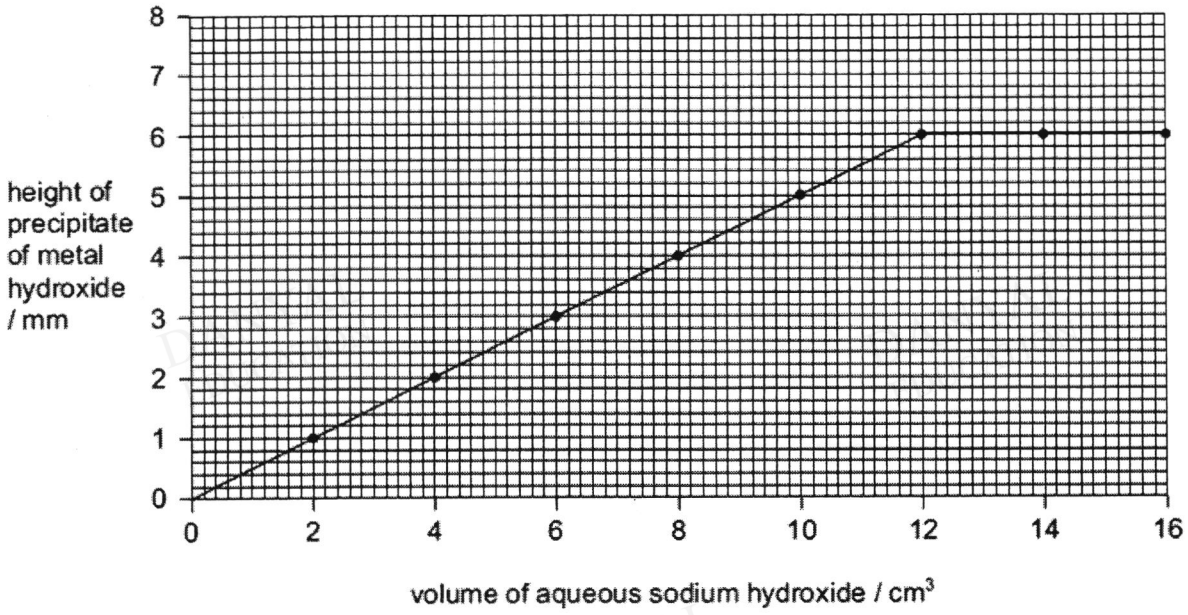
(ii) Which substance can be prepared using the titration method?

..... [1]

(iii) Which substance, when reacted with ammonium salts, produces a gas which turns moist red litmus paper blue?

..... [1]

(c) A student added 2.0 cm^3 portions of aqueous sodium hydroxide to a beaker of aqueous copper(II) chloride. After each addition of sodium hydroxide, the mixture was stirred, allowed to settle for 30 minutes and the height of the precipitate formed was measured. The results are shown in the graph below.



(i) State the volume of aqueous sodium hydroxide required for the reaction to complete.

..... [1]

(ii) Write a balanced chemical equation for the formation of the precipitate.

..... [2]

(iii) The experiment was repeated using aqueous ammonia of the same concentration and copper(II) chloride.

- On the graph above, draw how the new graph will look like
- Give a reason for your answer

.....

..... [2]

(iv) Another student did the above experiment but the mixture was allowed to settled for 15 minutes.

How would the result of this experiment be different, if any?

..... [1]

[Total 10 marks]

13

End of Paper

Bukit Batok Secondary School
Science Chemistry 5076
Secondary 4E5N
Preliminary Exam 2020

Answer Sheet

Paper 1

21	**C**	A compound is made up of 2 or more elements chemically combined. It has different properties from the elements it is made of. It is a pure substance with fixed melting and boiling points. It can only be separated by chemical means.
22	**D**	The more soluble the substance in the solvent, the further up it moves with the solvent.
23	**B**	Boiling point = condensation point Argon will condense at -186 °C. Nitrogen will condense at -196 °C. Oxygen will condense at -183 °C. At -200 °C, they turned into liquid.
24	**D**	Isotopes are with atoms with same number pf protons but different number of neutrons. Number of protons is the same, the difference is 238 – 235 = 3 neutrons
25	**D**	(1) C_2H_6 has 6 H atoms, NH_3 has 3 H atoms. (2) x represents valence electrons of N. There are 5 x around N atom. (3) There are 2 electrons (x) between the 2 C atoms.
26	**D**	To form formula X_2Y_3, 2 ions of X^{3+} are required to bond with 3 ions of Y^{2-}. Thus atom of X gives away 3 electrons while atom of Y receives 2 electrons to form these ions.
27	**C**	(A) In Group I, reactivity increases down the group. (B) Across the period, metallic character decreases. (becomes more non-metallic) (C) In Group I, melting point decreases down the group. (D) In Group VII, reactivity decreases down the group.
28	**D**	Group I metals are light (low density) and soft (can be cut with knife).
29	**A**	no of moles of HC*l* = concentration x volume $= 1.0\ mol/dm^3 \times \frac{100}{1000}\ dm^3 = 0.100mol$ 2mol of HC*l* produces 1mol of H_2 0.100mol of HC*l* produces 0.0500mol of H_2 volume of H_2 = no of moles x molar volume $= 0.0500mol \times 24dm^3 = 1.2dm^3$
30	**B**	At pH 6, both indicators will be yellow in colour.
31	**B**	M oxide can only react with acid, thus it's a base (metal oxide/hydroxide).

