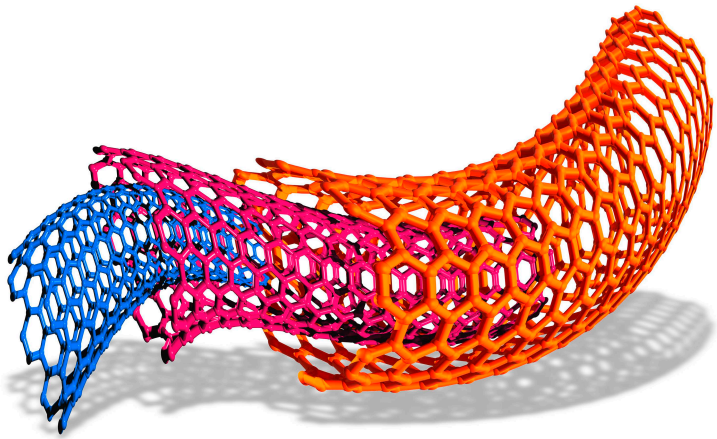
Cambridge Assessment International Education

Interactive

Interactive Example Candidate Responses

Paper 3 (May / June 2016), Question 1

Cambridge IGCSE™
Chemistry 0620



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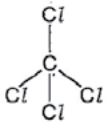
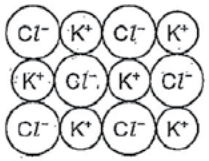
1 The structures of some substances containing chlorine are shown.

A

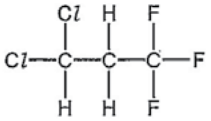


B

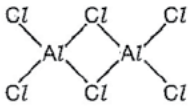
C



D



E



(a) Answer the following questions about these substances.

(i) Which substance is a diatomic molecule?

B [1]

(ii) Which substance represents part of an ionic structure?

C [1]

(iii) Which substance is an element?

Explain your answer.

B - it is made up of only one type of atom

[2]

(iv) Determine the simplest formula for substance D.

$C_3H_3F_3Cl_2$ [1]

Select page

HIGH MIDDLE LOW

	Your Mark
1(a)(i)	
1(a)(ii)	
1(a)(iii)	
1(a)(iv)	
1(b)(i)	
1(b)(ii)	
1(b)(iii)	

Examiner marks and comments

Mark	Comment
1/1	Correct. The chlorine contains two atoms so it is diatomic.
1/1	Correct. The ions are shown as + and –.
2/2	This is a concise model answer.
1/1	The correct molecular formula has been written.
1/1	Correct. The top number represents the number of protons and the number of neutrons.
1/1	Correct. The answer obtained by 35 – 17.
1/2	The middle electron shell is missing and therefore 1 mark has been deducted. There should be 17 electrons because there are 17 protons. (See the bottom figures in the symbols.)

EXAMINER COMMENTS MARK SCHEME

(b) The symbols for two isotopes of chlorine are shown.

$^{35}_{17}Cl$ $^{37}_{17}Cl$

(i) How do these two isotopes differ in their atomic structure?

Different number of ~~protons~~ neutrons ..... [1]

(ii) Determine the number of neutrons present in one atom of the isotope $^{35}_{17}Cl$.

18 ..... [1]

(iii) Draw the electronic structure of a chlorine atom. Show all shells and all electrons.

[2]

[Total: 9]

Select page

HIGH MIDDLE LOW

	Your Mark
1(a)(i)	
1(a)(ii)	
1(a)(iii)	
1(a)(iv)	
1(b)(i)	
1(b)(ii)	
1(b)(iii)	

Examiner marks and comments

Mark	Comment
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EXAMINER COMMENTS MARK SCHEME

1 The structures of some substances containing chlorine are shown.

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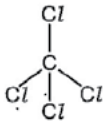
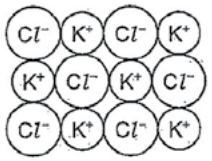
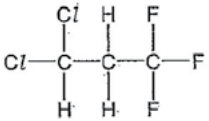


B

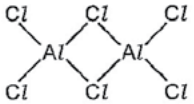
C



D



E



(a) Answer the following questions about these substances.

(i) Which substance is a diatomic molecule?

E [1]

(ii) Which substance represents part of an ionic structure?

A [1]

(iii) Which substance is an element?

Explain your answer.

B because it is ONLY Cl and elements are the simplest [2]

(iv) Determine the simplest formula for substance **D**.

~~$C_3H_3F_3Cl_2$~~ $(CHF)_3Cl_2$ [1]

Select page

HIGH | MIDDLE | LOW

Your Mark	
1(a)(i)	
1(a)(ii)	
1(a)(iii)	
1(a)(iv)	
1(b)(i)	
1(b)(ii)	
1(b)(iii)	

Examiner marks and comments

Mark	Comment
0/1	Although E has two types of atom, diatomic means containing two atoms only. No mark
0/1	The ionic structure is shown in these questions using + and – signs, so C is correct here, not A. No mark.
2/2	This contains the idea that elements contain only one type of atom.
1/1	This is acceptable instead of a molecular formula: $C_3H_3F_3Cl_2$.
0/1	The essential word, either *mass* (number) or *nucleon*, (number) is missing. No mark.
1/1	The calculation of the number of neutrons is correct and the working is shown.
2/2	The correct electronic structure is shown and the electrons are paired up, which helps in counting.

EXAMINER COMMENTS | MARK SCHEME

(b) The symbols for two isotopes of chlorine are shown.

$^{35}_{17}Cl$ $^{37}_{17}Cl$

(i) How do these two isotopes differ in their atomic structure?

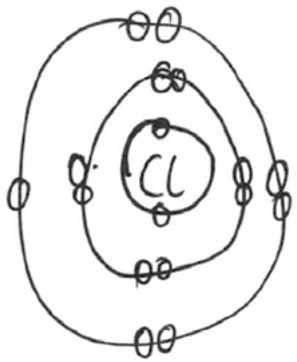
Same atomic mass but different number [1]

(ii) Determine the number of neutrons present in one atom of the isotope $^{35}_{17}Cl$.

(35-17) 18 [1]

(iii) Draw the electronic structure of a chlorine atom. Show all shells and all electrons.

17 = 2:8:7



[2]

[Total: 9]

Select page

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EXAMINER COMMENTS MARK SCHEME

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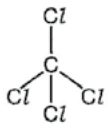
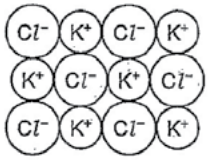
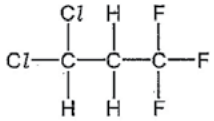


B

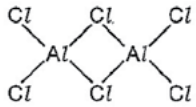
C



D



E



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i. E [1]

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Explain your answer.

B is an element because it has only one type of atom. [2]

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1(a)(iii)	
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1(b)(ii)	
1(b)(iii)	

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1/1	The ionic structure is shown in these questions using + and – signs, so C is correct.
2/2	Correct definition of an element.
0/1	The carbon atoms have not been counted. No mark.
0/1	The incorrect particles have been given here. There are different numbers of neutrons. No mark.
1/1	This has been calculated correctly (35–17) from the symbols above.
0/2	Structure A has been redrawn instead of the electronic structure requested in the instruction. No mark.

EXAMINER COMMENTS MARK SCHEME

(b) The symbols for two isotopes of chlorine are shown.

$^{35}_{17}Cl$ $^{37}_{17}Cl$

(i) How do these two isotopes differ in their atomic structure?

They have different numbers of electrons and protons - [1]

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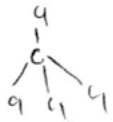

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[Total: 9]

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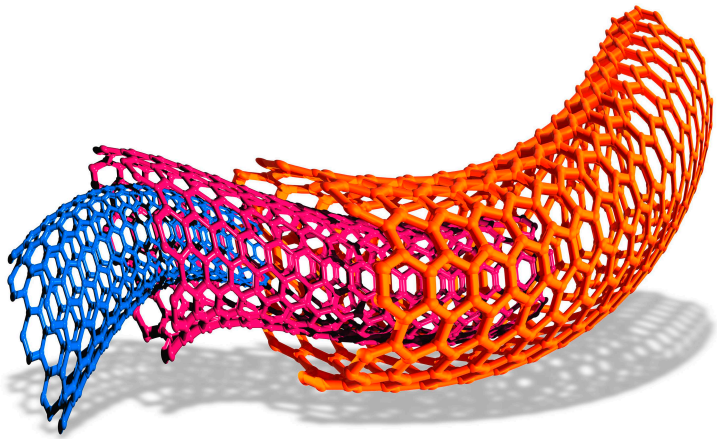
Paper 3 (May / June 2016), Question 2

Cambridge IGCSE™
Chemistry 0620



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Select page

HIGH | MIDDLE

2 A bicycle maker wants to choose a suitable material to make bicycle frames.
The table shows the properties of some materials that could be used.

material	relative strength	density in g/cm^3	resistance to corrosion	cost per tonne in $/tonne
aluminium	8	2.7	very good	1500
iron	21	7.9	poor	450
stainless steel	24	7.9	very good	600
titanium	27	4.5	very good	15000
zinc	14	7.1	good	1300

(a) Which material is the most suitable for making the bicycle frame?

Explain your answer using information from the table.

Stainless steel because it is strong resistant to corrosion, and very cheap. [3]

(b) Aluminium is extracted from aluminium oxide by electrolysis.

(i) State the name of the main ore of aluminium.

Bauxite [1]

(ii) Suggest why aluminium is extracted by electrolysis and **not** by reduction with carbon.

Its easier to do large amounts of it [1]

(iii) Molten aluminium oxide is electrolysed using graphite electrodes.

Predict the products of this electrolysis at

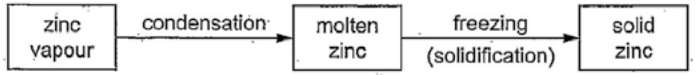
the positive electrode (anode), Oxygen

the negative electrode (cathode). Aluminium [2]

Your Mark	Examiner marks and comments	
	Mark	Comment
2(a)	3/3	'Stainless steel' with three correct reasons scores a full three marks.
2(b)(i)	1/1	The commonest ore of aluminium has been chosen.
2(b)(ii)	0/1	The ease of extraction is related incorrectly to the amount of material. Aluminium is a reactive metal so it is extracted by electrolysis. Carbon is used to extract less reactive metals such as iron. No mark.
2(b)(iii)	2/2	The anode and cathode products have been identified correctly.
2(c)	3/4	Mentioning the closer and slower movement of the particles during condensation earns marks. The answer conveys the idea that the particles in a solid are very close (touching) and suggests that the particles do move (from place to place). The word vibrate is required here.

EXAMINER COMMENTS | MARK SCHEME

(c) The diagram shows the changes of state when zinc vapour is cooled slowly to room temperature.



Explain what happens during these changes in terms of

- the distance between the particles,
- the type of motion shown by the particles.

During condensation, the particles get closer together and move slower, but still are moving. During freezing, particles get very close together, and barely move at all.

[4]

[Total: 11]

Select page

HIGH | MIDDLE

	Your Mark	Examiner marks and comments	
		Mark	Comment
2(a)		3/3	'Stainless steel' with three correct reasons scores a full three marks.
2(b)(i)		1/1	The commonest ore of aluminium has been chosen.
2(b)(ii)		0/1	The ease of extraction is related incorrectly to the amount of material. Aluminium is a reactive metal so it is extracted by electrolysis. Carbon is used to extract less reactive metals such as iron. No mark.
2(b)(iii)		2/2	The anode and cathode products have been identified correctly.
2(c)		3/4	Mentioning the closer and slower movement of the particles during condensation earns marks. The answer conveys the idea that the particles in a solid are very close (touching) and suggests that the particles do move (from place to place). The word vibrate is required here.

EXAMINER COMMENTS | MARK SCHEME

Select page

HIGH | MIDDLE

2 A bicycle maker wants to choose a suitable material to make bicycle frames.
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titanium	27	4.5	very good	15000
zinc	14	7.1	good	1300

(a) Which material is the most suitable for making the bicycle frame?

Explain your answer using information from the table.

Stainless steel because it is very strong, it is very dense and has good resistance to corrosion. ~~but~~ And it ~~is not as ex~~ is not too expensive [3]

(b) Aluminium is extracted from aluminium oxide by electrolysis.

(i) State the name of the main ore of aluminium.

bauxite [1]

(ii) Suggest why aluminium is extracted by electrolysis and **not** by reduction with carbon.

because it is ~~not too~~ [illegible] [1]

not reactive ~~a good conductor of electricity~~

(iii) Molten aluminium oxide is electrolysed using graphite electrodes.

Predict the products of this electrolysis at

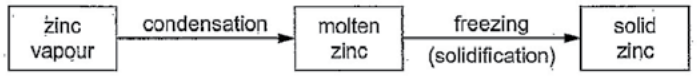
the positive electrode (anode), graphite

the negative electrode (cathode). Aluminium oxide [2]

Your Mark	Examiner marks and comments	
	Mark	Comment
2(a)	3/3	'Stainless steel' with three correct reasons scores a full three marks.
2(b)(i)	1/1	The correct ore of aluminium has been identified.
2(b)(ii)	0/1	Incorrect. Aluminium is high in the reactivity series but appears unreactive if not freshly made because of its unreactive oxide layer. Very reactive metals are extracted by electrolysis.
2(b)(iii)	0/2	Graphite is the anode not the product at the anode (which is oxygen). Aluminium oxide is the electrolyte not the product at the cathode (which is aluminium).
2(c)	2/4	The answer contains the idea of moving closer and the idea of slower movement. The arrangement is not asked for in the instruction.

EXAMINER COMMENTS | MARK SCHEME

(c) The diagram shows the changes of state when zinc vapour is cooled slowly to room temperature.



Explain what happens during these changes in terms of

- the distance between the particles,
- the type of motion shown by the particles.

Firstly, the particles slowly start to move closer and closer until they are aligned and fixed at solid zinc. Secondly, the particles tend to move less and less. [4]

[Total: 11]

Select page

HIGH MIDDLE

Your Mark		Examiner marks and comments	
		Mark	Comment
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2(b)(i)		1/1	The correct ore of aluminium has been identified.
2(b)(ii)		0/1	Incorrect. Aluminium is high in the reactivity series but appears unreactive if not freshly made because of its unreactive oxide layer. Very reactive metals are extracted by electrolysis.
2(b)(iii)		0/2	Graphite is the anode not the product at the anode (which is oxygen). Aluminium oxide is the electrolyte not the product at the cathode (which is aluminium).
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EXAMINER COMMENTS MARK SCHEME

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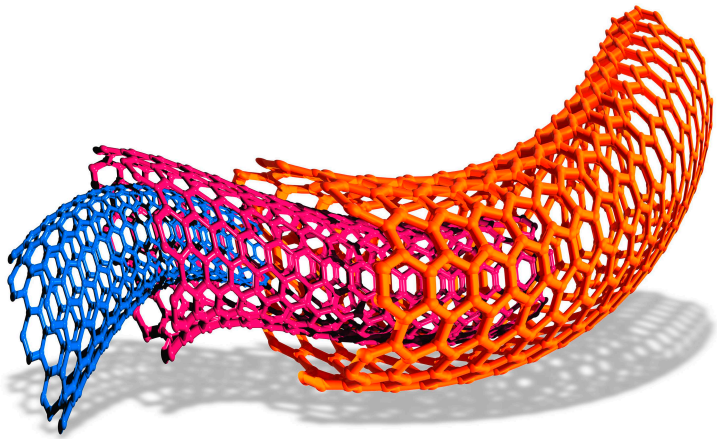
Interactive

Interactive Example Candidate Responses

Paper 3 (May / June 2016), Question 3

Cambridge IGCSE™
Chemistry 0620



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Select page

HIGH | MIDDLE

3 The table shows some properties of the Group I metals.

metal	density in g/cm^3	melting point /°C	boiling point /°C
lithium	0.53	181	1342
sodium		98	883
potassium	0.86	63	760
rubidium	1.53	39	686
caesium		29	669

(a) (i) Describe the trend in boiling points of the Group I metals.

~~Fe~~ decreases as it goes down. [1]

(ii) Predict the density of caesium.

2·5 [1]

(iii) Deduce the state of caesium at 20 °C.

Explain your answer.

solid because it ~~boils~~ ~~heats~~ melts at 29°C. [2]

(b) Complete the word equation for the reaction of rubidium with water.

rubidium + water → rubidium oxide + Hydrogen [2]

Rb

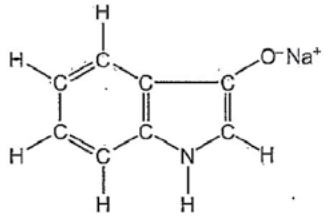
	Your Mark
3(a)(i)	
3(a)(ii)	
3(a)(iii)	
3(b)	
3(c)	
3(d)(i)	
3(d)(ii)	
3(d)(iii)	
3(d)(iv)	

Examiner marks and comments

Mark	Comment
1/1	This is just sufficient: 'down the Group' would have been better.
1/1	Just within the range allowed.
1/2	There must be a comparison with the quoted temperature of 20 °C to get the mark. 1 mark was lost.
1/2	A reactive metal reacting with cold water produces the hydroxide not the oxide. Hydrogen is correct.
2/2	The working is correct here, as well as the answer.
1/1	A good answer which mentions the solubility/insolubility of both pencil and ink.
1/1	Correct.
1/1	Correct.
1/1	Correct.

EXAMINER COMMENTS | MARK SCHEME

(c) The dye, indigotin, is formed when compound **F** is exposed to air.
The structure of compound **F** is shown below.



Complete the table and calculate the relative molecular mass of compound **F**.

type of atom	number of atoms	atomic mass	molecular mass
carbon	8	12	8×12=96
hydrogen	6	1	~~6×6=6~~ 6×1=6
nitrogen	1	14	1×14=14
oxygen	1	16	1×16=16
sodium	1	23	~~23×1=23~~ 1×23=23

relative molecular mass = ... 155 ..... [2]

Select page

HIGH | MIDDLE

	Your Mark
3(a)(i)	
3(a)(ii)	
3(a)(iii)	
3(b)	
3(c)	
3(d)(i)	
3(d)(ii)	
3(d)(iii)	
3(d)(iv)	

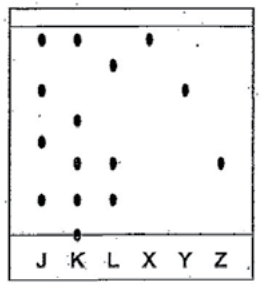
Examiner marks and comments

Mark	Comment
1/1	This is just sufficient: 'down the Group' would have been better.
1/1	Just within the range allowed.
1/2	There must be a comparison with the quoted temperature of 20 °C to get the mark. 1 mark was lost.
1/2	A reactive metal reacting with cold water produces the hydroxide not the oxide. Hydrogen is correct.
2/2	The working is correct here, as well as the answer.
1/1	A good answer which mentions the solubility/insolubility of both pencil and ink.
1/1	Correct.
1/1	Correct.
1/1	Correct.

EXAMINER COMMENTS | MARK SCHEME

(d) Three dye mixtures, **J**, **K** and **L**, were spotted onto a piece of chromatography paper. Three pure dyes, **X**, **Y** and **Z**, were also spotted onto the same piece of paper.

The diagram shows the results of this chromatography.



(i) Suggest why the base line was drawn in pencil and **not** in ink.

because pencil is insoluble; ~~ink is soluble~~, ink is soluble [1]

(ii) Which dye mixture, **J**, **K** or **L**, contains a dye which did **not** move during this chromatography?

~~J~~ K [1]

(iii) Which dye mixture, **J**, **K** or **L**, contains both dye **X** and dye **Y**?

J [1]

(iv) Which dye mixture, **J**, **K** or **L**, does **not** contain dye **Z**?

J [1]

[Total: 12]

Select page

HIGH MIDDLE

	Your Mark
3(a)(i)	
3(a)(ii)	
3(a)(iii)	
3(b)	
3(c)	
3(d)(i)	
3(d)(ii)	
3(d)(iii)	
3(d)(iv)	

Examiner marks and comments

Mark	Comment
1/1	This is just sufficient: 'down the Group' would have been better.
1/1	Just within the range allowed.
1/2	There must be a comparison with the quoted temperature of 20 °C to get the mark. 1 mark was lost.
1/2	A reactive metal reacting with cold water produces the hydroxide not the oxide. Hydrogen is correct.
2/2	The working is correct here, as well as the answer.
1/1	A good answer which mentions the solubility/insolubility of both pencil and ink.
1/1	Correct.
1/1	Correct.
1/1	Correct.

EXAMINER COMMENTS MARK SCHEME

Select page

HIGH | MIDDLE

3 The table shows some properties of the Group I metals.

metal	density in g/cm^3	melting point /°C	boiling point /°C
lithium	0.53	181	1342
sodium		98	883
potassium	0.86	63	760
rubidium	1.53	39	686
caesium		29	669

(a) (i) Describe the trend in boiling points of the Group I metals.

temperatures decrease. [1]

(ii) Predict the density of caesium.

2.02 g/cm^3 [1]

(iii) Deduce the state of caesium at 20 °C.

Explain your answer.

~~Molten liquid at 20°C~~ caesium would be a solid at 20°C in a fixed position [2]

(b) Complete the word equation for the reaction of rubidium with water.

rubidium + water → rubidium oxide + Hydrogen [2]

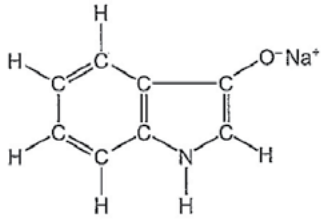
	Your Mark
3(a)(i)	
3(a)(ii)	
3(a)(iii)	
3(b)	
3(c)	
3(d)(i)	
3(d)(ii)	
3(d)(iii)	
3(d)(iv)	

Examiner marks and comments

Mark	Comment
0/1	No mark here because there is no mention of whether or not the temperature decreases down the Group or up the Group.
1/1	This is within the range allowed.
1/2	The candidate gives 20 °C but there is no reference to this temperature being lower than the melting point. The 'fixed position' is not necessary since the question does not ask about kinetic particle theory.
1/2	A reactive metal reacting with cold water produces the hydroxide not the oxide. Hydrogen is correct.
1/2	The figures showing the product of multiplication have been written incorrectly for sodium. The answer should be 23 (not 32). But 1 mark has been awarded for the correct row (hydrogen).
0/1	This answer is too vague. The word 'not' negates a correct answer. 'To stop the ink spreading on the paper' would have earned a mark.
1/1	Correct.
1/1	Correct.
1/1	Correct.

EXAMINER COMMENTS | MARK SCHEME

(c) The dye, indigotin, is formed when compound **F** is exposed to air.
The structure of compound **F** is shown below.



Complete the table and calculate the relative molecular mass of compound **F**.

type of atom	number of atoms	atomic mass	
carbon	8	12	8×12=96
hydrogen	6	1	6x1 = 6
nitrogen	1	14	1×14=14
oxygen	1	16	1×16=16
sodium	1	23	1x23 = 32

relative molecular mass = 164 [2]

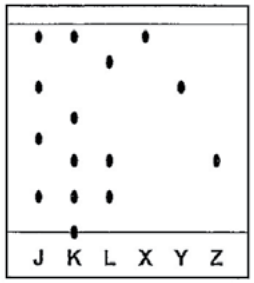
	Your Mark
3(a)(i)	
3(a)(ii)	
3(a)(iii)	
3(b)	
3(c)	
3(d)(i)	
3(d)(ii)	
3(d)(iii)	
3(d)(iv)	

Examiner marks and comments

	Mark	Comment
3(a)(i)	0/1	No mark here because there is no mention of whether or not the temperature decreases down the Group or up the Group.
3(a)(ii)	1/1	This is within the range allowed.
3(a)(iii)	1/2	The candidate gives 20 °C but there is no reference to this temperature being lower than the melting point. The 'fixed position' is not necessary since the question does not ask about kinetic particle theory.
3(b)	1/2	A reactive metal reacting with cold water produces the hydroxide not the oxide. Hydrogen is correct.
3(c)	1/2	The figures showing the product of multiplication have been written incorrectly for sodium. The answer should be 23 (not 32). But 1 mark has been awarded for the correct row (hydrogen).
3(d)(i)	0/1	This answer is too vague. The word 'not' negates a correct answer. 'To stop the ink spreading on the paper' would have earned a mark.
3(d)(ii)	1/1	Correct.
3(d)(iii)	1/1	Correct.
3(d)(iv)	1/1	Correct.

(d) Three dye mixtures, **J**, **K** and **L**, were spotted onto a piece of chromatography paper. Three pure dyes, **X**, **Y** and **Z**, were also spotted onto the same piece of paper.

The diagram shows the results of this chromatography.



(i) Suggest why the base line was drawn in pencil and **not** in ink.

To not ruin the ink from spreading on to the paper. ..... [1]

(ii) Which dye mixture, **J**, **K** or **L**, contains a dye which did **not** move during this chromatography?

K ..... [1]

(iii) Which dye mixture, **J**, **K** or **L**, contains both dye **X** and dye **Y**?

J ..... [1]

(iv) Which dye mixture, **J**, **K** or **L**, does **not** contain dye **Z**?

J ..... [1]

[Total: 12]

Select page

HIGH

MIDDLE

	Your Mark
3(a)(i)	
3(a)(ii)	
3(a)(iii)	
3(b)	
3(c)	
3(d)(i)	
3(d)(ii)	
3(d)(iii)	
3(d)(iv)	

Examiner marks and comments

Mark	Comment
0/1	No mark here because there is no mention of whether or not the temperature decreases down the Group or up the Group.
1/1	This is within the range allowed.
1/2	The candidate gives 20 °C but there is no reference to this temperature being lower than the melting point. The 'fixed position' is not necessary since the question does not ask about kinetic particle theory.
1/2	A reactive metal reacting with cold water produces the hydroxide not the oxide. Hydrogen is correct.
1/2	The figures showing the product of multiplication have been written incorrectly for sodium. The answer should be 23 (not 32). But 1 mark has been awarded for the correct row (hydrogen).
0/1	This answer is too vague. The word 'not' negates a correct answer. 'To stop the ink spreading on the paper' would have earned a mark.
1/1	Correct.
1/1	Correct.
1/1	Correct.

EXAMINER COMMENTS

MARK SCHEME

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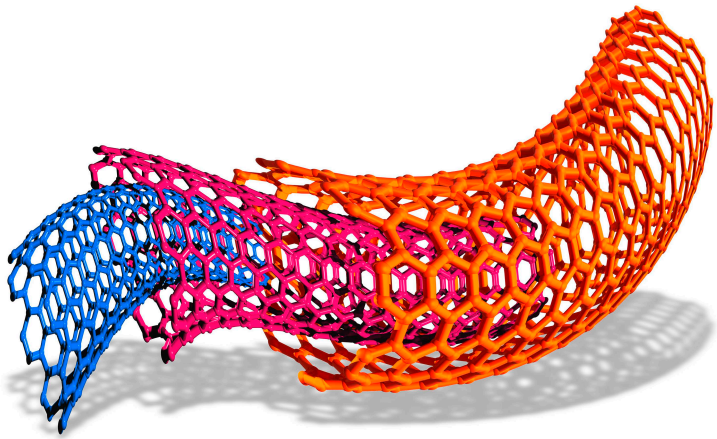
Cambridge Assessment International Education

Interactive

Interactive Example Candidate Responses

Paper 3 (May / June 2016), Question 4

Cambridge IGCSE™
Chemistry 0620



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www.surveymonkey.co.uk/r/GL6ZNJB

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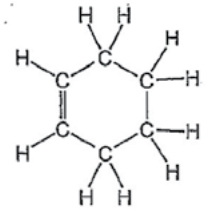
Please follow the link below to register your interest.

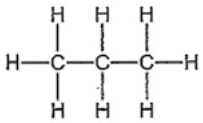
www.cambridgeinternational.org/cambridge-for/teachers/teacherconsultants/

4 The structures of some organic compounds are shown.

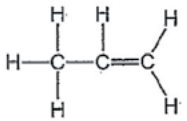
P



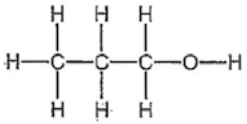
Q



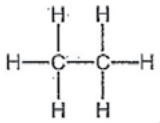
R



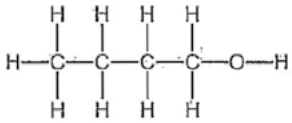
S



T



U



(a) (i) Which **two** of these compounds are alcohols?

Explain your answer.

S and U, they are alcohols because they belong to the same homologous series and have the same functional group. [2]

(ii) Which **two** of these compounds are saturated hydrocarbons?

Q and T. [1]

(b) Methanol and ethanol are alcohols in the same homologous series.

Complete the following sentence about a homologous series using words from the list.

alcohols	**chemical**	**compounds**	**elements**
functional	**mixtures**	**physical**	

A homologous series is a family of similar compounds with similar physical properties due to the same functional group. [3]

Select page

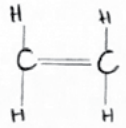
HIGH LOW

Your Mark	Examiner marks and comments	
	Mark	**Comment**
4(a)(i)	**1/2**	The alcohols are correctly identified but the second mark requires the identification of the functional group as OH.
4(a)(ii)	**1/1**	These have been identified correctly. They are carbon compounds containing only single bonds.
4(b)	**2/3**	The only error is the suggestion of a trend in physical properties. In a homologous series there is a trend in physical properties and not a similarity. The similarity in the functional group makes the chemical properties similar.
4(c)(i)	**1/1**	The structure shows all the bonds and all the atoms correctly.
4(c)(ii)	**2/2**	Both mixing bromine with ethene and decolourisation are mentioned here.
4(c)(iii)	**1/1**	The word 'heat' is sufficient for the mark here.
4(c)(iv)	**1/1**	The equation has been balanced correctly.

EXAMINER COMMENTS MARK SCHEME

(c) Ethene is an alkene.

(i) Draw the structure of ethene showing all atoms and all bonds.



[1]

(ii) Describe how aqueous bromine is used to show that ethene is an unsaturated compound.

Aqueous bromine is mixed with ethene and it becomes decolourised showing it is an unsaturated compound. [2]

(iii) Ethene is manufactured by cracking.

State the conditions needed for cracking.

There has to be a heat supply. [1]

(iv) Complete the chemical equation for the cracking of hexadecane, $C_{16}H_{34}$, to form propene and one other hydrocarbon.

$C_{16}H_{34} \rightarrow C_3H_6 + C_{13}H_{28}$ [1]

[Total: 11]

Select page

HIGH LOW

	Your Mark
4(a)(i)	
4(a)(ii)	
4(b)	
4(c)(i)	
4(c)(ii)	
4(c)(iii)	
4(c)(iv)	

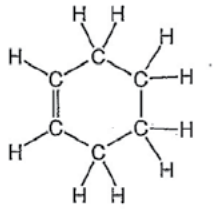
Examiner marks and comments

Mark	Comment
1/2	The alcohols are correctly identified but the second mark requires the identification of the functional group as OH.
1/1	These have been identified correctly. They are carbon compounds containing only single bonds.
2/3	The only error is the suggestion of a trend in physical properties. In a homologous series there is a trend in physical properties and not a similarity. The similarity in the functional group makes the chemical properties similar.
1/1	The structure shows all the bonds and all the atoms correctly.
2/2	Both mixing bromine with ethene and decolourisation are mentioned here.
1/1	The word 'heat' is sufficient for the mark here.
1/1	The equation has been balanced correctly.

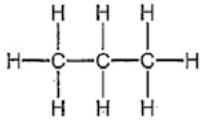
EXAMINER COMMENTS MARK SCHEME

4 The structures of some organic compounds are shown.

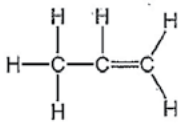
P



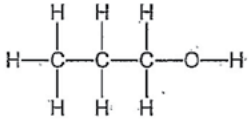
Q



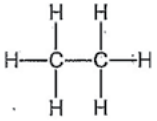
R



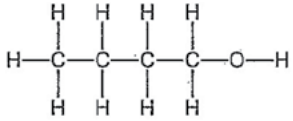
S



T



U



(a) (i) Which **two** of these compounds are alcohols?

Explain your answer.

Sorry Sorted and U because there structures are drawn like this. [2]

(ii) Which **two** of these compounds are saturated hydrocarbons?

P & R [1]

(b) Methanol and ethanol are alcohols in the same homologous series.

Complete the following sentence about a homologous series using words from the list.

alcohols	**chemical**	**compounds**	**elements**
functional	**mixtures**	**physical**	

A homologous series is a family of similar ..mixtures.., with similar ..physical.. properties due to the same ..elements.. group. [3]

Select page

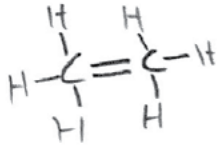
HIGH LOW

Your Mark		Examiner marks and comments	
		Mark	**Comment**
4(a)(i)		**1/2**	The alcohols have been identified correctly but no reference has been made to the OH functional group.
4(a)(ii)		**0/1**	The unsaturated hydrocarbons have been identified (C=C double bond) rather than the saturated hydrocarbons (only single C–C bonds).
4(b)		**0/3**	Methanol and ethanol are both compounds and not mixtures. In a homologous series there is a trend in physical properties and not a similarity. The similarity in the functional group makes the chemical properties similar. The similarity between methanol and ethanol is in their functional group (OH). They are not elements because they have different types of atoms bonded together.
4(c)(i)		**0/1**	Each carbon atom has five bonds in this structure. There should be four bonds to each carbon atom, so one hydrogen atom from each carbon should be removed (with its bond) to get the correct structure.
4(c)(ii)		**1/2**	The correct reagent has been added, although the acid has been ignored. There is also no description of what happens (bromine decolourised).
4(c)(iii)		**0/1**	The word 'stable' is not accurate enough. Conditions are things such as pressure, temperature or catalyst
4(c)(iv)		**0/1**	The equation has not been balanced correctly and the answer suggests guesswork rather than an attempt to subtract the carbon (16 – 3 = 13C) and hydrogen (34 – 6 = 28H)

EXAMINER COMMENTS MARK SCHEME

(c) Ethene is an alkene.

(i) Draw the structure of ethene showing all atoms and all bonds.



[1]

(ii) Describe how aqueous bromine is used to show that ethene is an unsaturated compound.

Add Aqueous bromine to the ethene and add little drops of acid. [2]

(iii) Ethene is manufactured by cracking.

State the conditions needed for cracking.

Stable [1]

(iv) Complete the chemical equation for the cracking of hexadecane, $C_{16}H_{34}$, to form propene and one other hydrocarbon.

$C_{16}H_{34} \rightarrow C_3H_6 +$ 13HN2 [1]

[Total: 11]

Select page

HIGH LOW

Your Mark	Examiner marks and comments	
	Mark	Comment
4(a)(i)	1/2	The alcohols have been identified correctly but no reference has been made to the OH functional group.
4(a)(ii)	0/1	The unsaturated hydrocarbons have been identified (C=C double bond) rather than the saturated hydrocarbons (only single C–C bonds).
4(b)	0/3	Methanol and ethanol are both compounds and not mixtures. In a homologous series there is a trend in physical properties and not a similarity. The similarity in the functional group makes the chemical properties similar. The similarity between methanol and ethanol is in their functional group (OH). They are not elements because they have different types of atoms bonded together.
4(c)(i)	0/1	Each carbon atom has five bonds in this structure. There should be four bonds to each carbon atom, so one hydrogen atom from each carbon should be removed (with its bond) to get the correct structure.
4(c)(ii)	1/2	The correct reagent has been added, although the acid has been ignored. There is also no description of what happens (bromine decolourised).
4(c)(iii)	0/1	The word 'stable' is not accurate enough. Conditions are things such as pressure, temperature or catalyst
4(c)(iv)	0/1	The equation has not been balanced correctly and the answer suggests guesswork rather than an attempt to subtract the carbon (16 – 3 = 13C) and hydrogen (34 – 6 = 28H)

EXAMINER COMMENTS MARK SCHEME

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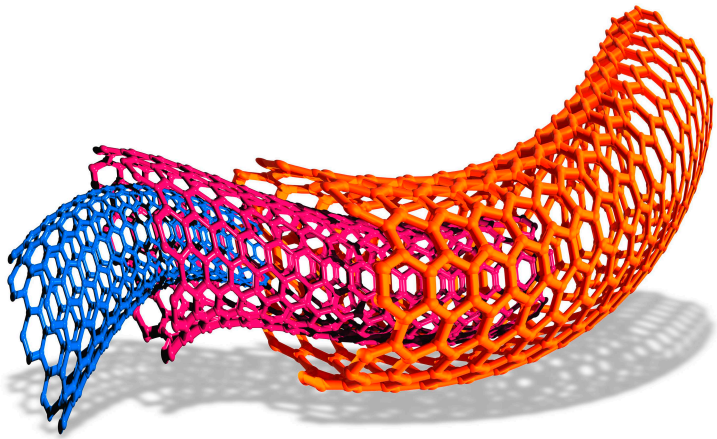
Interactive Example Candidate Responses

Paper 3 (May / June 2016), Question 5

Cambridge IGCSE™
Chemistry 0620



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5 The Group VII elements are called the halogens.

(a) Describe the trends in

- the physical properties of the halogens,
- the reactivity of halogens with other halide ions.

Include a relevant word equation in your answer.

The physical properties of Halogens
colours get darker when going down periodic table
used for daily appliances eg chlorine = swimming baths
iodine = ~~light~~ medical use
fluoride = toothpaste
Reactivity
Group ~~VIII~~ VII is more reactive than ~~gas~~ halogens.
Halogens are more reactive than group VI. [5]

(b) Iodine reacts with hot concentrated nitric acid.

$$I_2 + 10HNO_3 \rightarrow 2HIO_3 + 4H_2O + 10NO_2$$

(i) Explain why this reaction could have an adverse effect on health if not carried out in a fume cupboard.

Iodine is a good dye, so any
~~errors~~ spills may result in dying skin [2]
Nitric acid is also strongly acidic, etc.
could have adverse effects on health.

(ii) Nitric acid is strongly acidic.

Which one of the following pH values represents a strongly acidic solution?

Put a ring around the correct answer.

(pH 1) pH 7 pH 9 pH 13

[1]

Select page

MIDDLE LOW

	Your Mark
5(a)	
5(b)(i)	
5(b)(ii)	
5(b)(iii)	

Examiner marks and comments

Mark	Comment
3/5	Two trends are identified (melting and boiling points increase down the Group). The wording of the instruction suggests that the halogens do react with the halide ions (A more reactive halogen displaces a less reactive halogen from a solution of its halide ions.) The trend in density is identified.
1/2	Credit has been given for the identification of an oxide of nitrogen. A better answer would have been to name nitrogen dioxide. 'Harmful' is not sufficient to gain a mark here. A definite effect, e.g. 'irritates the lungs' is required.
0/1	Incorrect: acids have pH values below pH 7.
1/2	The salt is correctly identified here. Water is formed (not oxygen) when an acid reacts with a metal oxide.

EXAMINER COMMENTS MARK SCHEME

(iii) Nitric acid reacts with zinc oxide.

State the names of the products of this reaction.

Nitrate and zinc [2]

[Total: 10]

Select page

MIDDLE LOW

	Your Mark
5(a)	
5(b)(i)	
5(b)(ii)	
5(b)(iii)	

Examiner marks and comments

Mark	Comment
3/5	Two trends are identified (melting and boiling points increase down the Group). The wording of the instruction suggests that the halogens do react with the halide ions (A more reactive halogen displaces a less reactive halogen from a solution of its halide ions.) The trend in density is identified.
1/2	Credit has been given for the identification of an oxide of nitrogen. A better answer would have been to name nitrogen dioxide. 'Harmful' is not sufficient to gain a mark here. A definite effect, e.g. 'irritates the lungs' is required.
0/1	Incorrect: acids have pH values below pH 7.
1/2	The salt is correctly identified here. Water is formed (not oxygen) when an acid reacts with a metal oxide.

EXAMINER COMMENTS MARK SCHEME

Select page

MIDDLE | LOW

5 The Group VII elements are called the halogens.

(a) Describe the trends in

- the physical properties of the halogens,
- the reactivity of halogens with other halide ions.

Include a relevant word equation in your answer.

Halogens are ~~very~~ reactive but as you go down the lower you go the lowers the reactivity. for example: Chlorine is more reactive than Iodine.

Halogens usually have very dark colors, for example: Iodine is very black and sometimes dark green.

[5]

(b) Iodine reacts with hot concentrated nitric acid.

$$I_2 + 10HNO_3 \rightarrow 2HIO_3 + 4H_2O + 10NO_2$$

(i) Explain why this reaction could have an adverse effect on health if not carried out in a fume cupboard.

This reaction would have an adverse effect on health because it contains a lot of nitric acid. [2]

(ii) Nitric acid is strongly acidic.

Which one of the following pH values represents a strongly acidic solution?

Put a ring around the correct answer.

(pH 1) pH 7 pH 9 pH 13

[1]

	Your Mark
5(a)	
5(b)(i)	
5(b)(ii)	
5(b)(iii)	

Examiner marks and comments

	Mark	Comment
5(a)	0/5	This is not quite enough to gain a mark. The question asks for the reactivity of halogens with halide ions. The mark would have been given if there had been mention of a more reactive halogen displacing a less reactive halogen (from the halide). No trends in physical properties have been identified. Only the colour of iodine has been mentioned (and the green conflicts with the black).
5(b)(i)	0/2	The examiners were expecting a reference to a gas, not to the acid, because the information in the instruction referred to a fume cupboard.
5(b)(ii)	1/1	Correct. Acids have pH values below pH 7.
5(b)(iii)	1/2	'Water' is a correct product. The other product should be 'zinc nitrate' (acid + metal oxide produces a salt + water).

EXAMINER COMMENTS | MARK SCHEME

(iii) Nitric acid reacts with zinc oxide.

State the names of the products of this reaction.

nitric oxide and water;

[2]

[Total: 10]

Select page

MIDDLE LOW

	Your Mark
5(a)	
5(b)(i)	
5(b)(ii)	
5(b)(iii)	

Examiner marks and comments

	Mark	Comment
5(a)	0/5	This is not quite enough to gain a mark. The question asks for the reactivity of halogens with halide ions. The mark would have been given if there had been mention of a more reactive halogen displacing a less reactive halogen (from the halide). No trends in physical properties have been identified. Only the colour of iodine has been mentioned (and the green conflicts with the black).
5(b)(i)	0/2	The examiners were expecting a reference to a gas, not to the acid, because the information in the instruction referred to a fume cupboard.
5(b)(ii)	1/1	Correct. Acids have pH values below pH 7.
5(b)(iii)	1/2	'Water' is a correct product. The other product should be 'zinc nitrate' (acid + metal oxide produces a salt + water).

EXAMINER COMMENTS MARK SCHEME

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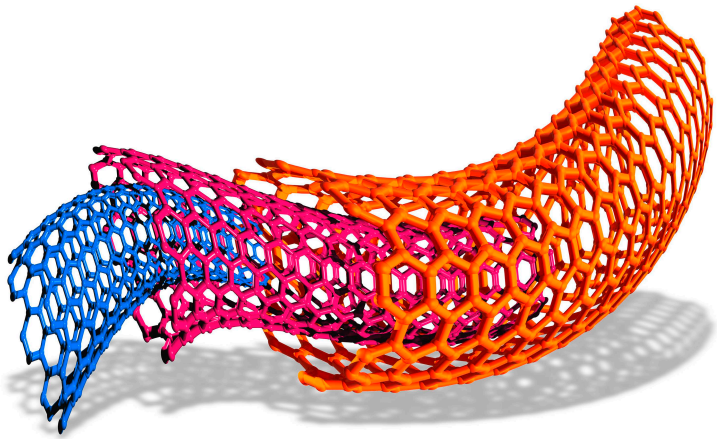
Interactive Example Candidate Responses

Paper 3 (May / June 2016), Question 6

Cambridge IGCSE™
Chemistry 0620



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6 Ammonia is manufactured by the reaction of nitrogen with hydrogen in the presence of a catalyst.