32	**B**	Barium chloride is a soluble salt – crystallisation to obtain solid salt from solution. Barium sulfate is an insoluble salt – filtration to obtain solid salt from solution.
33	**D**	30% oxygen used up to react with moist iron filling (rusting). $100cm^3$ of air – $30cm^3$ oxygen = $70cm^3$ air left
34	**D**	(2) $2CH_4$ + limited $3O_2 \rightarrow 2CO + 4H_2O$ (3) CO reacts with haemoglobin to form carboxyhaemoglobin.
35	**D**	$CaO + SiO_2 \rightarrow CaSiO_3$ lime removes acidic impurity (sand)
36	**A**	Add NaOH, warm, produce NH_3 – NH_4^+ ion present Add *Al* to warm mixture, produce NH_3 – NO_3^- ion present
37	**B**	$2Fe^{3+} + 2e- \rightarrow 2Fe^{2+}$ Two Fe^{3+} ion the gain of 2 electron for form two Fe^{2+} ion – reduction $2I^- \rightarrow I_2 + 2e-$ Two I^- ion the loses of 2 electron for form I_2 molecule – oxidation
38	**B**	Temperature of surrounding drops during dissolving of NH_4NO_3.
39	**B**	Temperature of surrounding rises (exothermic) and falls back to room temperature when the reaction ends.
40	**C**	Expt 2 is faster than Expt 1. Same amount of marble chips used thus same mass of CO_2 lost.

Paper 3 Section A

1a	A	1m
1b	B	1m
1c	E	1m
1d	C	1m
2a	A mixture.	1m
	It has no fixed freezing point / It freezes over a range of temperatures.	1m
2b	The particles' arrangement changed from closely packed in disorderly manner to closely packed in orderly manner.	1m
	The particles changed from being able to slide over one another to vibrating in fixed positions.	1m
3a	Oxygen is very slightly soluble in water.	1m
3b	Gas syringe	1m
3c	Put a glowing splint into a test tube of oxygen, it will relight.	1m
4ai	Cold water flowing through the condenser cools down the vapours of the oil and turn them to liquid.	1m
4aii	The oil is above the water / floats on water.	1m
4aiii	Use a separating funnel to separate the oil and water.	1m

4bi	Four	1m
4bii	Lemongrass is a mixture whereas citronella is a pure substance / compound.	1m
5ai	Both elements have 7 valence electrons (2.7 and 2.8.7).	1m
5aii	Down the group - melting and boiling point increases - states change from gas (F_2,Cl_2) to liquid (Br_2) to solid (I_2, At_2)	either 1m
5b	Colourless solution turns brown. Iodine is less reactive than chlorine. It is not able to displace chlorine from magnesium chloride. *Iodine dissolves in the magnesium chloride solution forming a brown solution.*	1m 1m Bonus 1m
6a	no of moles of TiO_2 = $\frac{mass}{molar\ mass}$ = $\frac{400g}{48+16+16}$ = 5.00 mol **(3sf)**	1m
6b	1 mol TiO_2 reacts with 2 mol Cl_2 5.00 mol TiO_2 reacts with 10.0 mol Cl_2 **(3sf)** *(a) and (b) no 3sf minus 1m*	1m
6c	volume of Cl_2 = no of moles x molar volume = 10.0 x 24 = ***240 dm^3***	1m
7a	Oxygen and nitrogen from the air reacts under high temperature in the car combustion engines.	1m
7b	Between 6 am to 10 am, there is a lot of people commute to work using vehicles therefore high level of unburnt hydrocarbons are produced from these vehicles.	1m
7c	Carbon monoxide	1m
8ai	Use a pH meter to measure the pH of the water from the soil, pH is 5-6 OR Add 2-3 drops of Universal indicator into soil water and compare the colour with pH chart. Colour of indicator shows orange / yellow (or pH is 5-6).	either 1m
8aii	Calcium hydroxide / calcium carbonate / calcium oxide can be used to treat the acidic soil	1m
8b	1) Mix sulfuric acid and calcium nitrate. (*accept any correct Ca^{2+} solution*) 2) Filter to obtain calcium sulfate as residue. 3) Wash residue with deionized water and pat dry between filter papers.	1m 1m 1m
9ai	J > iron > I > nickel	1m