(a) What is the purpose of a catalyst?

to speed up the reaction with ..... [1]

(b) The reaction is reversible.

Complete the equation below by adding the sign for a reversible reaction.

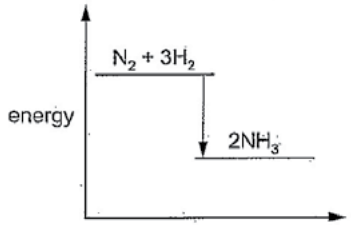
$$N_2 + 3H_2 \rightleftharpoons 2NH_3$$

[1]

(c) The energy level diagram for this reaction is shown.

Is this reaction exothermic or endothermic?

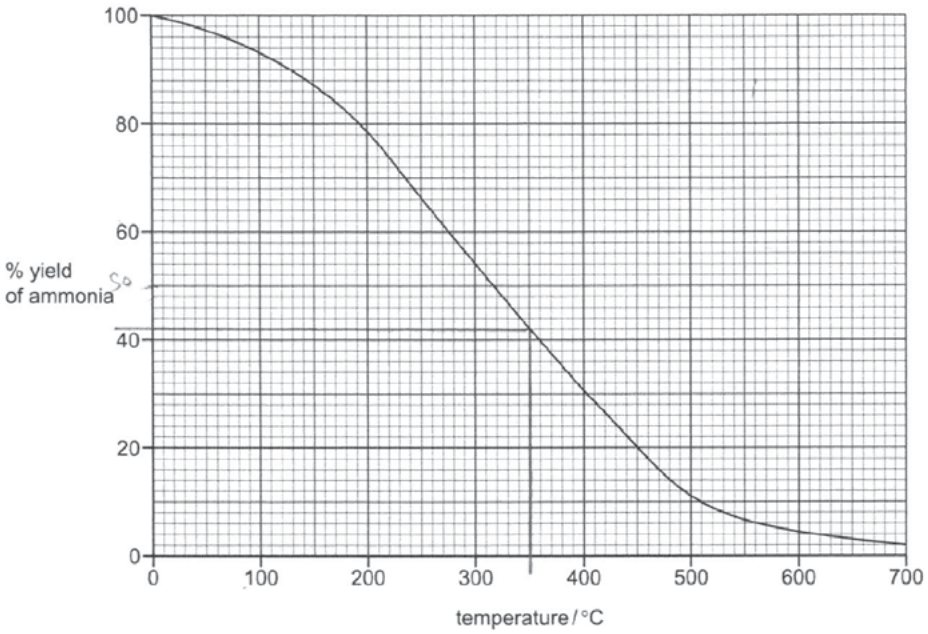
Give a reason for your answer.



endo ther endothermic because it is losing heat losing energy [1]

Your Mark	Examiner marks and comments	
	Mark	Comment
6(a)	1/1	Correct.
6(b)	1/1	The sign for the reversible reaction is correct.
6(c)	0/1	Although the reason given here ('losing energy') is correct, this means that energy is being given out (exothermic).
6(d)(i)	1/1	Both yield and temperature have been referred to, so this gains the mark.
6(d)(ii)	1/1	Correct.
6(e)	2/2	The test and the result are correct. The answer could have been improved by giving the test as '*damp* red litmus paper'.
6(f)	1/2	The idea of adding the Universal Indicator to the solution has been given, but there is no reference to a comparison with a colour chart, only the colour obtained.
6(g)	2/2	The equation has been balanced correctly.

(d) The graph shows how the percentage yield of ammonia changes with temperature when the pressure is kept constant.



(i) Describe how the percentage yield of ammonia changes with temperature.

The higher the temperature the less % yeild of ammonia [1]

(ii) Determine the percentage yield of ammonia at 350 °C.

42% [1]

(e) Describe a test for ammonia.

test red litmus paper

result turns blue. [2]

Select page

HIGH | MIDDLE | LOW

	Your Mark
6(a)	
6(b)	
6(c)	
6(d)(i)	
6(d)(ii)	
6(e)	
6(f)	
6(g)	

Examiner marks and comments

	Mark	Comment
6(a)	1/1	Correct.
6(b)	1/1	The sign for the reversible reaction is correct.
6(c)	0/1	Although the reason given here ('losing energy') is correct, this means that energy is being given out (exothermic).
6(d)(i)	1/1	Both yield and temperature have been referred to, so this gains the mark.
6(d)(ii)	1/1	Correct.
6(e)	2/2	The test and the result are correct. The answer could have been improved by giving the test as '*damp* red litmus paper'.
6(f)	1/2	The idea of adding the Universal Indicator to the solution has been given, but there is no reference to a comparison with a colour chart, only the colour obtained.
6(g)	2/2	The equation has been balanced correctly.

EXAMINER COMMENTS | MARK SCHEME

(f) Ammonia is a weak base.

Describe how you would measure the pH of an aqueous solution of a weak base using Universal Indicator.

add 2-3 drops of universal indicator, ~~A Then~~

universal indicator should turn green-blue [2]

(g) Complete the chemical equation for the reaction of ammonia with chlorine.

$2\,NH_3 + 3Cl_2 \rightarrow N_2 + 6\,HCl$ [2]

[Total: 11]

Select page

HIGH | MIDDLE | LOW

Your Mark	Examiner marks and comments	
	Mark	Comment
6(a)	1/1	Correct.
6(b)	1/1	The sign for the reversible reaction is correct.
6(c)	0/1	Although the reason given here ('losing energy') is correct, this means that energy is being given out (exothermic).
6(d)(i)	1/1	Both yield and temperature have been referred to, so this gains the mark.
6(d)(ii)	1/1	Correct.
6(e)	2/2	The test and the result are correct. The answer could have been improved by giving the test as '*damp* red litmus paper'.
6(f)	1/2	The idea of adding the Universal Indicator to the solution has been given, but there is no reference to a comparison with a colour chart, only the colour obtained.
6(g)	2/2	The equation has been balanced correctly.

EXAMINER COMMENTS | MARK SCHEME

6 Ammonia is manufactured by the reaction of nitrogen with hydrogen in the presence of a catalyst.

(a) What is the purpose of a catalyst?

Speed up the reaction and remains unchanged [1]

(b) The reaction is reversible.

Complete the equation below by adding the sign for a reversible reaction.

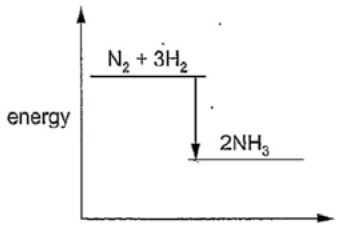
$N_2 + 3H_2 \rightleftharpoons 2NH_3$

[1]

(c) The energy level diagram for this reaction is shown.

Is this reaction exothermic or endothermic?

Give a reason for your answer.



Endothermic

The energy is stored. [1]

Select page

HIGH | MIDDLE | LOW

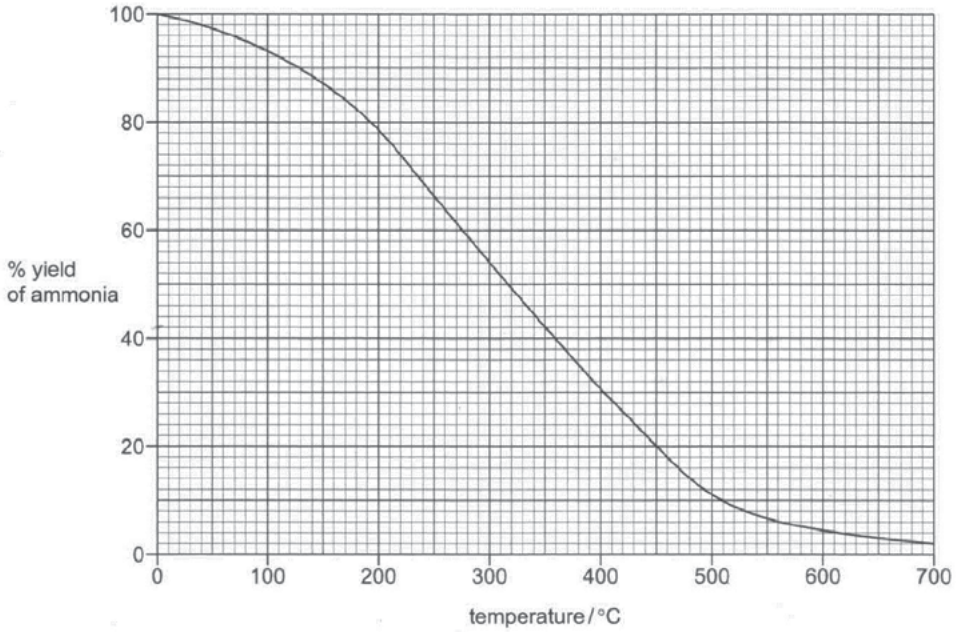
Your Mark	
6(a)	
6(b)	
6(c)	
6(d)(i)	
6(d)(ii)	
6(e)	
6(f)	
6(g)	

Examiner marks and comments

Mark	Comment
1/1	Correct.
1/1	The symbol for the reversible reaction is correct.
0/1	The energy decreases from reactants to products and so heat is given out and the reaction is exothermic (not endothermic).
0/1	'Decreases' alone is insufficient. No mention has been made as to whether the yield increases or decreases as temperature increases.
1/1	Correct.
0/2	Adding an acid is not accurate enough. The mark could have been given for 'concentrated hydrochloric acid'. The result should be a description, e.g. what you see, rather than the name of a compound.
1/2	The addition of the indicator to solution is mentioned. A description of how you find the pH is required here (compare with a colour chart), not just stating the pH value.
1/2	NH_3 is correctly balanced but HC*l* is not.

EXAMINER COMMENTS | MARK SCHEME

(d) The graph shows how the percentage yield of ammonia changes with temperature when the pressure is kept constant.



(i) Describe how the percentage yield of ammonia changes with temperature.

Decreases [1]

(ii) Determine the percentage yield of ammonia at 350 °C.

42 % [1]

(e) Describe a test for ammonia.

test a acid

result ammonia gas [2]

Select page

HIGH MIDDLE LOW

	Your Mark
6(a)	
6(b)	
6(c)	
6(d)(i)	
6(d)(ii)	
6(e)	
6(f)	
6(g)	

Examiner marks and comments

	Mark	Comment
6(a)	1/1	Correct.
6(b)	1/1	The symbol for the reversible reaction is correct.
6(c)	0/1	The energy decreases from reactants to products and so heat is given out and the reaction is exothermic (not endothermic).
6(d)(i)	0/1	'Decreases' alone is insufficient. No mention has been made as to whether the yield increases or decreases as temperature increases.
6(d)(ii)	1/1	Correct.
6(e)	0/2	Adding an acid is not accurate enough. The mark could have been given for 'concentrated hydrochloric acid'. The result should be a description, e.g. what you see, rather than the name of a compound.
6(f)	1/2	The addition of the indicator to solution is mentioned. A description of how you find the pH is required here (compare with a colour chart), not just stating the pH value.
6(g)	1/2	NH_3 is correctly balanced but HC*l* is not.

EXAMINER COMMENTS MARK SCHEME

(f) Ammonia is a weak base.

Describe how you would measure the pH of an aqueous solution of a weak base using Universal Indicator.

By adding the universal indicator in to the aqueous solution. If the pH ~~is~~ is between 9-11 then it is a weak base. [2]

(g) Complete the chemical equation for the reaction of ammonia with chlorine.

$2NH_3 + 3Cl_2 \rightarrow N_2 + 3HCl$ [2]

[Total: 11]

Select page

HIGH | MIDDLE | LOW

	Your Mark	Examiner marks and comments	
		Mark	Comment
6(a)		1/1	Correct.
6(b)		1/1	The symbol for the reversible reaction is correct.
6(c)		0/1	The energy decreases from reactants to products and so heat is given out and the reaction is exothermic (not endothermic).
6(d)(i)		0/1	'Decreases' alone is insufficient. No mention has been made as to whether the yield increases or decreases as temperature increases.
6(d)(ii)		1/1	Correct.
6(e)		0/2	Adding an acid is not accurate enough. The mark could have been given for 'concentrated hydrochloric acid'. The result should be a description, e.g. what you see, rather than the name of a compound.
6(f)		1/2	The addition of the indicator to solution is mentioned. A description of how you find the pH is required here (compare with a colour chart), not just stating the pH value.
6(g)		1/2	NH_3 is correctly balanced but HC*l* is not.

EXAMINER COMMENTS | MARK SCHEME

Select page

HIGH | MIDDLE | LOW

6 Ammonia is manufactured by the reaction of nitrogen with hydrogen in the presence of a catalyst.

(a) What is the purpose of a catalyst?

Slow down a reaction ..... [1]

(b) The reaction is reversible.

Complete the equation below by adding the sign for a reversible reaction.

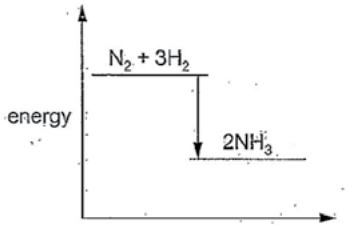
$N_2 + 3H_2 \rightleftharpoons 2NH_3$

[1]

(c) The energy level diagram for this reaction is shown.

Is this reaction exothermic or endothermic?

Give a reason for your answer.



endotherm because the energy is decreasing ..... [1]

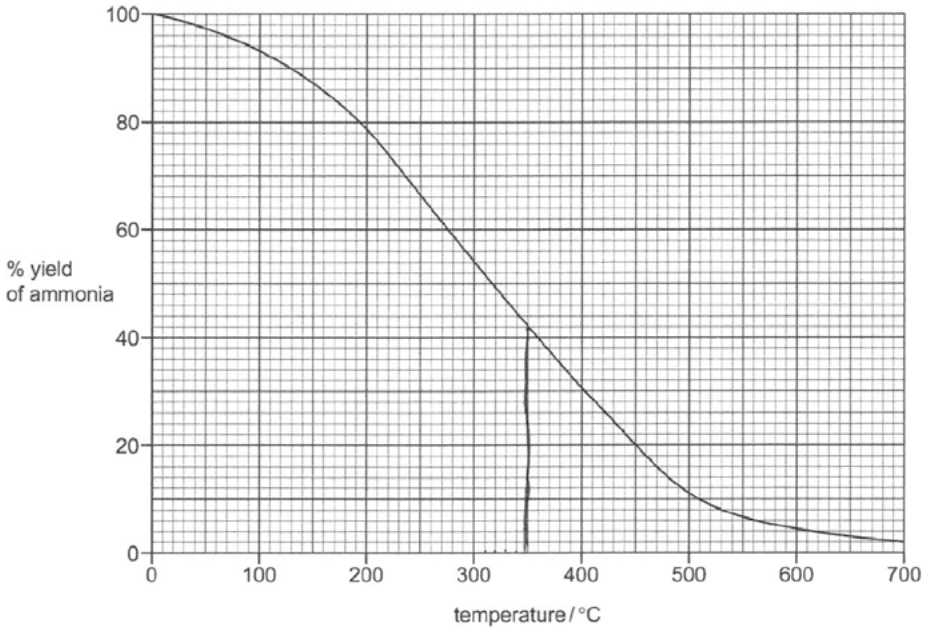
	Your Mark
6(a)	
6(b)	
6(c)	
6(d)(i)	
6(d)(ii)	
6(e)	
6(f)	
6(g)	

Examiner marks and comments

Mark	Comment
0/1	Catalysts speed up a reaction. A substance which slows a reaction is called an inhibitor.
1/1	This is sufficient to be awarded a mark.
0/1	Although the reason 'energy is decreasing' is correct, this means that energy is being given out (exothermic).
1/1	This was given the benefit of the doubt. A better answer would have been 'the lower the temperature, the greater the yield of ammonia'.
0/1	This value is not accurate enough to gain a mark.
0/2	The candidate has referred back to the graph instead of describing a test (damp red litmus) and a result (turns blue).
1/2	It is not clear how the pH strip is used here i.e. dip the (Universal Indicator) strip into the solution.
0/2	The dotted lines are intended to show where the number for balance should be written. These have not been used.

EXAMINER COMMENTS | MARK SCHEME

(d) The graph shows how the percentage yield of ammonia changes with temperature when the pressure is kept constant.



(i) Describe how the percentage yield of ammonia changes with temperature.

low temps = more ammonia [1]

(ii) Determine the percentage yield of ammonia at 350 °C.

41% [1]

(e) Describe a test for ammonia.

test the percentage of ammonium in high temperatures

result higher the temperatures the less the ammonia [2]

Select page

HIGH MIDDLE LOW

	Your Mark	Examiner marks and comments	
		Mark	Comment
6(a)		0/1	Catalysts speed up a reaction. A substance which slows a reaction is called an inhibitor.
6(b)		1/1	This is sufficient to be awarded a mark.
6(c)		0/1	Although the reason 'energy is decreasing' is correct, this means that energy is being given out (exothermic).
6(d)(i)		1/1	This was given the benefit of the doubt. A better answer would have been 'the lower the temperature, the greater the yield of ammonia'.
6(d)(ii)		0/1	This value is not accurate enough to gain a mark.
6(e)		0/2	The candidate has referred back to the graph instead of describing a test (damp red litmus) and a result (turns blue).
6(f)		1/2	It is not clear how the pH strip is used here i.e. dip the (Universal Indicator) strip into the solution.
6(g)		0/2	The dotted lines are intended to show where the number for balance should be written. These have not been used.

EXAMINER COMMENTS MARK SCHEME

(f) Ammonia is a weak base.

Describe how you would measure the pH of an aqueous solution of a weak base using Universal Indicator.

You use a pH strip

..... [2]

(g) Complete the chemical equation for the reaction of ammonia with chlorine.

$.....NH_3 + 3Cl_2 \rightarrow N_2 + ...HCl + 2Cl_2 + N_3$ [2]

[Total: 11]

Select page

HIGH MIDDLE LOW

	Your Mark
6(a)	
6(b)	
6(c)	
6(d)(i)	
6(d)(ii)	
6(e)	
6(f)	
6(g)	

Examiner marks and comments

Mark	Comment
0/1	Catalysts speed up a reaction. A substance which slows a reaction is called an inhibitor.
1/1	This is sufficient to be awarded a mark.
0/1	Although the reason 'energy is decreasing' is correct, this means that energy is being given out (exothermic).
1/1	This was given the benefit of the doubt. A better answer would have been 'the lower the temperature, the greater the yield of ammonia'.
0/1	This value is not accurate enough to gain a mark.
0/2	The candidate has referred back to the graph instead of describing a test (damp red litmus) and a result (turns blue).
1/2	It is not clear how the pH strip is used here i.e. dip the (Universal Indicator) strip into the solution.
0/2	The dotted lines are intended to show where the number for balance should be written. These have not been used.

EXAMINER COMMENTS MARK SCHEME

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Paper 3 (May / June 2016), Question 7

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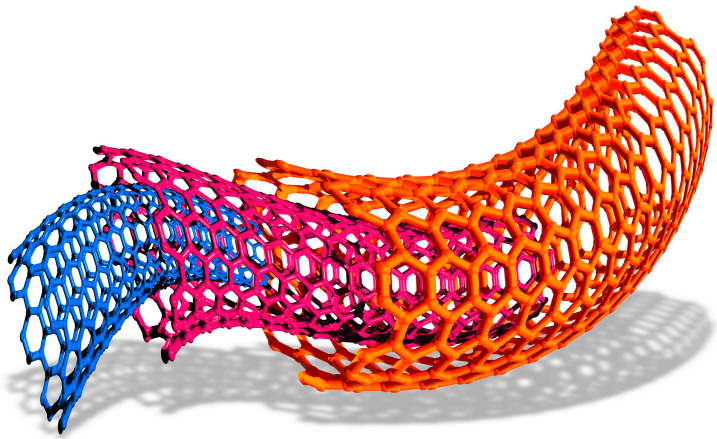
Chemistry 0620



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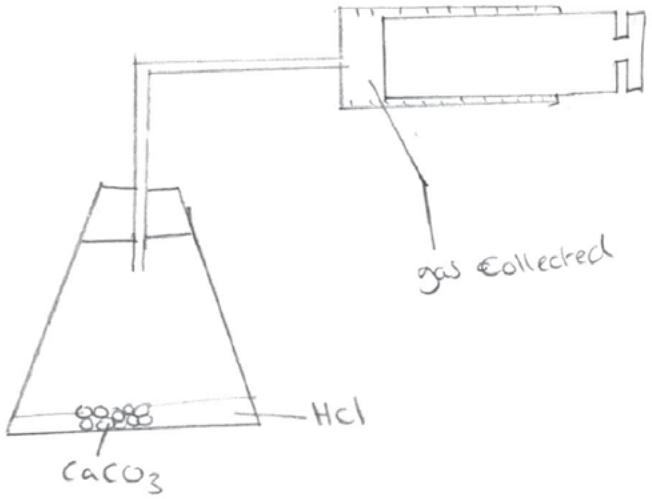
7 Calcium carbonate reacts with dilute hydrochloric acid.

$$CaCO_3(s) + 2HCl(aq) \rightarrow CaCl_2(aq) + CO_2(g) + H_2O(l)$$

A student investigated this reaction by measuring the volume of carbon dioxide released every minute at constant temperature.

(a) Draw a diagram of the apparatus that the student could use to investigate this reaction.



[2]

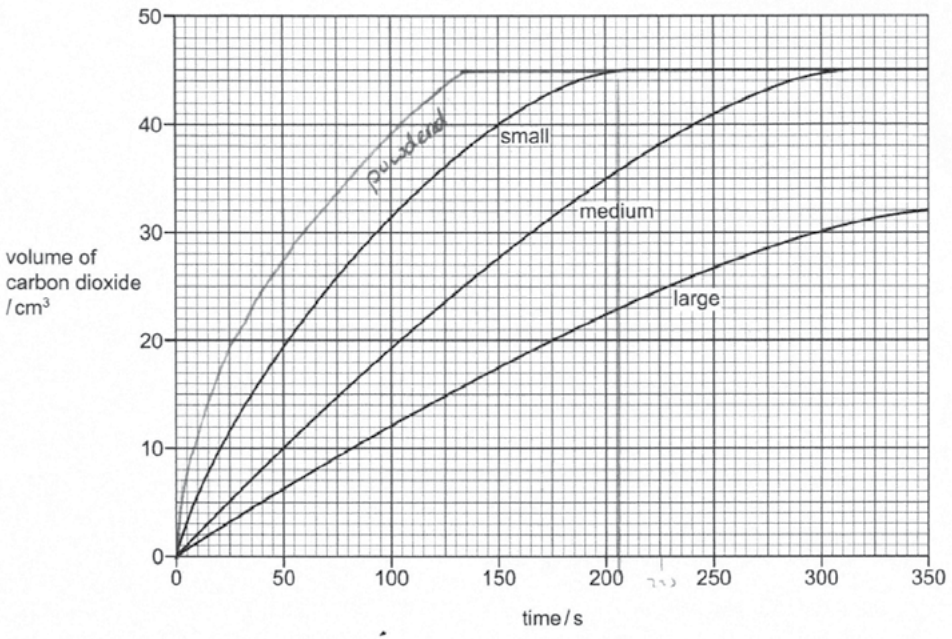
Select page

HIGH | MIDDLE | LOW

Your Mark	Examiner marks and comments	
	Mark	Comment
7(a)	2/2	This is a good diagram. Although the syringe is not labelled, it is clearly a gas syringe and has graduation marks.
7(b)(i)	1/2	There is no reference to the graph here, just a theoretical explanation
7(b)(ii)	2/2	The line is steeper and ends up at 45 cm^3.
7(b)(iii)	1/1	This is within the range allowed.
7(c)(i)	1/1	A suitable example is given here.
7(c)(ii)	0/2	Type of oxide not identified and no explanation given.

EXAMINER COMMENTS | MARK SCHEME

(b) The graph shows the results of this reaction using three samples of calcium carbonate of the same mass: large pieces, medium-sized pieces and small pieces.



(i) Which sample, large, medium or small pieces, gave the fastest initial rate of reaction?

Use the graph to explain your answer.

Small is the fastest then medium then large, ~~because~~ it is faster because it has a larger surface area. [2]

(ii) The experiment was repeated using powdered calcium carbonate of the same mass. Draw a line **on the grid above** to show how the volume of carbon dioxide changes with time for this experiment. [2]

(iii) At what time was the reaction just complete when small pieces of calcium carbonate were used?

~~220~~ 205 s [1]

Select page

HIGH | MIDDLE | LOW

Your Mark		Examiner marks and comments	
		Mark	Comment
7(a)		2/2	This is a good diagram. Although the syringe is not labelled, it is clearly a gas syringe and has graduation marks.
7(b)(i)		1/2	There is no reference to the graph here, just a theoretical explanation
7(b)(ii)		2/2	The line is steeper and ends up at 45 cm³.
7(b)(iii)		1/1	This is within the range allowed.
7(c)(i)		1/1	A suitable example is given here.
7(c)(ii)		0/2	Type of oxide not identified and no explanation given.

EXAMINER COMMENTS | MARK SCHEME

(c) When calcium carbonate is heated strongly, calcium oxide is formed.

(i) Give **one** use of calcium oxide.

making cement [1]

(ii) What type of oxide is calcium oxide?

Explain your answer.

Calcium oxide is lime, it is one type of oxide [2]

[Total: 10]

Select page

HIGH MIDDLE LOW

	Your Mark
7(a)	
7(b)(i)	
7(b)(ii)	
7(b)(iii)	
7(c)(i)	
7(c)(ii)	

Examiner marks and comments

Mark	Comment
2/2	This is a good diagram. Although the syringe is not labelled, it is clearly a gas syringe and has graduation marks.
1/2	There is no reference to the graph here, just a theoretical explanation
2/2	The line is steeper and ends up at 45 cm^3.
1/1	This is within the range allowed.
1/1	A suitable example is given here.
0/2	Type of oxide not identified and no explanation given.

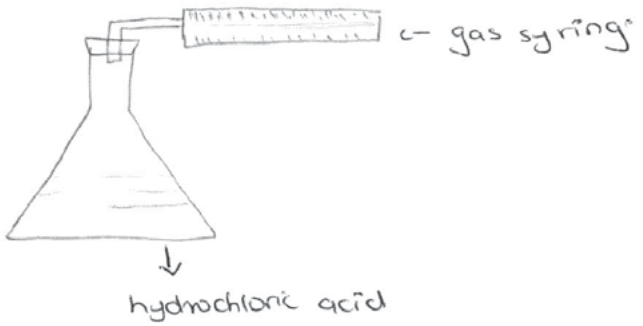
EXAMINER COMMENTS MARK SCHEME

7 Calcium carbonate reacts with dilute hydrochloric acid.

$$CaCO_3(s) + 2HCl(aq) \rightarrow CaCl_2(aq) + CO_2(g) + H_2O(l)$$

A student investigated this reaction by measuring the volume of carbon dioxide released every minute at constant temperature.

(a) Draw a diagram of the apparatus that the student could use to investigate this reaction.



[2]

Select page

HIGH | MIDDLE | LOW

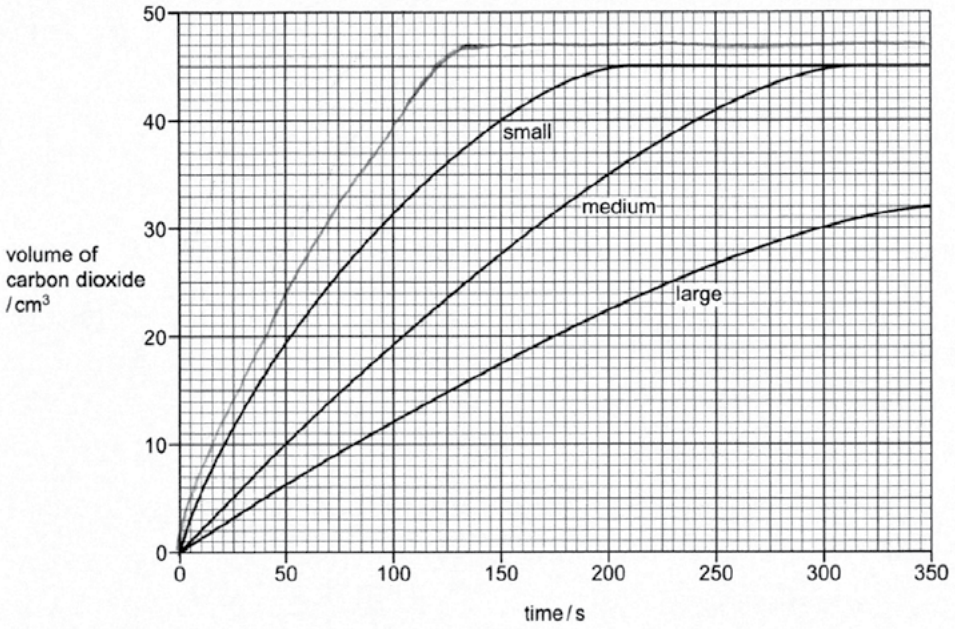
	Your Mark
7(a)	
7(b)(i)	
7(b)(ii)	
7(b)(iii)	
7(c)(i)	
7(c)(ii)	

Examiner marks and comments

Mark	Comment
2/2	The gas syringe is labelled and there are graduation marks. There are no gaps in the apparatus. Both marks were given although the drawing could have been improved by not showing the stopper cutting across the delivery tube.
1/2	The small pieces have been identified but the reason has not been explained well enough. The mark would have been given if an answer such as 'it becomes a constant volume before the others' had been written.
1/2	The line starts off steeper but the horizontal part of the line should be at the same value as the small and medium pieces because the same mass of calcium carbonate was used.
0/1	At 200 seconds the reaction has not quite finished.
0/1	A specific use is needed here, such as 'for neutralising acidic lakes'.
0/2	For the Core Paper, the type of oxide should be either *acidic* or *basic*.

EXAMINER COMMENTS | MARK SCHEME

(b) The graph shows the results of this reaction using three samples of calcium carbonate of the same mass: large pieces, medium-sized pieces and small pieces.



(i) Which sample, large, medium or small pieces, gave the fastest initial rate of reaction?

Use the graph to explain your answer.

Small

– because it becomes constant in 200s other than the others two [2]

(ii) The experiment was repeated using powdered calcium carbonate of the same mass. Draw a line **on the grid above** to show how the volume of carbon dioxide changes with time for this experiment. [2]

(iii) At what time was the reaction just complete when small pieces of calcium carbonate were used?

200 seconds [1]

	Your Mark
7(a)	
7(b)(i)	
7(b)(ii)	
7(b)(iii)	
7(c)(i)	
7(c)(ii)	

Examiner marks and comments

	Mark	Comment
7(a)	2/2	The gas syringe is labelled and there are graduation marks. There are no gaps in the apparatus. Both marks were given although the drawing could have been improved by not showing the stopper cutting across the delivery tube.
7(b)(i)	1/2	The small pieces have been identified but the reason has not been explained well enough. The mark would have been given if an answer such as 'it becomes a constant volume before the others' had been written.
7(b)(ii)	1/2	The line starts off steeper but the horizontal part of the line should be at the same value as the small and medium pieces because the same mass of calcium carbonate was used.
7(b)(iii)	0/1	At 200 seconds the reaction has not quite finished.
7(c)(i)	0/1	A specific use is needed here, such as 'for neutralising acidic lakes'.
7(c)(ii)	0/2	For the Core Paper, the type of oxide should be either *acidic* or *basic*.

(c) When calcium carbonate is heated strongly, calcium oxide is formed.

(i) Give **one** use of calcium oxide.

as an ore ..... [1]

(ii) What type of oxide is calcium oxide?

Explain your answer.

oxygen .....

..... [2]

[Total: 10]

Select page

HIGH | MIDDLE | LOW

	Your Mark
7(a)	
7(b)(i)	
7(b)(ii)	
7(b)(iii)	
7(c)(i)	
7(c)(ii)	

Examiner marks and comments

Mark	Comment
2/2	The gas syringe is labelled and there are graduation marks. There are no gaps in the apparatus. Both marks were given although the drawing could have been improved by not showing the stopper cutting across the delivery tube.
1/2	The small pieces have been identified but the reason has not been explained well enough. The mark would have been given if an answer such as 'it becomes a constant volume before the others' had been written.
1/2	The line starts off steeper but the horizontal part of the line should be at the same value as the small and medium pieces because the same mass of calcium carbonate was used.
0/1	At 200 seconds the reaction has not quite finished.
0/1	A specific use is needed here, such as 'for neutralising acidic lakes'.
0/2	For the Core Paper, the type of oxide should be either *acidic* or *basic*.

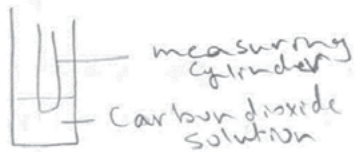
EXAMINER COMMENTS | MARK SCHEME

7 Calcium carbonate reacts with dilute hydrochloric acid.

$$CaCO_3(s) + 2HCl(aq) \rightarrow CaCl_2(aq) + CO_2(g) + H_2O(l)$$

A student investigated this reaction by measuring the volume of carbon dioxide released every minute at constant temperature.

(a) Draw a diagram of the apparatus that the student could use to investigate this reaction.



[2]

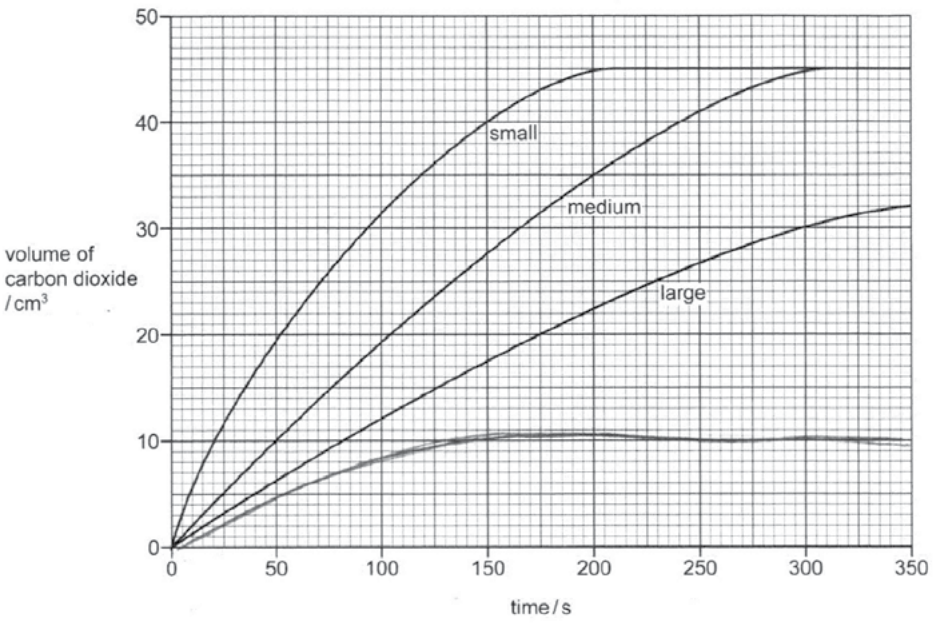
Select page

HIGH MIDDLE LOW

Your Mark	Examiner marks and comments	
	Mark	Comment
7(a)	0/2	A measuring cylinder has been suggested but there is no tube leading to a flask. The gas could escape from the beaker here.
7(b)(i)	1/2	The small pieces have been identified correctly but the gradient (slope) of the graph has not been used to explain this.
7(b)(ii)	0/2	Small pieces should react faster so the gradient (slope) should be steeper than the others and end up at 45 cm^3.
7(b)(iii)	0/1	The highest value of time on the graph has been used instead of the time when the horizontal line starts.
7(c)(i)	0/1	A use such as 'neutralising acidic lakes' is required here.
7(c)(ii)	0/2	For the Core Paper, the type of oxide should be either *acidic* or *basic*.

EXAMINER COMMENTS MARK SCHEME

(b) The graph shows the results of this reaction using three samples of calcium carbonate of the same mass: large pieces, medium-sized pieces and small pieces.



(i) Which sample, large, medium or small pieces, gave the fastest initial rate of reaction?

Use the graph to explain your answer.

small, because as volume i:

because if time increased the volume increased [2]

(ii) The experiment was repeated using powdered calcium carbonate of the same mass. Draw a line **on the grid above** to show how the volume of carbon dioxide changes with time for this experiment. [2]

(iii) At what time was the reaction just complete when small pieces of calcium carbonate were used?

350 /s [1]

Your Mark		Examiner marks and comments	
		Mark	**Comment**
7(a)		**0/2**	A measuring cylinder has been suggested but there is no tube leading to a flask. The gas could escape from the beaker here.
7(b)(i)		**1/2**	The small pieces have been identified correctly but the gradient (slope) of the graph has not been used to explain this.
7(b)(ii)		**0/2**	Small pieces should react faster so the gradient (slope) should be steeper than the others and end up at 45 cm^3.
7(b)(iii)		**0/1**	The highest value of time on the graph has been used instead of the time when the horizontal line starts.
7(c)(i)		**0/1**	A use such as 'neutralising acidic lakes' is required here.
7(c)(ii)		**0/2**	For the Core Paper, the type of oxide should be either *acidic* or *basic*.

(c) When calcium carbonate is heated strongly, calcium oxide is formed.

(i) Give **one** use of calcium oxide.

& Indactor [1]

(ii) What type of oxide is calcium oxide?

Explain your answer.

oxygen ~~[illegible]~~, because it form calcium oxide [2]

[Total: 10]

Select page

HIGH MIDDLE LOW

	Your Mark
7(a)	
7(b)(i)	
7(b)(ii)	
7(b)(iii)	
7(c)(i)	
7(c)(ii)	

Examiner marks and comments

	Mark	Comment
7(a)	0/2	A measuring cylinder has been suggested but there is no tube leading to a flask. The gas could escape from the beaker here.
7(b)(i)	1/2	The small pieces have been identified correctly but the gradient (slope) of the graph has not been used to explain this.
7(b)(ii)	0/2	Small pieces should react faster so the gradient (slope) should be steeper than the others and end up at 45 cm^3.
7(b)(iii)	0/1	The highest value of time on the graph has been used instead of the time when the horizontal line starts.
7(c)(i)	0/1	A use such as 'neutralising acidic lakes' is required here.
7(c)(ii)	0/2	For the Core Paper, the type of oxide should be either *acidic* or *basic*.

EXAMINER COMMENTS MARK SCHEME

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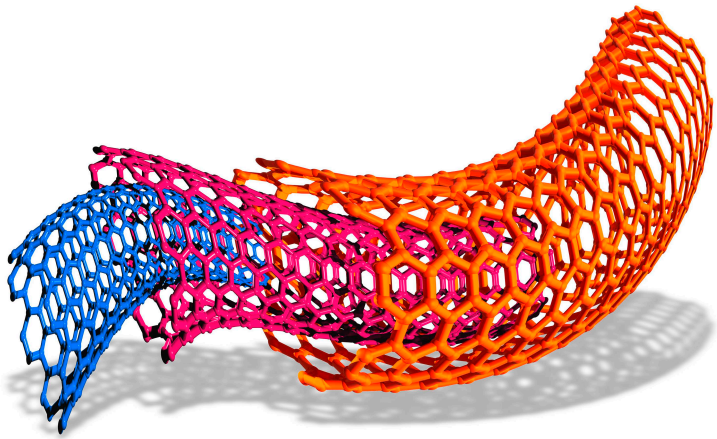
Paper 3 (May / June 2016), Question 8

Cambridge IGCSE™
Chemistry 0620



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Select page

HIGH | MIDDLE | LOW

8 A teacher passed hydrogen gas over hot copper(II) oxide.

$$CuO(s) + H_2(g) \rightarrow Cu(s) + H_2O(g)$$

(a) Which substance is reduced in this reaction?

Explain your answer.

CuO because is lost Oxygen.

[2]

Your Mark

8(a)

8(b)(i)

8(b)(ii)

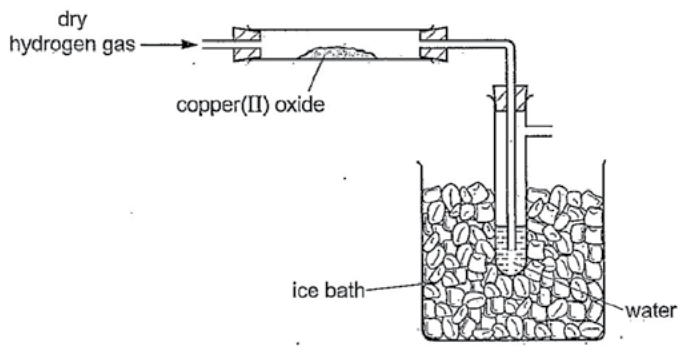
8(b)(iii)

Q8	Mark scheme
(a)	copper(II) oxide; loses oxygen;
(b)(i)	(mass of copper oxide in tube) decreases;
(b)(ii)	hydrogen is flammable/hydrogen is explosive;
(b)(iii)	anhydrous copper(II) sulfate goes blue/white copper(II) sulfate goes blue (1 mark for anhydrous copper(II) sulfate/white copper(II) sulfate) **OR** anhydrous cobalt(II) chloride goes pink/blue cobalt(II) chloride goes pink (1 mark for anhydrous cobalt(II) chloride/blue cobalt(II) chloride)

EXAMINER COMMENTS

MARK SCHEME

(b) The diagram shows the apparatus used.



The hydrogen was passed over the hot copper(II) oxide until the reaction was complete.

(i) As the experiment proceeds, suggest what happens to the mass of copper(II) oxide.

the mass of the copper (II) oxide will decrease [1]

(ii) Suggest why electrical heating is used in this experiment and **not** a Bunsen burner.

So that electrical heat is given because electrical heating gives heat evenly but a bunsen burner gives only one place. [1]

(iii) Describe the chemical test for the presence of water.

test anhydrous copper (II) sulphate

result white to blue [2]

[Total: 6]

Select page

HIGH | MIDDLE | LOW

Your Mark

8(a)

8(b)(i)

8(b)(ii)

8(b)(iii)

Q8	Mark scheme
(a)	copper(II) oxide; loses oxygen;
(b)(i)	(mass of copper oxide in tube) decreases;
(b)(ii)	<u>hydrogen</u> is flammable/<u>hydrogen</u> is explosive;
(b)(iii)	anhydrous copper(II) sulfate goes blue/white copper(II) sulfate goes blue (1 mark for anhydrous copper(II) sulfate/white copper(II) sulfate) **OR** anhydrous cobalt(II) chloride goes pink/blue cobalt(II) chloride goes pink (1 mark for anhydrous cobalt(II) chloride/blue cobalt(II) chloride)

EXAMINER COMMENTS

MARK SCHEME

8 A teacher passed hydrogen gas over hot copper(II) oxide.

$$CuO(s) + H_2(g) \rightarrow Cu(s) + H_2O(g)$$

(a) Which substance is reduced in this reaction?

Explain your answer.