9aii	Magnesium / Zinc	1m
9bi	• Painting / greasing / plating • Coat iron with a sacrificial / more reactive metal eg zinc or magnesium • Use alloy eg stainless steel	either 1m
9bii	• Educate the public about importance of recycling iron. • partner with businesses or government bodies to set up recycling bins outside of homes and offices to be used for waste iron objects.	either 1m
9ci	Aluminium is more reactive than iron. Aluminium displaces iron from its oxide.	1m 1m
9cii	Aluminium Its oxidation state increased from 0 in Al to +3 in aluminium oxide.	1m 1m
10a	A – water B – oxygen gas C – calcium nitrate D – calcium hydroxide E – ammonia gas	1m 1m 1m 1m 1m
10b	$Ca(NO_3)_2 + 2NaOH \rightarrow Ca(OH)_2 + 2NaNO_3$	1m

Paper 3 Section B

11ai	Weak intermolecular force of attraction between (hydrogen chloride) molecules requires little amount of heat energy to overcome the force	1m 1m
11aii		bond 1m Cl e- 1m
11aiii	When dissolved in water, HCl ionised to form H^+ and Cl^- ions. H^+ ions give the acidic property of solution.	1m
11bi	A tangent is to be drawn at the 20th second. Total mass **loss** between two points are to be recorded. (e.g. 10s and 20s). The total mass loss is divided by 10s to determine the speed of reaction at 20s.	1m 1m
11bii	1) Increase in temperature of hydrochloric acid.	any

Increase in temperature will result in particles gaining heat energy and move faster. Frequency of effective collisions increases. — factor 1m, explain 1m, total 2m

2) Increase in concentration of acid.
There will be more particles per unit volume and they are closer together.
Frequency of effective collisions increases.

3) Decrease in particle size of magnesium carbonate.
Smaller particle size will lead to larger surface area.
Frequency of effective collisions increases.

11biii $MgCO_3 + 2HCl \rightarrow MgCl_2 + CO_2 + H_2O$ — 1m

12a Lead (II) carbonate
$Fe_2(SO_4)_3$ — both 1m

12bi B — 1m

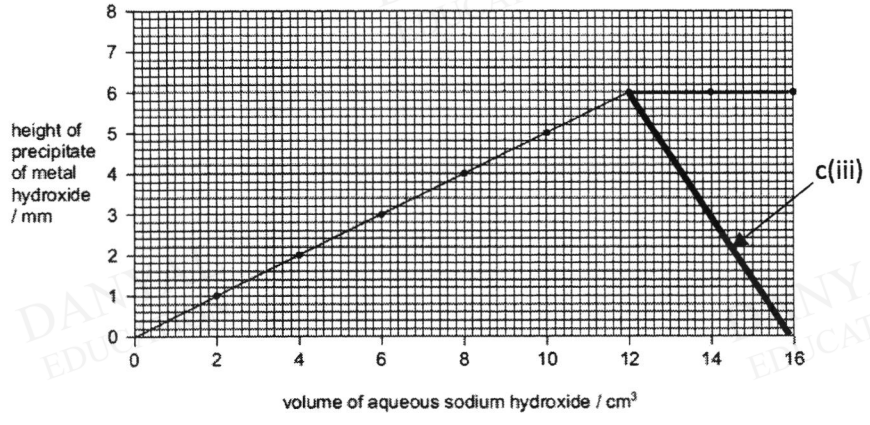
12bii E — 1m

12biii B — 1m

12ci $12cm^3$ — 1m

12cii $2NaOH_{(aq)} + CuCl_{2\,(aq)} \rightarrow Cu(OH)_{2\,(s)} + 2NaCl_{(aq)}$ — Eqn 1m, Sym 1m

12ciii



1m

12ciii The (blue) precipitate formed is soluble in excess aqueous ammonia (forming a dark blue solution). — 1m

12civ Height of precipitate will be lower. — 1m