The copper (II) is reduced because it has ~~lose~~ lost the oxygen to Hydrogen which makes Hydrogen ~~is~~ ~~reduces~~ oxidised [2]

Select page

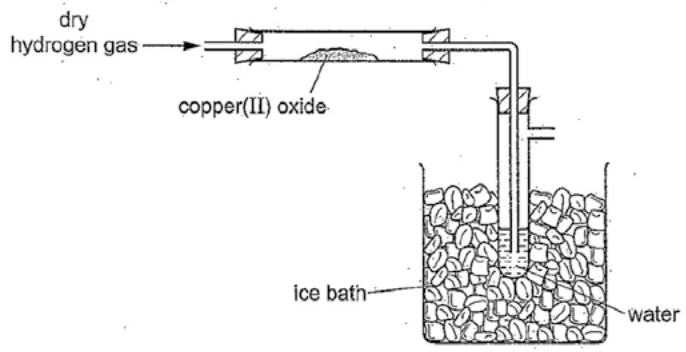
HIGH | MIDDLE | LOW

	Your Mark
8(a)	
8(b)(i)	
8(b)(ii)	
8(b)(iii)	

Q8	Mark scheme
(a)	copper(II) oxide; loses oxygen;
(b)(i)	(mass of copper oxide in tube) decreases;
(b)(ii)	hydrogen is flammable/hydrogen is explosive;
(b)(iii)	anhydrous copper(II) sulfate goes blue/white copper(II) sulfate goes blue (1 mark for anhydrous copper(II) sulfate/white copper(II) sulfate) **OR** anhydrous cobalt(II) chloride goes pink/blue cobalt(II) chloride goes pink (1 mark for anhydrous cobalt(II) chloride/blue cobalt(II) chloride)

EXAMINER COMMENTS | MARK SCHEME

(b) The diagram shows the apparatus used.



The hydrogen was passed over the hot copper(II) oxide until the reaction was complete.

(i) As the experiment proceeds, suggest what happens to the mass of copper(II) oxide.

its mass becomes less because it is losing ~~ex~~ being reduced. [1]

(ii) Suggest why electrical heating is used in this experiment and **not** a Bunsen burner.

because with electrical heating the temperature can be controlled were as ~~if~~ the temperature of a bunsen burner cant. [1]

(iii) Describe the chemical test for the presence of water.

test get copper (II) crystals and add a solution to it

result if the crystals become blue then water is present. [2]

[Total: 6]

Select page

HIGH | MIDDLE | LOW

Your Mark

8(a)

8(b)(i)

8(b)(ii)

8(b)(iii)

Q8	Mark scheme
(a)	copper(II) oxide; loses oxygen;
(b)(i)	(mass of copper oxide in tube) decreases;
(b)(ii)	hydrogen is flammable/hydrogen is explosive;
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EXAMINER COMMENTS | MARK SCHEME

Select page

HIGH | MIDDLE | LOW

8 A teacher passed hydrogen gas over hot copper(II) oxide.

$$CuO(s) + H_2(g) \rightarrow Cu(s) + H_2O(g)$$

(a) Which substance is reduced in this reaction?

Explain your answer.

water/ Hot Steam $H_2O(g)$ as the g means gas [2]

Your Mark

8(a) ☐

8(b)(i) ☐

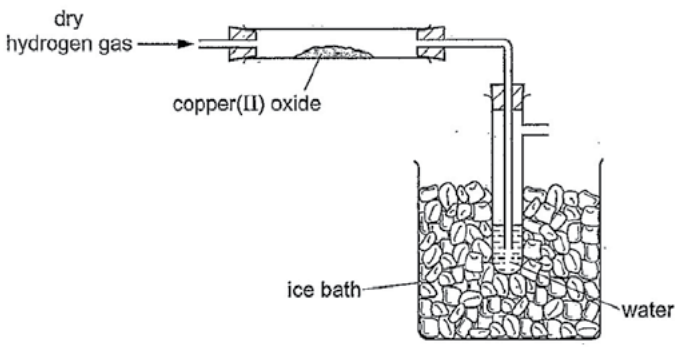
8(b)(ii) ☐

8(b)(iii) ☐

Q8	Mark scheme
(a)	copper(II) oxide; loses oxygen;
(b)(i)	(mass of copper oxide in tube) decreases;
(b)(ii)	hydrogen is flammable/hydrogen is explosive;
(b)(iii)	anhydrous copper(II) sulfate goes blue/white copper(II) sulfate goes blue (1 mark for anhydrous copper(II) sulfate/white copper(II) sulfate) **OR** anhydrous cobalt(II) chloride goes pink/blue cobalt(II) chloride goes pink (1 mark for anhydrous cobalt(II) chloride/blue cobalt(II) chloride)

EXAMINER COMMENTS | MARK SCHEME

(b) The diagram shows the apparatus used.



The hydrogen was passed over the hot copper(II) oxide until the reaction was complete.

(i) As the experiment proceeds, suggest what happens to the mass of copper(II) oxide.

decreases ..... [1]

(ii) Suggest why electrical heating is used in this experiment and **not** a Bunsen burner.

Yes electrical heating is more Accurate ..... [1]

(iii) Describe the chemical test for the presence of water.

test PH/Scale Universal indicator

result Should be green-ish ..... [2]

[Total: 6]

Select page

HIGH | MIDDLE | LOW

Your Mark

8(a) ☐

8(b)(i) ☐

8(b)(ii) ☐

8(b)(iii) ☐

Q8	Mark scheme
(a)	copper(II) oxide; loses oxygen;
(b)(i)	(mass of copper oxide in tube) decreases;
(b)(ii)	<u>hydrogen</u> is flammable/<u>hydrogen</u> is explosive;
(b)(iii)	anhydrous copper(II) sulfate goes blue/white copper(II) sulfate goes blue (1 mark for anhydrous copper(II) sulfate/white copper(II) sulfate) **OR** anhydrous cobalt(II) chloride goes pink/blue cobalt(II) chloride goes pink (1 mark for anhydrous cobalt(II) chloride/blue cobalt(II) chloride)

EXAMINER COMMENTS | MARK SCHEME

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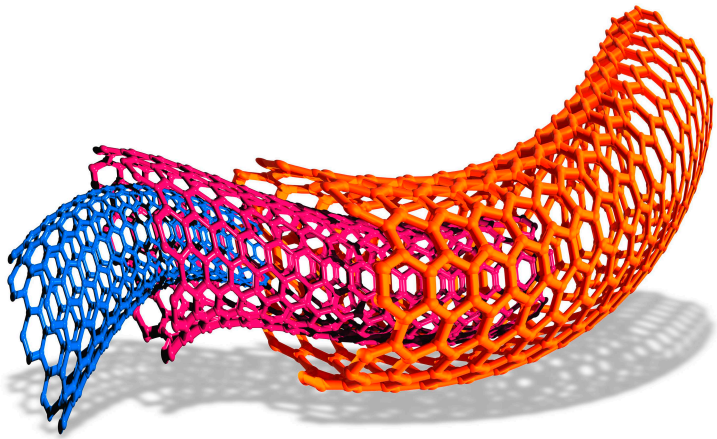
Paper 4 (May / June 2016), Question 1

Cambridge IGCSE™
Chemistry 0620



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Select page

HIGH | MIDDLE | LOW

1 Protons, neutrons and electrons are subatomic particles.

(a) Complete the table to show the relative mass and relative charge of a proton, a neutron and an electron.

particle	relative mass	relative charge
proton	1	+1
neutron	1	0
electron	$\frac{1}{1840}$	-1

[3]

(b) Bromine has two isotopes.

(i) Define the term *isotope*.

Isotopes are atoms with the same number of protons of the same element but different numbers of neutrons [2]

(ii) Explain why the two isotopes of bromine have the same chemical properties.

They have the same number of valency electrons so react the same [2]

(c) The table shows the number of protons, neutrons and electrons in some atoms and ions.

Complete the table.

particle	number of protons	number of neutrons	number of electrons
$^{7}_{3}Li$	3	4	3
$^{34}_{16}S^{2-}$	16	18	18
$^{41}_{19}F^{+}$	19	22	18

[5]

[Total: 12]

	Your Mark
1(a)	
1(b)(i)	
1(b)(ii)	
1(c)	

Examiner marks and comments

Mark	Comment
3/3	Correct.
2/2	Correct.
2/2	Correct.
4/5	An almost model response to this question, except for 'F' instead of 'K'.

EXAMINER COMMENTS | MARK SCHEME

Select page

HIGH | MIDDLE | LOW

1 Protons, neutrons and electrons are subatomic particles.

(a) Complete the table to show the relative mass and relative charge of a proton, a neutron and an electron.

particle	relative mass	relative charge
proton	1	positive
neutron	~~almost~~ 0	neutral
electron	$\frac{1}{1840}$	negative

[3]

(b) Bromine has two isotopes.

(i) Define the term *isotope*.

Isotopes are atoms of the same elements with same proton number but different number of neutrons [2]

(ii) Explain why the two isotopes of bromine have the same chemical properties.

Because they are of the same element, have same number of protons [2]

(c) The table shows the number of protons, neutrons and electrons in some atoms and ions.

Complete the table.

particle	number of protons	number of neutrons	number of electrons
$^{7}_{3}Li$	3	4	3
$^{34}_{16}S^{2-}$	16	18	18
$^{41}_{19}K^{+}$	19	22	18

[5]

$^{32}_{16}S$ $^{32}_{16}S^{2-}$ # nucleons = P + N -1

N = nucleon - P

[Total: 12]

Your Mark	Examiner marks and comments	
	Mark	Comment
1(a)	1/3	The candidate needed to realise that the relative charge needs a value, so +1 and –1 were needed, rather than 'positive' and 'negative' for *proton* and *electron*, respectively. Also the relative mass of a neutron is 1.
1(b)(i)	2/2	Correct.
1(b)(ii)	0/2	A correct explanation would have referred to isotopes of bromine having the same number of outer electrons.
1(c)	4/5	The mass number (41) is missing.

EXAMINER COMMENTS | MARK SCHEME

Select page

HIGH | MIDDLE | LOW

1 Protons, neutrons and electrons are subatomic particles.

(a) Complete the table to show the relative mass and relative charge of a proton, a neutron and an electron.

particle	relative mass	relative charge
proton	1226/1840	neutral
neutron	613/1840	+
electron	1/1840	−

[3]

(b) Bromine has two isotopes.

(i) Define the term *isotope*.

Different ~~conversions~~ ~~on~~ of the same element have different number of neutrons [2]

(ii) Explain why the two isotopes of bromine have the same chemical properties.

Because they are still the same element and they both have the same ~~same~~ number of protons and electrons [2]

(c) The table shows the number of protons, neutrons and electrons in some atoms and ions.

Complete the table.

particle	number of protons	number of neutrons	number of electrons
$^{7}_{3}Li$	3	4	~~3~~ 3
$^{34}_{16}S^{2-}$	16	~~16~~ 16	~~16~~ 16
$^{40}_{18}Ag^{+}$	19	22	18

[5]

[Total: 12]

	Your Mark
1(a)	
1(b)(i)	
1(b)(ii)	
1(c)	

Examiner marks and comments

Mark	Comment
0/3	The candidate needed to realise that the relative charge needs a value, so +1 and –1 were needed for *proton* and *electron*, respectively. They also needed to know that neutrons have no charge. The relative masses of a proton and a neutron are both 1.
1/2	The candidate gives a partial definition of isotope. They should have stated that isotopes are 'atoms of the same element' here.
1/2	The candidate should have explained that isotopes have the same chemical properties because they have the same number of outer electrons.
2/5	Row 1 is correct. The figures in row 2 should be *18* neutrons and *18* electrons. In row 3 the species required is a positive ion of potassium (K) with a mass number of 41 and an atomic number of 19.

EXAMINER COMMENTS | MARK SCHEME

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Paper 4 (May / June 2016), Question 2

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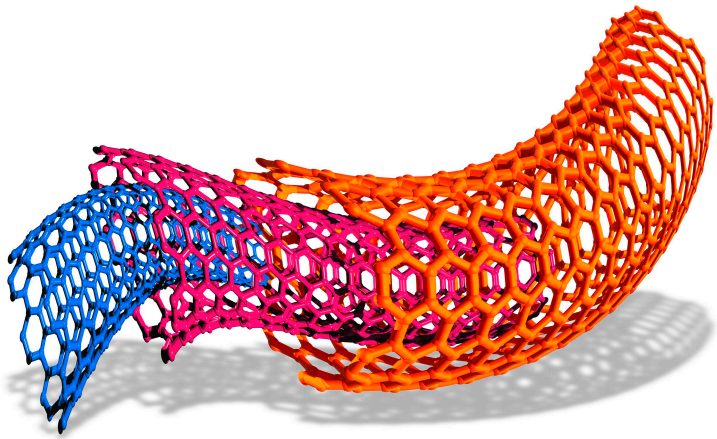
Chemistry 0620



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Select page

HIGH | MIDDLE | LOW

2 Period 3 contains the elements sodium to argon. This question asks about the chemistry of each of the Period 3 elements or their compounds.

(a) Sodium nitrate is a white crystalline solid. When heated it melts and the following reaction occurs.

$$2NaNO_3(l) \rightarrow 2NaNO_2(l) + O_2(g)$$

A 3.40 g sample of sodium nitrate is heated.

Calculate the

- number of moles of $NaNO_3$ used,

1 mol : 85g
n : 3.40
$= \frac{3.40}{85} = 0.04$ mols

0.04 mol

- number of moles of O_2 formed,

2 : 1
0.04 : n
$n = \frac{0.04}{2} = 0.02$

0.02 mol

- volume of O_2 formed, in dm^3 (measured at r.t.p.).

1 : 24
0.02 : n
$n = 24 \times 0.04 = 0.48$

0.48 dm^3 [3]

(b) Magnesium reacts slowly with warm water to form a base, magnesium hydroxide.

(i) Explain what is meant by the term *base*.

A compound that can react with an acid to give salt [1]

(ii) Write a chemical equation for the reaction between magnesium and warm water.

$Mg + 2H_2O \rightarrow Mg(OH)_2 + H_2$ [2]

	Your Mark	Examiner marks and comments	
		Mark	Comment
2(a)		3/3	Correct.
2(b)(i)		0/1	The answer needed to include the idea of a proton acceptor.
2(b)(ii)		2/2	Correct.
2(c)		2/3	The candidate mentions reacting aluminium with named acids and bases but does not describe the dissolving of aluminium oxide in acids.
2(d)(i)		1/1	Correct.
2(d)(ii)		2/2	Correct.
2(e)(i)		1/2	The answer scores one mark for giving the oppositely charged ions involved but does not state that these particles attract one another.
2(e)(ii)		1/1	Correct.

EXAMINER COMMENTS | MARK SCHEME

(c) Aluminium oxide is amphoteric. It is insoluble in water.

$Al_2O_3 + HCl$

Describe experiments to show that aluminium oxide is amphoteric.

Add aluminium oxide to a few drops of aqueous sodium hydroxide, a white precipitate will form; add excess sodium hydroxide, solution will be dissolve to give a colorless solution. Aluminium oxide will react with an acid like HCl to form a salt, acting as base. It will redissolve in excess sodium hydroxide solution to form a colourless solution by forming salt of Sodium Alumminate while acting as a acid. [3]

(d) Silicon(IV) oxide has a giant structure.

(i) Name the type of bonding in silicon(IV) oxide.

Covalent [1]

(ii) Give two **physical** properties of silicon(IV) oxide.

High melting and boiling point

Insoluble in water. [2]

(e) Calcium phosphate is used in fertilisers. The bonding in calcium phosphate is ionic. Calcium phosphate contains the phosphate ion, PO_4^{3-}.

(i) What is ionic bonding?

Bonding between a cation and anion through complete transfer of electrons. Electrostatic forces hold the bonds. [2]

(ii) Deduce the formula of calcium phosphate.

$Ca_3(PO_4)_2$ [1]

Select page

HIGH MIDDLE LOW

	Your Mark
2(a)	
2(b)(i)	
2(b)(ii)	
2(c)	
2(d)(i)	
2(d)(ii)	
2(e)(i)	
2(e)(ii)	

Examiner marks and comments

Mark	Comment
3/3	Correct.
0/1	The answer needed to include the idea of a proton acceptor.
2/2	Correct.
2/3	The candidate mentions reacting aluminium with named acids and bases but does not describe the dissolving of aluminium oxide in acids.
1/1	Correct.
2/2	Correct.
1/2	The answer scores one mark for giving the oppositely charged ions involved but does not state that these particles attract one another.
1/1	Correct.

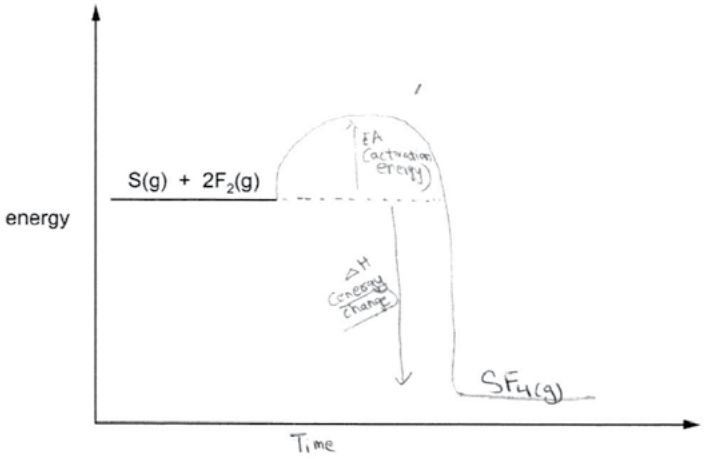
EXAMINER COMMENTS MARK SCHEME

(f) Sulfur tetrafluoride, SF_4, can be made by combining gaseous sulfur with fluorine.

$$S(g) + 2F_2(g) \rightarrow SF_4(g)$$

The reaction is exothermic.

(i) Complete the energy level diagram for this reaction. Include an arrow which clearly shows the energy change during the reaction.

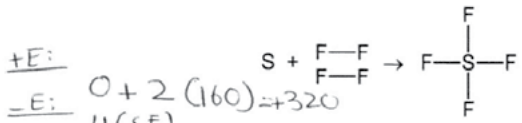


[3]

(ii) During the reaction the amount of energy given out is -780 kJ/mol.

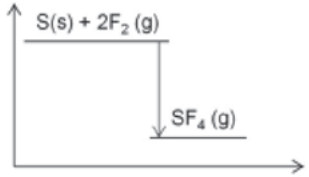
The F–F bond energy is 160 kJ/mol.

Use this information to determine the bond energy, in kJ/mol, of one S–F bond in SF_4.



275 kJ/mol [3]

	Your Mark
2(f)(i)	
2(f)(ii)	
2(g)(i)	
2(g)(ii)	
2(h)(i)	
2(h)(ii)	

Q2	Mark scheme
(f)(i)	 **M1** *exothermic mark*: horizontal product energy line at lower energy than that of reactant energy line; **M2** *label of product mark*: SF_4; **M3** *correct direction of vertical heat arrow*: arrow must start level with reactant energy and finish level with product energy **and** must have only **one** (correct) arrow-head.
(f)(ii)	**M1** *bond energy of* $2F_2$: 2 × F–F = 2 × 160 = 320 (kJ/mol) **M2** *bond energy of all bonds in* SF_4: 780 + 320 = 1100 (kJ/mol) **M3** *calculated bond energy of* SF_4 *divided by 4*: 1100/4 = 275 (kJ/mol)
(g)(i)	kills bacteria;
(g)(ii)	name of compound: cobalt(II) chloride; from: blue; to: pink;
(h)(i)	it has a complete outer shell/a full outer shell/8 electrons in the outer shell;
(h)(ii)	(in) lamps;

(g) Chlorine and compounds of chlorine are important in water treatment and in laboratory testing for water.

(i) Chlorine is added to water to make the water safe to drink.

Explain why adding chlorine makes water safe to drink.

It kills bacteria in water. [1]

(ii) A compound of chlorine is used in the laboratory to test for the presence of water.

Name the compound of chlorine used in this test and describe the colour change seen in a positive result of this test.

name of compound Cobalt chloride

colour change from blue to pink

[3]

(h) Argon is an unreactive noble gas.

(i) Explain why argon is unreactive.

It outer shells are complete with electrons. [1]

(ii) Give **one** use of argon.

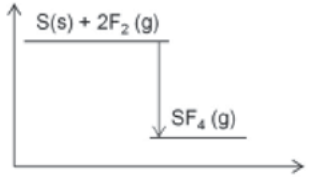
Filled in filament lamps [1]

[Total: 27]

Select page

HIGH MIDDLE LOW

	Your Mark
2(f)(i)	
2(f)(ii)	
2(g)(i)	
2(g)(ii)	
2(h)(i)	
2(h)(ii)	

Q2	Mark scheme
(f)(i)	 **M1** *exothermic mark*: horizontal product energy line at lower energy than that of reactant energy line; **M2** *label of product mark*: SF_4; **M3** *correct direction of vertical heat arrow*: arrow must start level with reactant energy and finish level with product energy **and** must have only **one** (correct) arrow-head.
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(h)(ii)	(in) lamps;

EXAMINER COMMENTS

MARK SCHEME

Select page

HIGH | MIDDLE | LOW

2 Period 3 contains the elements sodium to argon. This question asks about the chemistry of each of the Period 3 elements or their compounds.

(a) Sodium nitrate is a white crystalline solid. When heated it melts and the following reaction occurs.

$$2NaNO_3(l) \rightarrow 2NaNO_2(l) + O_2(g)$$

A 3.40 g sample of sodium nitrate is heated.

Calculate the

- number of moles of $NaNO_3$ used,

$\frac{3.4}{85} \neq \frac{0.04}{2}$ ~~x2~~.

0.042 mol

- number of moles of O_2 formed,

0.02 ÷ 2.

0.01 mol

- volume of O_2 formed, in dm^3 (measured at r.t.p.).

1 mole = 24

0.01 = x.

0.24 dm^3

[3]

(b) Magnesium reacts slowly with warm water to form a base, magnesium hydroxide.

(i) Explain what is meant by the term *base*.

Proton acceptor. Has OH^- ions. [1]

(ii) Write a chemical equation for the reaction between magnesium and warm water.

$2Mg + 2H_2O \rightarrow 2Mg(OH)_2$ [2]

~~Mg + H2O → MgOH2~~.

	Your Mark
2(a)	
2(b)(i)	
2(b)(ii)	
2(c)	
2(d)(i)	
2(d)(ii)	
2(e)(i)	
2(e)(ii)	

Q2	Mark scheme
(a)	number of moles of $NaNO_3$ used: 3.40/85 = 0.04(00) (mol) **OR** 4.(00) × 10^{-2} (mol); number of moles of O_2 formed: 0.04/2 = 0.02(00) (mol) **OR** 2.(00) × 10^{-2} (mol); volume of O_2 formed: 0.02 × 24 = 0.48 (dm^3);
(b)(i)	(a substance which is) a proton/H+/hydrogen ion acceptor;
(b)(ii)	$Mg(s) + 2H2O(l) \rightarrow Mg(OH)_2(aq) + H_2(g)$ $Mg(OH)_2$; rest of equation;
(c)	**M1** add a named acid, e.g. HCl and a named alkali, e.g. NaOH; **M2** Al_2O_3 will react with/neutralise both reagents; **M3** and so it will dissolve into the reagent/form a solution;
(d)(i)	covalent;
(d)(ii)	any 2 from: high melting point/high boiling point; poor conductor (of electricity); hard; insoluble;
(e)(i)	**M1** (electrostatic) attraction; **M2** between oppositely charged ions;
(e)(ii)	$Ca_3(PO_4)_2$;

EXAMINER COMMENTS

MARK SCHEME

Select page

HIGH | MIDDLE | LOW

(c) Aluminium oxide is amphoteric. It is insoluble in water.

Describe experiments to show that aluminium oxide is amphoteric.

React aluminum oxide with an acid. You will get an aluminum salt and water. React aluminum oxide and base you will get water and salt. [3]

Eg: $Al_2O_3 + H_2SO_4 \rightarrow Al(SO_4)_3 + H_2O$.

② $Al_2O_3 + NO_3 \rightarrow Al(NO_3)_3 + H_2O$

(d) Silicon(IV) oxide has a giant structure.

(i) Name the type of bonding in silicon(IV) oxide.

Covalent bonding [1]

(ii) Give two **physical** properties of silicon(IV) oxide.

Very hard. and high density. [2]

(e) Calcium phosphate is used in fertilisers. The bonding in calcium phosphate is ionic. Calcium phosphate contains the phosphate ion, PO_4^{3-}.

(i) What is ionic bonding?

Bonding between a metal and non-metal. Cation bonded to anion. [2]

(ii) Deduce the formula of calcium phosphate.

$Ca_3(PO_4)_2$ [1]

	Your Mark
2(a)	
2(b)(i)	
2(b)(ii)	
2(c)	
2(d)(i)	
2(d)(ii)	
2(e)(i)	
2(e)(ii)	

Q2	Mark scheme
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(d)(i)	covalent;
(d)(ii)	any 2 from: high melting point/high boiling point; poor conductor (of electricity); hard; insoluble;
(e)(i)	**M1** (electrostatic) attraction; **M2** between oppositely charged ions;
(e)(ii)	$Ca_3(PO_4)_2$;

EXAMINER COMMENTS

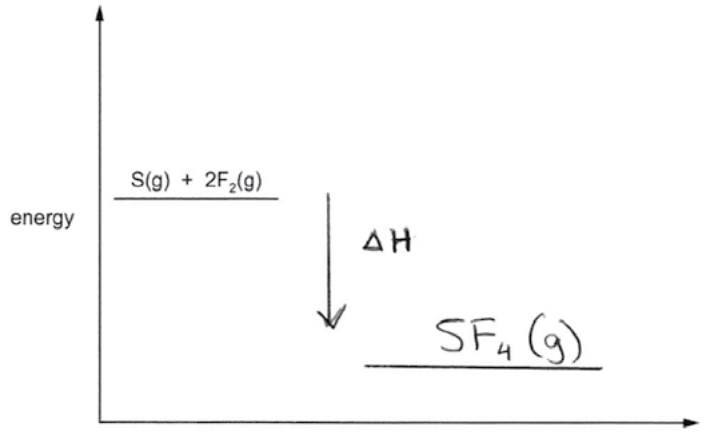
MARK SCHEME

(f) Sulfur tetrafluoride, SF_4, can be made by combining gaseous sulfur with fluorine.

$$S(g) + 2F_2(g) \rightarrow SF_4(g)$$

The reaction is exothermic.

(i) Complete the energy level diagram for this reaction. Include an arrow which clearly shows the energy change during the reaction.

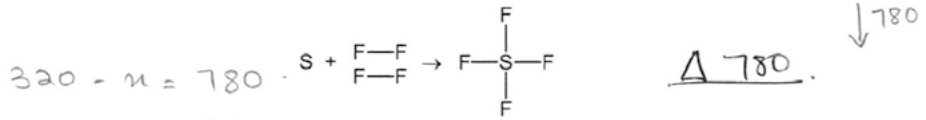


[3]

(ii) During the reaction the amount of energy given out is 780 kJ/mol.

The F–F bond energy is 160 kJ/mol.

Use this information to determine the bond energy, in kJ/mol, of one S–F bond in SF_4.



F-F x 2 = 320.

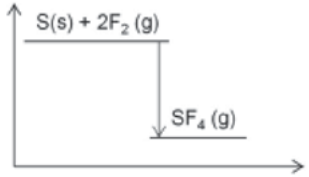
$\frac{-460}{4} = -115$

320 − x = 780

x = −460

-115 kJ/mol [3]

	Your Mark
2(f)(i)	
2(f)(ii)	
2(g)(i)	
2(g)(ii)	
2(h)(i)	
2(h)(ii)	

Q2	Mark scheme
(f)(i)	 **M1** *exothermic mark*: horizontal product energy line at lower energy than that of reactant energy line; **M2** *label of product mark*: SF_4; **M3** *correct direction of vertical heat arrow*: arrow must start level with reactant energy and finish level with product energy **and** must have only **one** (correct) arrow-head.
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(h)(i)	it has a complete outer shell/a full outer shell/8 electrons in the outer shell;
(h)(ii)	(in) lamps;

EXAMINER COMMENTS

MARK SCHEME

(g) Chlorine and compounds of chlorine are important in water treatment and in laboratory testing for water.

(i) Chlorine is added to water to make the water safe to drink.

Explain why adding chlorine makes water safe to drink.

To kill microbes and bacteria. [1]

(ii) A compound of chlorine is used in the laboratory to test for the presence of water.

Name the compound of chlorine used in this test and describe the colour change seen in a positive result of this test.

name of compound Ea' Cobalt (II) chloride

colour change from blue to pink. [3]

(h) Argon is an unreactive noble gas.

(i) Explain why argon is unreactive.

Has a complete outter electron shell. (8 electrons). [1]

(ii) Give **one** use of argon.

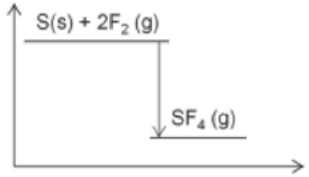
Used in tungsten light bulbs. [1]

[Total: 27]

Select page

HIGH | MIDDLE | LOW

	Your Mark
2(f)(i)	
2(f)(ii)	
2(g)(i)	
2(g)(ii)	
2(h)(i)	
2(h)(ii)	

Q2	Mark scheme
(f)(i)	 **M1** *exothermic mark*: horizontal product energy line at lower energy than that of reactant energy line; **M2** *label of product mark*: SF_4; **M3** *correct direction of vertical heat arrow*: arrow must start level with reactant energy and finish level with product energy **and** must have only **one** (correct) arrow-head.
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EXAMINER COMMENTS | MARK SCHEME

Select page

HIGH | MIDDLE | LOW

2 Period 3 contains the elements sodium to argon. This question asks about the chemistry of each of the Period 3 elements or their compounds.

(a) Sodium nitrate is a white crystalline solid. When heated it melts and the following reaction occurs..

$$2NaNO_3(l) \rightarrow 2NaNO_2(l) + O_2(g)$$

A 3.40 g sample of sodium nitrate is heated.

Calculate the

- number of moles of $NaNO_3$ used,

10 mol

- number of moles of O_2 formed,

6 Ab mol

- volume of O_2 formed, in dm^3 (measured at r.t.p.).

48 dm^3 [3]

(b) Magnesium reacts slowly with warm water to form a base, magnesium hydroxide.

(i) Explain what is meant by the term *base*.

It doesn't react [1]

(ii) Write a chemical equation for the reaction between magnesium and warm water.

$2Mg + 2H_2O \rightarrow 2MgH_2O$ [2]

Your Mark

2(a)

2(b)(i)

2(b)(ii)

2(c)

2(d)(i)

2(d)(ii)

2(e)(i)

2(e)(ii)

Q2	Mark scheme
(a)	number of moles of $NaNO_3$ used: 3.40/85 = 0.04(00) (mol) **OR** 4.(00) × 10^{-2} (mol); number of moles of O_2 formed: 0.04/2 = 0.02(00) (mol) **OR** 2.(00) × 10^{-2} (mol); volume of O_2 formed: 0.02 × 24 = 0.48 (dm^3);
(b)(i)	(a substance which is) a proton/H+/hydrogen ion acceptor;
(b)(ii)	$Mg(s) + 2H2O(l) \rightarrow Mg(OH)_2(aq) + H_2(g)$ $Mg(OH)_2$; rest of equation;
(c)	**M1** add a named acid, e.g. HCl and a named alkali, e.g. NaOH; **M2** Al_2O_3 will react with/neutralise both reagents; **M3** and so it will dissolve into the reagent/form a solution;
(d)(i)	covalent;
(d)(ii)	any 2 from: high melting point/high boiling point; poor conductor (of electricity); hard; insoluble;
(e)(i)	**M1** (electrostatic) attraction; **M2** between oppositely charged ions;
(e)(ii)	$Ca_3(PO_4)_2$;

EXAMINER COMMENTS

MARK SCHEME

(c) Aluminium oxide is amphoteric. It is insoluble in water.

Describe experiments to show that aluminium oxide is amphoteric.

-try to dissolve it in water

[3]

(d) Silicon(IV) oxide has a giant structure.

(i) Name the type of bonding in silicon(IV) oxide.

covalent ionic [1]

(ii) Give two **physical** properties of silicon(IV) oxide.

-shiny

-malubal [2]

(e) Calcium phosphate is used in fertilisers. The bonding in calcium phosphate is ionic. Calcium phosphate contains the phosphate ion, PO_4^{3-}.

(i) What is ionic bonding?

When two ionic compounds bond

[2]

(ii) Deduce the formula of calcium phosphate.

$2Ca_3PO_4^{-3}$ [1]

Select page

HIGH MIDDLE LOW

	Your Mark
2(a)	
2(b)(i)	
2(b)(ii)	
2(c)	
2(d)(i)	
2(d)(ii)	
2(e)(i)	
2(e)(ii)	

Q2	Mark scheme
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EXAMINER COMMENTS

MARK SCHEME

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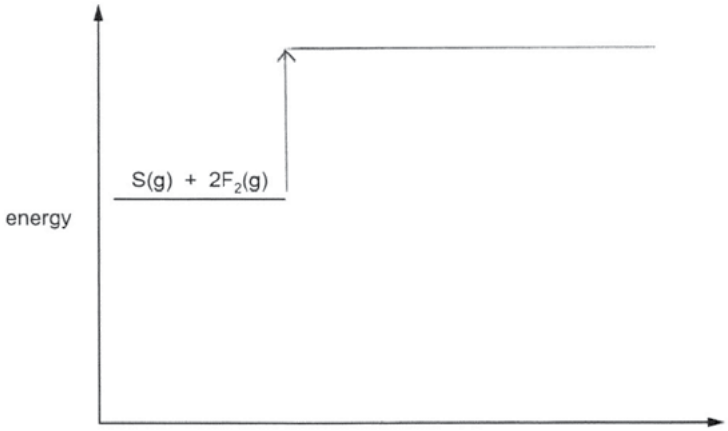
$$S(g) + 2F_2(g) \rightarrow SF_4(g)$$

The reaction is exothermic.

(i) Complete the energy level diagram for this reaction. Include an arrow which clearly shows the energy change during the reaction.

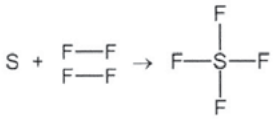


[3]

(ii) During the reaction the amount of energy given out is 780 kJ/mol.

The F–F bond energy is 160 kJ/mol.

Use this information to determine the bond energy, in kJ/mol, of one S–F bond in SF_4.

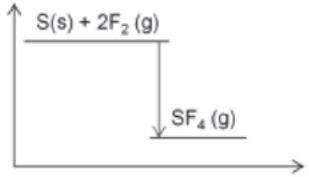


780 - 160 - 160 = 460

460 ÷ 4 = 115

~~195~~ 115 kJ/mol [3]

Your Mark	
2(f)(i)	
2(f)(ii)	
2(g)(i)	
2(g)(ii)	
2(h)(i)	
2(h)(ii)	

Q2	Mark scheme
(f)(i)	 **M1** *exothermic mark*: horizontal product energy line at lower energy than that of reactant energy line; **M2** *label of product mark*: SF_4; **M3** *correct direction of vertical heat arrow*: arrow must start level with reactant energy and finish level with product energy **and** must have only **one** (correct) arrow-head.
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(g)(ii)	name of compound: cobalt(II) chloride; from: blue; to: pink;
(h)(i)	it has a complete outer shell/a full outer shell/8 electrons in the outer shell;
(h)(ii)	(in) lamps;

(g) Chlorine and compounds of chlorine are important in water treatment and in laboratory testing for water.

(i) Chlorine is added to water to make the water safe to drink.

Explain why adding chlorine makes water safe to drink.

It kills germs ..... [1]

(ii) A compound of chlorine is used in the laboratory to test for the presence of water.

Name the compound of chlorine used in this test and describe the colour change seen in a positive result of this test.

name of compound ..... Cl_2 .....

colour change from ..... Green ..... to ..... colourless .....

[3]

(h) Argon is an unreactive noble gas.

(i) Explain why argon is unreactive.

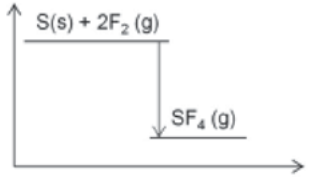
because it has a complete outer shell ..... [1]

(ii) Give **one** use of argon.

used it lights ..... [1]

[Total: 27]

	Your Mark
2(f)(i)	
2(f)(ii)	
2(g)(i)	
2(g)(ii)	
2(h)(i)	
2(h)(ii)	

Q2	Mark scheme
(f)(i)	 **M1** *exothermic mark*: horizontal product energy line at lower energy than that of reactant energy line; **M2** *label of product mark*: SF_4; **M3** *correct direction of vertical heat arrow*: arrow must start level with reactant energy and finish level with product energy **and** must have only **one** (correct) arrow-head.
(f)(ii)	**M1** *bond energy of* $2F_2$: $2 \times F–F = 2 \times 160 = 320$ (kJ/mol) **M2** *bond energy of all bonds in* SF_4: 780 + 320 = 1100 (kJ/mol) **M3** *calculated bond energy of* SF_4 *divided by 4*: 1100/4 = 275 (kJ/mol)
(g)(i)	kills bacteria;
(g)(ii)	name of compound: cobalt(II) chloride; from: blue; to: pink;
(h)(i)	it has a complete outer shell/a full outer shell/8 electrons in the outer shell;
(h)(ii)	(in) lamps;

EXAMINER COMMENTS

MARK SCHEME

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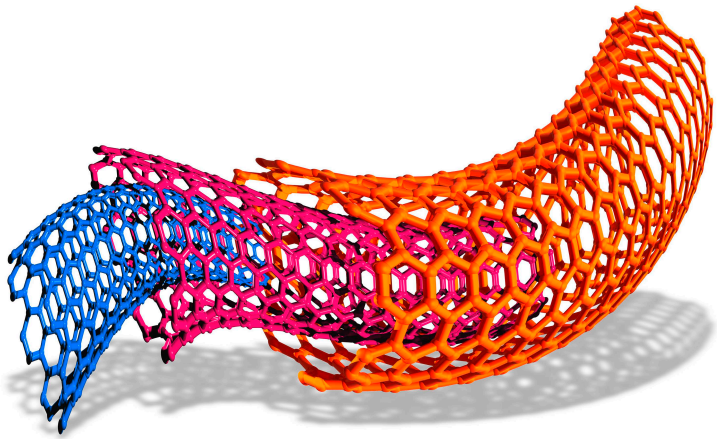
Interactive Example Candidate Responses

Paper 4 (May / June 2016), Question 3

Cambridge IGCSE™
Chemistry 0620



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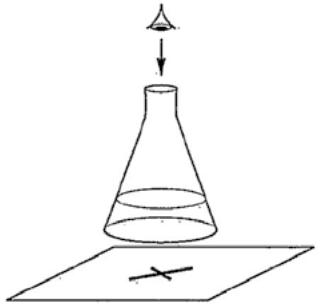
3 When aqueous sodium thiosulfate and dilute hydrochloric acid are mixed, a precipitate of insoluble sulfur is produced. This makes the mixture difficult to see through.

$$Na_2S_2O_3(aq) + 2HCl(aq) \rightarrow S(s) + 2NaCl(aq) + H_2O(l) + SO_2(g)$$

The time taken for the cross to disappear from view is measured.



A student adds the following volumes of aqueous sodium thiosulfate, dilute hydrochloric acid and distilled water to the conical flask.

The time taken for the formation of the precipitate of sulfur to make the cross disappear from view is recorded.

experiment number	volume of sodium thiosulfate /cm³	volume of hydrochloric acid /cm³	volume of distilled water /cm³	time taken for cross to disappear from view/s
1	10	10	40	56
2	20	10	30	28
3	20	10	15	14

(a) State the order in which the aqueous sodium thiosulfate, hydrochloric acid and distilled water should be added to the flask.

~~Volume of~~ distilled water then ~~hydrochloric acid~~ sodium thiosulfate then ~~sodium thiosulfate~~ hydrochloric acid. [1]

	Your Mark
3(a)	
3(b)(i)	
3(b)(ii)	
3(c)	

Examiner marks and comments

	Mark	Comment
3(a)	1/1	Correct.
3(b)(i)	1/2	The candidate shows that doubling the concentration would halve the time, but has failed to see the relevance of keeping the total volume constant.
3(b)(ii)	2/2	Correct. Both points are adequately explained.
3(c)	2/3	The first two points gain marks, but the candidate needed to state that as the increased temperature caused a higher proportion of collisions to reach activation energy.

(b) In experiment 3 the student wanted the sodium thiosulfate to be double the concentration used in experiment 2.

(i) Complete the table to show the **volumes** which should be used and the **expected** time taken for the cross to disappear from view in experiment 3. [2]

(ii) Use collision theory to explain why increasing the concentration of sodium thiosulfate would change the rate of reaction.

Increasing the concentration would mean more particles on sodium thiosulfate in that particular volume to react with HCl. There will be more frequent collisions between sodium thiosulfate and HCl and thus rate of reaction would speed up. [2]

(c) The student repeated experiment 1 at a higher temperature.

Use collision theory to explain why the rate of reaction would increase.

At higher temperature, particles gain more kinetic energy and move more faster. There would be more frequent collisions between reactants due to speed and reactants will collide with greater energy. [3]

[Total: 8]

Select page

HIGH | MIDDLE | LOW

Your Mark	Examiner marks and comments	
	Mark	Comment
3(a)	1/1	Correct.
3(b)(i)	1/2	The candidate shows that doubling the concentration would halve the time, but has failed to see the relevance of keeping the total volume constant.
3(b)(ii)	2/2	Correct. Both points are adequately explained.
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EXAMINER COMMENTS | MARK SCHEME

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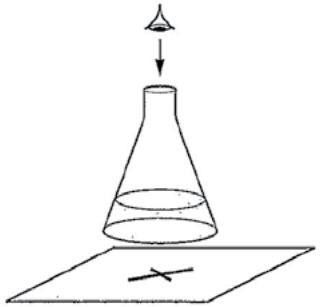

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1	10	10	40	56
2	20	10	30	28
3	40	10	10	14

(a) State the order in which the aqueous sodium thiosulfate, hydrochloric acid and distilled water should be added to the flask.

The sodium thiosulfate and water should be added first, followed by the hydrochloric acid [1]

Select page

HIGH | MIDDLE | LOW

	Your Mark
3(a)	
3(b)(i)	
3(b)(ii)	
3(c)	

Examiner marks and comments

	Mark	Comment
3(a)	1/1	Correct.
3(b)(i)	2/2	Correct.
3(b)(ii)	0/2	The candidate does not refer to the fact that increased concentration results in more particles per unit volume or to the fact that this brings about an increased collision rate between particles.
3(c)	2/3	The candidate gains the first two marks here, but does not explain that a higher proportion of collisions would be above activation energy.

EXAMINER COMMENTS | MARK SCHEME

(b) In experiment 3 the student wanted the sodium thiosulfate to be double the concentration used in experiment 2.

(i) Complete the table to show the **volumes** which should be used and the **expected** time taken for the cross to disappear from view in experiment 3. [2]

(ii) Use collision theory to explain why increasing the concentration of sodium thiosulfate would change the rate of reaction.

When the concentration increases the ~~rate increases because~~ there would be more particles to collide so the reaction would occur faster so the rate would increase [2]

(c) The student repeated experiment 1 at a higher temperature.

Use collision theory to explain why the rate of reaction would increase.

The particles would gain energy when the temperature increases causing them to move faster and collide more frequently and ~~#~~ there would be more successful collisions because more activation energy [3]

[Total: 8]

Select page

HIGH | MIDDLE | LOW

Your Mark		Examiner marks and comments	
		Mark	Comment
3(a)		1/1	Correct.
3(b)(i)		2/2	Correct.
3(b)(ii)		0/2	The candidate does not refer to the fact that increased concentration results in more particles per unit volume or to the fact that this brings about an increased collision rate between particles.
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EXAMINER COMMENTS | MARK SCHEME

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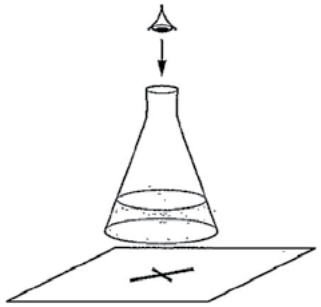

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2	20	10	30	28
3	40	10	30	14

(a) State the order in which the aqueous sodium thiosulfate, hydrochloric acid and distilled water should be added to the flask.

first distilled water, then hydrochloric acid and then sodium thiosulfate. [1]

Select page

HIGH MIDDLE LOW

Your Mark	Examiner marks and comments	
	Mark	Comment
3(a)	1/1	Correct.
3(b)(i)	1/2	The candidate shows that doubling the concentration would halve the time but has failed to see the relevance of keeping the total volume constant.
3(b)(ii)	0/2	The candidate does not refer to the fact that the increased concentration results in more particles per unit volume or to the fact that this results in an increased collision rate between particles.
3(c)	1/3	The candidate explains that the collision rate increases but fails to explain that this is because higher energetic particles move quicker. There is no reference to the fact that a higher proportion of collisions would be above activation energy.

EXAMINER COMMENTS MARK SCHEME

(b) In experiment 3 the student wanted the sodium thiosulfate to be double the concentration used in experiment 2.

(i) Complete the table to show the **volumes** which should be used and the **expected** time taken for the cross to disappear from view in experiment 3. [2]

(ii) Use collision theory to explain why increasing the concentration of sodium thiosulfate would change the rate of reaction.

There are more particles of sodium thiosulfate which collide with the other particles, making the reaction go faster.

[2]

(c) The student repeated experiment 1 at a higher temperature.

Use collision theory to explain why the rate of reaction would increase.

increasing the heat ~~cuts~~ gives the particles more energy so the collide with eachother more often and with greater force, increasing the rate of reaction

[3]

[Total: 8]

Select page

HIGH | MIDDLE | LOW

	Your Mark	Examiner marks and comments	
		Mark	Comment
3(a)		1/1	Correct.
3(b)(i)		1/2	The candidate shows that doubling the concentration would halve the time but has failed to see the relevance of keeping the total volume constant.
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EXAMINER COMMENTS | MARK SCHEME

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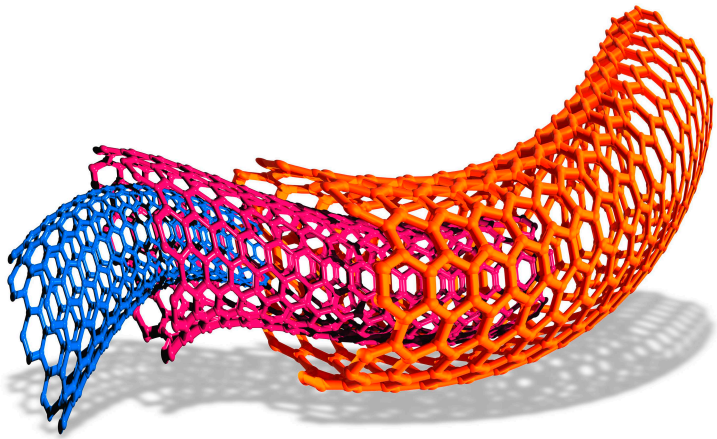
Paper 4 (May / June 2016), Question 4

Cambridge IGCSE™
Chemistry 0620



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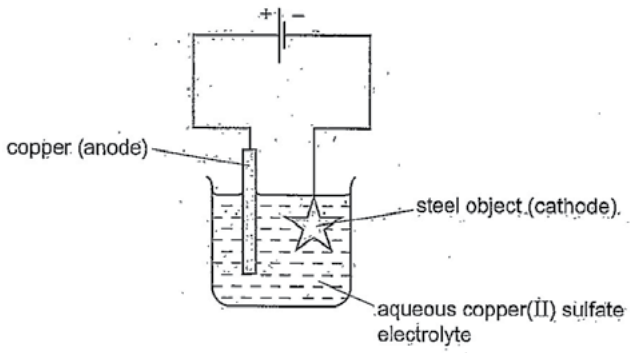
4. Electroplating steel objects with silver involves a three-step process.

step 1 A coating of copper is applied to the object.

step 2 A coating of nickel is applied to the object.

step 3 The coating of silver is applied to the object.

(a) A diagram of the apparatus used for **step 1** is shown.



(i) The chemical process taking place on the surface of the object is

$$Cu^{2+}(aq) + 2e^- \rightarrow Cu(s)$$

Explain whether this process is oxidation or reduction.

This process is reduction as the Copper is gaining electrons [1]

(ii) Explain why the concentration of copper ions in the electrolyte remains constant throughout **step 1**.

The copper anode is not inert and therefore loses ions into the electrolyte. This means that although the copper ions are reducing on the surface of the object, they are constantly being replaced with ions from the anode [2]

Select page

HIGH | MIDDLE | LOW

	Your Mark
4(a)(i)	
4(a)(ii)	
4(b)	
4(c)	

Q4	Mark scheme
(a)(i)	reduction **and** (the Cu^{2+} ion/copper ions) is gaining electrons/is decreasing in oxidation number;
(a)(ii)	formation of Cu^{2+}/copper ions at the anode happens at the same rate as; removal of Cu^{2+}/copper ions at the cathode ora;
(b)	replace (anode of) copper with nickel; replace electrolyte with nickel(II) sulfate/$NiSO_4$;
(c)	(good) catalysts; variable oxidation numbers; form coloured compounds/coloured ions;

EXAMINER COMMENTS | MARK SCHEME

(b) Give **two** changes which would be needed in order to coat nickel onto the object in **step 2**.

One would need to change the Copper anode for a nickel one made of nickel. One would also need to change the electrolyte for a nickel ionic compound solution, [2]

(c) Copper, nickel and silver are transition elements.
Typical physical properties of transition elements are a high density and a high melting point.

Give **three** different properties of transition metals which are not typical of other metals.

- They can have variable charges
- They often can be used as catalysts
- They usually form coloured compounds [3]

[Total: 8]

Select page

HIGH | MIDDLE | LOW

Your Mark

4(a)(i) [ ]

4(a)(ii) [ ]

4(b) [ ]

4(c) [ ]

Q4	Mark scheme
(a)(i)	reduction **and** (the Cu^{2+} ion/copper ions) is gaining electrons/is decreasing in oxidation number;
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EXAMINER COMMENTS

MARK SCHEME

4 Electroplating steel objects with silver involves a three-step process.

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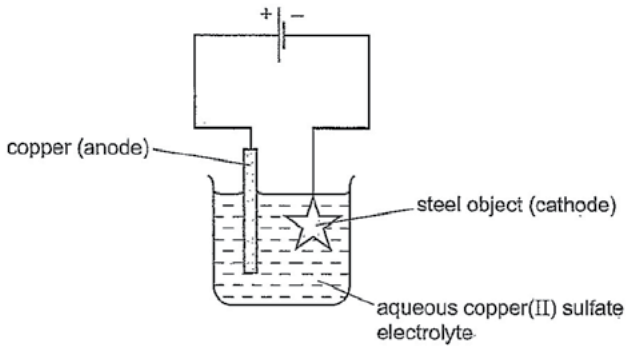

(i) The chemical process taking place on the surface of the object is

$$Cu^{2+}(aq) + 2e^- \rightarrow Cu(s)$$

Explain whether this process is oxidation or reduction.

A reduction because ~~it is~~ when a reduction occurs electrons are being gained [1]

(ii) Explain why the concentration of copper ions in the electrolyte remains constant throughout **step 1**.

Because the copper anode replaces the copper ions that were used up

[2]

Select page

HIGH | MIDDLE | LOW

Your Mark

4(a)(i)

4(a)(ii)

4(b)

4(c)

Q4	Mark scheme
(a)(i)	reduction **and** (the Cu^{2+} ion/copper ions) is gaining electrons/is decreasing in oxidation number;
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(b)	replace (anode of) copper with nickel; replace electrolyte with nickel(II) sulfate/$NiSO_4$;
(c)	(good) catalysts; variable oxidation numbers; form coloured compounds/coloured ions;

EXAMINER COMMENTS

MARK SCHEME

(b) Give **two** changes which would be needed in order to coat nickel onto the object in **step 2**.

The electrolyte would needed to be changed, to a substance of nickel and the ~~electrode~~ anode would have to be changed as well

..... [2]

(c) Copper, nickel and silver are transition elements.
Typical physical properties of transition elements are a high density and a high melting point.

Give **three** different properties of transition metals which are not typical of other metals.

They form coloured ions, they are generally quite unreactive and they ~~conduct electricity and heat well~~ one element has more than 1 form [3]

[Total: 8]

Select page

HIGH | MIDDLE | LOW

	Your Mark
4(a)(i)	
4(a)(ii)	
4(b)	
4(c)	

Q4	Mark scheme
(a)(i)	reduction **and** (the Cu^{2+} ion/copper ions) is gaining electrons/is decreasing in oxidation number;
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EXAMINER COMMENTS | MARK SCHEME

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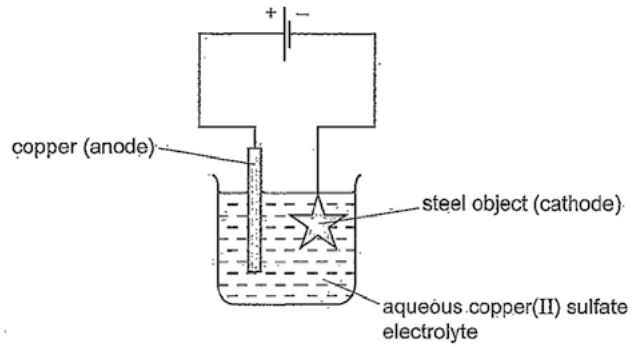

(i) The chemical process taking place on the surface of the object is

$$Cu^{2+}(aq) + 2e^- \rightarrow Cu(s)$$

Explain whether this process is oxidation or reduction.

The reaction is oxidation because there is a loss of electrons [1]

(ii) Explain why the concentration of copper ions in the electrolyte remains constant throughout **step 1.**

Because they are copper(II) and ~~water~~ ~~not attracted~~ are mixed with sulfates

[2]

Select page

HIGH MIDDLE LOW

	Your Mark
4(a)(i)	
4(a)(ii)	
4(b)	
4(c)	

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(b)	replace (anode of) copper with nickel; replace electrolyte with nickel(II) sulfate/$NiSO_4$;
(c)	(good) catalysts; variable oxidation numbers; form coloured compounds/coloured ions;

EXAMINER COMMENTS

MARK SCHEME

(b) Give **two** changes which would be needed in order to coat nickel onto the object in **step 2**.

A different electrolyte and a ~~different~~ nickle ~~anode~~ at the anode

[2]

(c) Copper, nickel and silver are transition elements.
Typical physical properties of transition elements are a high density and a high melting point.

Give **three** different properties of transition metals which are not typical of other metals.

- Malusable
- Ductile
- Shiney

[3]

[Total: 8]

Select page

HIGH | MIDDLE | LOW

Your Mark

4(a)(i)

4(a)(ii)

4(b)

4(c)

Q4	Mark scheme
(a)(i)	reduction **and** (the Cu^{2+} ion/copper ions) is gaining electrons/is decreasing in oxidation number;
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EXAMINER COMMENTS

MARK SCHEME

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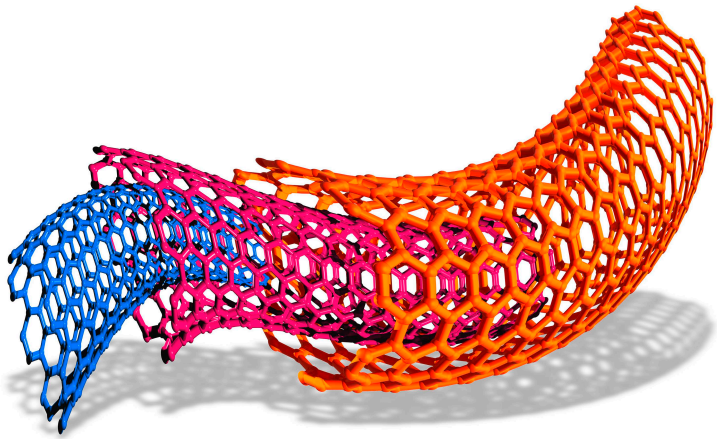
Paper 4 (May / June 2016), Question 5

Cambridge IGCSE™
Chemistry 0620



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Select page

HIGH | MIDDLE | LOW

5 Sulfuric acid is produced by the Contact process. The steps of the Contact process are shown.

starting material —step 1→ sulfur dioxide —step 2→ sulfur trioxide —step 3→ oleum —step 4→ sulfuric acid

(a) Sulfur is a common starting material for the Contact process.

Name a source of sulfur.

USA volcanoes in the USA ..... [1]

(b) Describe **step 2**, giving reaction conditions and a chemical equation. Reference to reaction rate and yield is not required.

$2SO_2 + O_2 \rightarrow 2SO_3$ for this reaction a temperature of 450°C is needed as it is exothermic, a higher temperature would result in grea faster reaction. This reaction is not reversible. A pressure of 1-2 atmosphere is also needed. ~~A~~ The catalyst vanadium (v) oxide is also needed. ..... [5]

(c) **Step 3** involves adding sulfur trioxide to concentrated sulfuric acid to form oleum.

Complete the chemical equation for this reaction.

$H_2SO_4 + SO_3 \rightarrow$ $H_2S_2O_7$ ..... [1]

	Your Mark
5(a)	
5(b)	
5(c)	
5(d)(i)	
5(d)(ii)	
5(e)(i)	
5(e)(ii)	

Examiner marks and comments

Mark	Comment
1/1	Correct.
4/5	The candidate fails to describe the reaction as being reversible but scores the other 4 marks.
1/1	Correct.
1/2	The candidate fails to state that the copper(II) carbonate would dissolve.
1/1	Correct.
0/1	The candidate fails to name the substance as carbon.
1/1	This is a possible alternative answer to 'dehydration'.

EXAMINER COMMENTS | MARK SCHEME

(d) Dilute sulfuric acid is a typical acid.

A student adds excess dilute sulfuric acid to a sample of solid copper(II) carbonate in a test-tube.

(i) Give **three** observations the student would make.

→ bubbles of gas

→ effervescence

→ solution changes blue [2]

(ii) Give the **names** of all products formed.

→ copper sulphate, carbon dioxide, water

[1]

(e) Concentrated sulfuric acid has different properties to dilute sulfuric acid.

When concentrated sulfuric acid is added to glucose, $C_6H_{12}O_6$, steam is given off and a black solid is formed.

(i) Name the black solid. hydrogen sulphate ~~hydr sulphate~~ [1]

(ii) What type of reaction has occurred?

exothermic reaction [1]

[Total: 12]

Select page

HIGH | MIDDLE | LOW

	Your Mark
5(a)	
5(b)	
5(c)	
5(d)(i)	
5(d)(ii)	
5(e)(i)	
5(e)(ii)	

Examiner marks and comments

Mark	Comment
1/1	Correct.
4/5	The candidate fails to describe the reaction as being reversible but scores the other 4 marks.
1/1	Correct.
1/2	The candidate fails to state that the copper(II) carbonate would dissolve.
1/1	Correct.
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EXAMINER COMMENTS | MARK SCHEME

Select page

HIGH | MIDDLE | LOW

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(a) Sulfur is a common starting material for the Contact process.

Name a source of sulfur.

Near volcanoes ..... [1]

(b) Describe **step 2**, giving reaction conditions and a chemical equation. Reference to reaction rate and yield is not required.

Sulfur dioxide mixed with is roasted in excess oxygen to form sulfur trioxide ~~sulfur dioxide~~ ~~$S + O_2 \rightarrow SO_2$~~. This ~~is an exothermic reaction so it works best at high temperatures~~. It is mixed and then passed over seperate beds of catalyst vanadium (VII) oxide. This forms the sulfur trioxide

$2SO_2 + O_2 \rightarrow 2SO_3$. Heat should be supplied ..... [5]

(c) **Step 3** involves adding sulfur trioxide to concentrated sulfuric acid to form oleum.

Complete the chemical equation for this reaction.

$H_2SO_4 + SO_3 \rightarrow H_2S_2O_7$ .....

[1]

	Your Mark	Examiner marks and comments	
		Mark	**Comment**
5(a)		**1/1**	Correct.
5(b)		**1/5**	The candidate fails to describe the reaction as being reversible and does not give the correct temperature (450 °C), pressure (1 to 5 atm) or catalyst (vanadium pentoxide).
5(c)		**1/1**	Correct.
5(d)(i)		**0/2**	The candidate fails to state that the copper(II) carbonate would dissolve or that the final colour would be blue.
5(d)(ii)		**1/1**	Correct.
5(e)(i)		**0/1**	The candidate fails to name the substance as carbon.
5(e)(ii)		**1/1**	This is a possible alternative answer to 'dehydration'.

EXAMINER COMMENTS | MARK SCHEME

(d) Dilute sulfuric acid is a typical acid.

A student adds excess dilute sulfuric acid to a sample of solid copper(II) carbonate in a test-tube.

(i) Give **three** observations the student would make.

A salt would form, a colourless liquid would form and bubbles would form

[2]

(ii) Give the **names** of all products formed.

Copper (II) sulfate, carbon dioxide and water

[1]

(e) Concentrated sulfuric acid has different properties to dilute sulfuric acid.

When concentrated sulfuric acid is added to glucose, $C_6H_{12}O_6$, steam is given off and a black solid is formed.

(i) Name the black solid.

Carbon sulfite [1]

(ii) What type of reaction has occurred?

Exothermic reaction [1]

[Total: 12]

Select page

HIGH | MIDDLE | LOW

	Your Mark	Examiner marks and comments	
		Mark	**Comment**
5(a)		**1/1**	Correct.
5(b)		**1/5**	The candidate fails to describe the reaction as being reversible and does not give the correct temperature (450 °C), pressure (1 to 5 atm) or catalyst (vanadium pentoxide).
5(c)		**1/1**	Correct.
5(d)(i)		**0/2**	The candidate fails to state that the copper(II) carbonate would dissolve or that the final colour would be blue.
5(d)(ii)		**1/1**	Correct.
5(e)(i)		**0/1**	The candidate fails to name the substance as carbon.
5(e)(ii)		**1/1**	This is a possible alternative answer to 'dehydration'.

EXAMINER COMMENTS | MARK SCHEME

5 Sulfuric acid is produced by the Contact process. The steps of the Contact process are shown.

starting material —step 1→ sulfur dioxide —step 2→ sulfur trioxide —step 3→ oleum —step 4→ sulfuric acid

(a) Sulfur is a common starting material for the Contact process.

Name a source of sulfur.

From the oil, which is refined & sulphur is produced. [1]

(b) Describe **step 2**, giving reaction conditions and a chemical equation. Reference to reaction rate and yield is not required.

450°C to 700°C and at 10 atmospheric pressure are the reaction conditions. Vanadium Pentoxide is the catalyst use to spur on the reaction.

~~$SO_4 + SH_6$~~ $\rightarrow$ $SH_4 + SOH \rightarrow S_2 H_{04}$

[5]

(c) **Step 3** involves adding sulfur trioxide to concentrated sulfuric acid to form oleum.

Complete the chemical equation for this reaction.

$H_2SO_4 + SO_3 \rightarrow$ $H_2S_2O_7$

[1]

H_2SO_4

$H_2S_2O_7$

Select page

HIGH MIDDLE LOW

Your Mark	Examiner marks and comments	
	Mark	Comment
5(a)	0/1	The candidate fails to state that it is crude oil which is a source of sulfur.
5(b)	1/5	The candidate fails to describe the reaction as being reversible and fails to give the correct temperature (450 °C), pressure (1 to 5 atm) or a balanced equation.
5(c)	1/1	Correct.
5(d)(i)	0/2	The candidate fails to state that the copper(II) carbonate would effervesce or that the final colour would be blue.
5(d)(ii)	0/1	The candidate fails to state that water and carbon dioxide would form as well as copper(II) sulfate.
5(e)(i)	1/1	Correct.
5(e)(ii)	0/1	This is not allowed as an alternative answer to 'dehydration'.

EXAMINER COMMENTS MARK SCHEME

(d) Dilute sulfuric acid is a typical acid.

A student adds excess dilute sulfuric acid to a sample of solid copper(II) carbonate in a test-tube.

(i) Give **three** observations the student would make.

- The solid copper (II) carbonate would change color.
- It would react and dissolve completely.
- It would leave behind a reddish-brown color. [2]

(ii) Give the **names** of all products formed.

- Copper Sulphate
- Carbon sulfate. [1]

(e) Concentrated sulfuric acid has different properties to dilute sulfuric acid.

When concentrated sulfuric acid is added to glucose, $C_6H_{12}O_6$, steam is given off and a black solid is formed.

(i) Name the black solid.

Carbon. [1]

(ii) What type of reaction has occurred?

A displacement reaction. [1]

[Total: 12]

Select page

HIGH | MIDDLE | LOW

	Your Mark	Examiner marks and comments	
		Mark	**Comment**
5(a)		**0/1**	The candidate fails to state that it is crude oil which is a source of sulfur.
5(b)		**1/5**	The candidate fails to describe the reaction as being reversible and fails to give the correct temperature (450 °C), pressure (1 to 5 atm) or a balanced equation.
5(c)		**1/1**	Correct.
5(d)(i)		**0/2**	The candidate fails to state that the copper(II) carbonate would effervesce or that the final colour would be blue.
5(d)(ii)		**0/1**	The candidate fails to state that water and carbon dioxide would form as well as copper(II) sulfate.
5(e)(i)		**1/1**	Correct.
5(e)(ii)		**0/1**	This is not allowed as an alternative answer to 'dehydration'.

EXAMINER COMMENTS | MARK SCHEME

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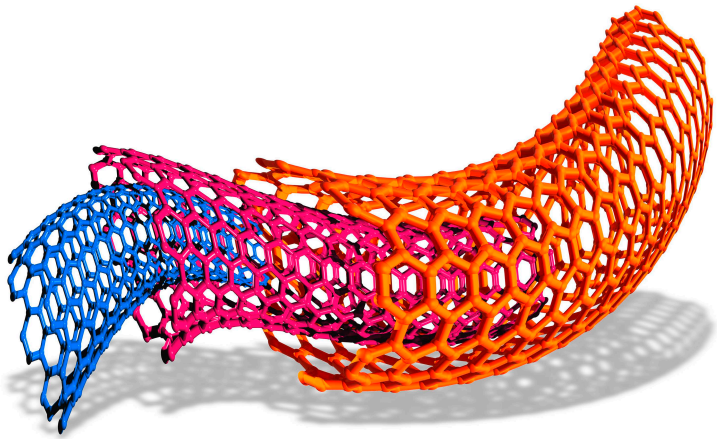
Interactive

Interactive Example Candidate Responses

Paper 4 (May / June 2016), Question 6

Cambridge IGCSE™
Chemistry 0620



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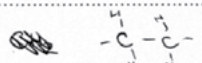
6 Petroleum is a source of many important chemicals.

(a) Name **two** industrial processes which must take place to produce alkenes from petroleum.

Fractional Distillation, Cracking

..... [2]



(b) Ethene, $CH_2=CH_2$, and propene, $CH_2=CHCH_3$, can both be converted into polymers.

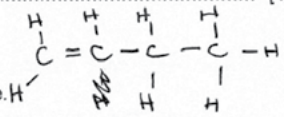
(i) What type of polymerisation takes place when ethene forms a polymer?

Addition Polymerisation ..... [1]

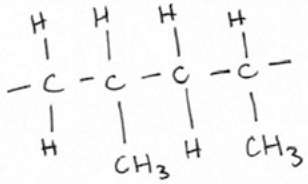
(ii) What is the empirical formula of the polymer formed from ethene?

..... [1]

(iii) Propene has the structural formula $CH_2=CHCH_3$.



Draw **two** repeat units of the polymer made from propene.

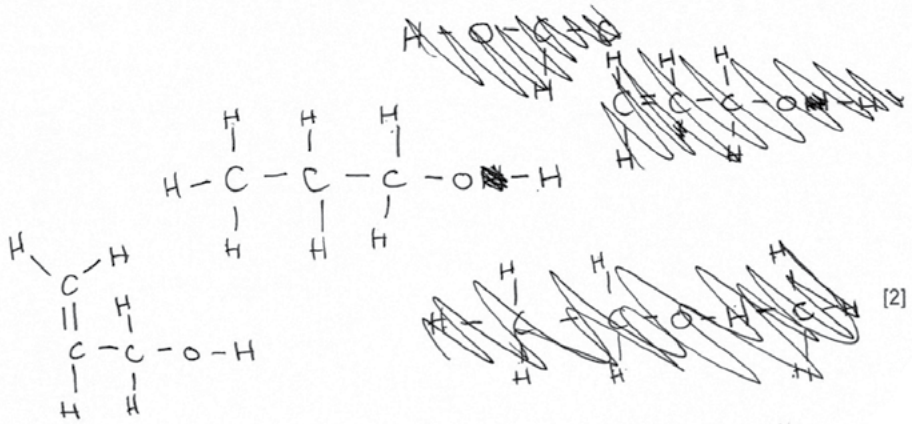


[2]

(c) Ethene will react with steam to form ethanol.

Propene will react with steam to form two isomers, both of which are alcohols.

Suggest the structures of these alcohols.



[2]

Select page

HIGH LOW

Your Mark		Examiner marks and comments	
		Mark	Comment
6(a)		2/2	Correct.
6(b)(i)		1/1	Correct.
6(b)(ii)		0/1	The candidate fails to show the empirical formula of the polymer.
6(b)(iii)		2/2	Correct.
6(c)		1/2	The candidate fails to draw the structure of propan-2-ol.
6(d)(i)		0/1	The candidate fails to name the catalyst used in the formation of esters from carboxylic acids and alcohols.
6(d)(ii)		1/1	Correct.
6(d)(iii)		2/2	Correct.
6(d)(iv)		1/1	Correct.

EXAMINER COMMENTS MARK SCHEME

(d) Esters are organic chemicals noted for their characteristic smells. Ethanoic acid and methanol will react to form an ester.

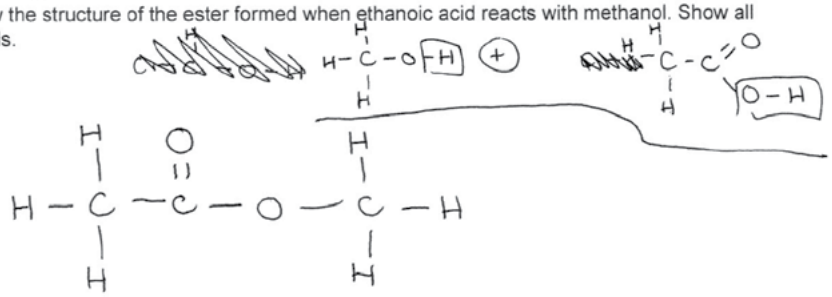
(i) Name the catalyst needed to form an ester from ethanoic acid and methanol.

Copper ..... [1]

(ii) Name the ester formed when ethanoic acid reacts with methanol.

methyl ethanoate ..... [1]

(iii) Draw the structure of the ester formed when ethanoic acid reacts with methanol. Show all bonds.



[2]

(iv) Give the name of a polyester.

terylene ..... [1]

[Total: 13]

Select page

HIGH LOW

Your Mark		Examiner marks and comments	
		Mark	Comment
6(a)		2/2	Correct.
6(b)(i)		1/1	Correct.
6(b)(ii)		0/1	The candidate fails to show the empirical formula of the polymer.
6(b)(iii)		2/2	Correct.
6(c)		1/2	The candidate fails to draw the structure of propan-2-ol.
6(d)(i)		0/1	The candidate fails to name the catalyst used in the formation of esters from carboxylic acids and alcohols.
6(d)(ii)		1/1	Correct.
6(d)(iii)		2/2	Correct.
6(d)(iv)		1/1	Correct.

EXAMINER COMMENTS MARK SCHEME

Select page

HIGH LOW

6 Petroleum is a source of many important chemicals.

(a) Name **two** industrial processes which must take place to produce alkenes from petroleum.

→ Burning of ~~fossil~~ fossil fuel.

→ Extracting petroleum [2]

(b) Ethene, $CH_2=CH_2$, and propene, $CH_2=CHCH_3$, can both be converted into polymers.

(i) What type of polymerisation takes place when ethene forms a polymer?

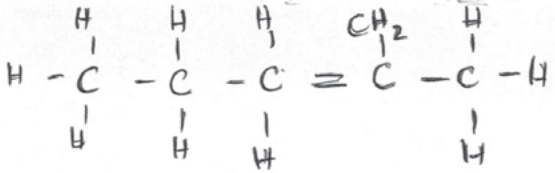
Addition polymerisation. [1]

(ii) What is the empirical formula of the polymer formed from ethene?

~~C_2H_4~~ C_6H_8 [1]

(iii) Propene has the structural formula $CH_2=CHCH_3$.

Draw **two** repeat units of the polymer made from propene.

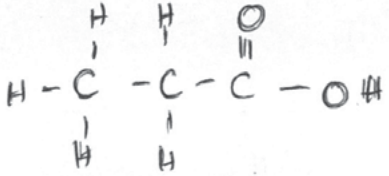


[2]

(c) Ethene will react with steam to form ethanol.

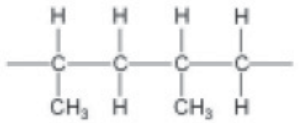
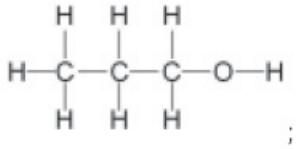
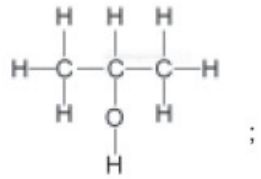
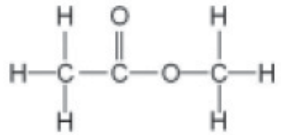
Propene will react with steam to form two isomers, both of which are alcohols.

Suggest the structures of these alcohols.



[2]

	Your Mark
6(a)	
6(b)(i)	
6(b)(ii)	
6(b)(iii)	
6(c)	
6(d)(i)	
6(d)(ii)	
6(d)(iii)	
6(d)(iv)	

Q6	Mark scheme
(a)	fractional distillation; cracking;
(b)(i)	addition;
(b)(ii)	CH_2;
(b)(iii)	 **M1** chain of 4 carbon atoms with single bonds and continuation bonds; **M2** correctly positioned CH_3 side chains;
(c)	 ;  ;
(d)(i)	(concentrated) sulfuric acid;
(d)(ii)	methyl ethanoate;
(d)(iii)	 **M1** ester link; **M2** rest of molecule;
(d)(iv)	terylene;

EXAMINER COMMENTS

MARK SCHEME

(d) Esters are organic chemicals noted for their characteristic smells. Ethanoic acid and methanol will react to form an ester.

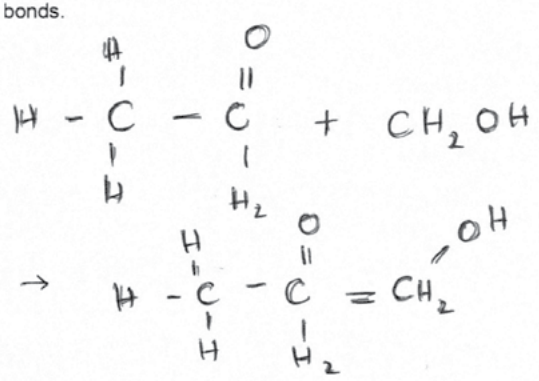
(i) Name the catalyst needed to form an ester from ethanoic acid and methanol.

Sodium hydroxide. [1]

(ii) Name the ester formed when ethanoic acid reacts with methanol.

Methly ethanoate. [1]

(iii) Draw the structure of the ester formed when ethanoic acid reacts with methanol. Show all bonds.



[2]

(iv) Give the name of a polyester.

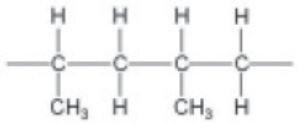
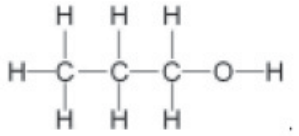
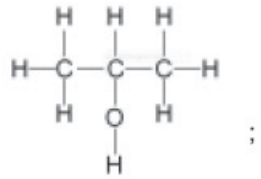
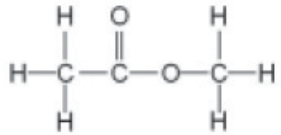
Nylon polyester. [1]

[Total: 13]

Select page

HIGH LOW

	Your Mark
6(a)	
6(b)(i)	
6(b)(ii)	
6(b)(iii)	
6(c)	
6(d)(i)	
6(d)(ii)	
6(d)(iii)	
6(d)(iv)	

Q6	Mark scheme
(a)	fractional distillation; cracking;
(b)(i)	addition;
(b)(ii)	CH_2;
(b)(iii)	 **M1** chain of 4 carbon atoms with single bonds and continuation bonds; **M2** correctly positioned CH_3 side chains;
(c)	 ;  ;
(d)(i)	(concentrated) sulfuric acid;
(d)(ii)	methyl ethanoate;
(d)(iii)	 **M1** ester link; **M2** rest of molecule;
(d)(iv)	terylene;

EXAMINER COMMENTS

MARK SCHEME

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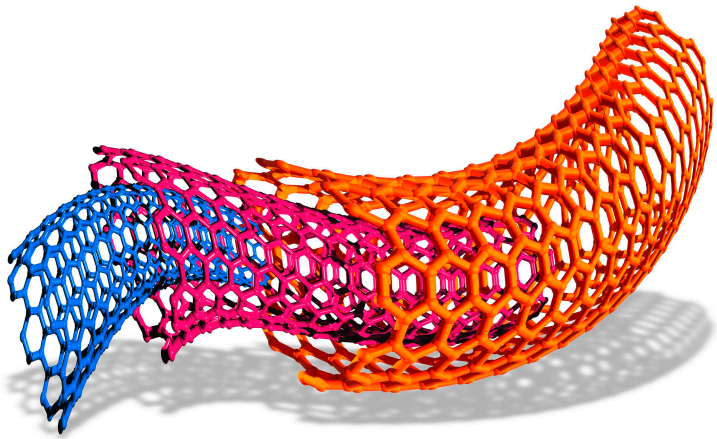
Paper 5 (May / June 2016), Question 1

Cambridge IGCSE™
Chemistry 0620



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Select page

HIGH | MIDDLE | LOW

1 You are going to investigate what happens when two different metals, iron and magnesium, react with aqueous copper(II) sulfate.

Read all the instructions carefully before starting the experiments.

Instructions
You are going to carry out two experiments.

(a) *Experiment 1*

Use a measuring cylinder to pour 25 cm^3 of aqueous copper(II) sulfate into the polystyrene cup provided. Put the polystyrene cup into a 250 cm^3 beaker for support. Measure the initial temperature of the solution and then the temperature after 30 seconds and 60 seconds. Record your results in the table.

At 60 seconds add all of the iron to the aqueous copper(II) sulfate and stir the mixture continuously with the thermometer.

Measure the temperature of the mixture every 30 seconds for 300 seconds (5 minutes). Record your results in the table.

time/s	0	30	60	90	120	150	180	210	240	270	300
temperature /°C	20.5	20.5	20.5	22.0	23.0	24.0	24.5	24.5	25.0	25.0	25.0

[2]

(b) *Experiment 2*

Empty the polystyrene cup and rinse it with water.

Use a measuring cylinder to pour 25 cm^3 of aqueous copper(II) sulfate into the polystyrene cup. Put the polystyrene cup into a 250 cm^3 beaker for support. Measure the initial temperature of the solution and then the temperature after 30 seconds and 60 seconds. Record your results in the table.

At 60 seconds add all of the magnesium to the aqueous copper(II) sulfate and stir the mixture continuously with the thermometer.

Measure the temperature of the mixture every 30 seconds for 300 seconds (5 minutes). Record your results in the table.

time/s	0	30	60	90	120	150	180	210	240	270	300
temperature /°C	20.5	20.5	20.5	83.0	86.5	86.0	85.0	83.5	81.0	78.5	76.5

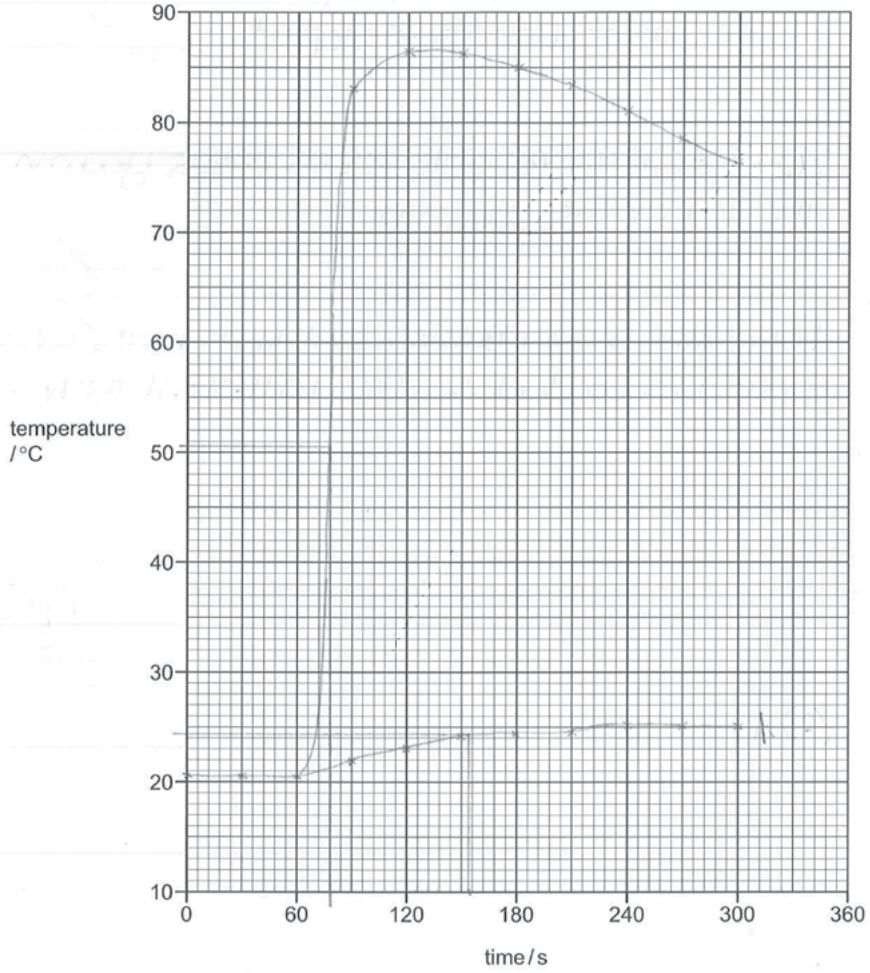
[2]

	Your Mark
1(a)	
1(b)	
1(c)	
1(d)(i)	
1(d)(ii)	
1(e)	
1(f)	
1(g)	

Q1	Mark scheme
(a)	table of results for Experiment 1 temperature boxes completed correctly results comparable to supervisor's
(b)	table of results for Experiment 2 temperature boxes completed correctly results comparable to supervisor's
(c)	all points correctly plotted ± half a small square smooth line graphs labelled
(d)(i)	value from graph –60 s
(d)(ii)	value from graph shown clearly
(e)	room temperature or initial temperature from results table reaction has finished/stopped
(f)	more readings/points/data smoother curve/better or more accurate graph
(g)	polystyrene is an insulator/copper is a (good) conductor reduced heat losses

EXAMINER COMMENTS | MARK SCHEME

(c) Plot the results for Experiments 1 and 2 on the grid and draw **two** smooth line graphs. Clearly label the graphs.



[4]

(d) (i) **From your graph**, deduce the temperature of the mixture in Experiment 1 after 135 seconds.
Show clearly **on the grid** how you worked out your answer.

24.5 °C [2]

(ii) **From your graph**, deduce the time taken for the temperature of the mixture in Experiment 2 to change by 30 °C **after the magnesium was added**.
Show clearly **on the grid** how you worked out your answer.

78 s [2]

	Your Mark
1(a)	
1(b)	
1(c)	
1(d)(i)	
1(d)(ii)	
1(e)	
1(f)	
1(g)	

Q1	Mark scheme
(a)	table of results for Experiment 1 temperature boxes completed correctly results comparable to supervisor's
(b)	table of results for Experiment 2 temperature boxes completed correctly results comparable to supervisor's
(c)	all points correctly plotted ± half a small square smooth line graphs labelled
(d)(i)	value from graph –60 s
(d)(ii)	value from graph shown clearly
(e)	room temperature or initial temperature from results table reaction has finished/stopped
(f)	more readings/points/data smoother curve/better or more accurate graph
(g)	polystyrene is an insulator/copper is a (good) conductor reduced heat losses

(e) Predict the temperature of the mixture in Experiment 2 after one hour. Explain your answer.

20.5°C, as that is the temperature of it's surroundings and the reaction would have stopped. [2]

(f) Suggest an advantage of taking the temperature readings every 15 seconds.

More ~~accurate~~ reliable results means you can judge the rate of the reaction better [2]

(g) Explain why a polystyrene cup is used in the experiments and **not** a copper can.

Polystyrene is an insulator, so it traps heat, whereas copper is a conductor, which will absorb the heat. [2]

[Total: 18]

Select page

HIGH MIDDLE LOW

	Your Mark
1(a)	
1(b)	
1(c)	
1(d)(i)	
1(d)(ii)	
1(e)	
1(f)	
1(g)	

Q1	Mark scheme
(a)	table of results for Experiment 1 temperature boxes completed correctly results comparable to supervisor's
(b)	table of results for Experiment 2 temperature boxes completed correctly results comparable to supervisor's
(c)	all points correctly plotted ± half a small square smooth line graphs labelled
(d)(i)	value from graph –60 s
(d)(ii)	value from graph shown clearly
(e)	room temperature or initial temperature from results table reaction has finished/stopped
(f)	more readings/points/data smoother curve/better or more accurate graph
(g)	polystyrene is an insulator/copper is a (good) conductor reduced heat losses

EXAMINER COMMENTS

MARK SCHEME

Select page

HIGH | MIDDLE | LOW

1 You are going to investigate what happens when two different metals, iron and magnesium, react with aqueous copper(II) sulfate.

Read all the instructions carefully before starting the experiments.

Instructions
You are going to carry out two experiments.

(a) *Experiment 1*

Use a measuring cylinder to pour 25 cm^3 of aqueous copper(II) sulfate into the polystyrene cup provided. Put the polystyrene cup into a 250 cm^3 beaker for support. Measure the initial temperature of the solution and then the temperature after 30 seconds and 60 seconds. Record your results in the table.

At 60 seconds add all of the iron to the aqueous copper(II) sulfate and stir the mixture continuously with the thermometer.

Measure the temperature of the mixture every 30 seconds for 300 seconds (5 minutes). Record your results in the table.

time/s	0	30	60	90	120	150	180	210	240	270	300
temperature /°C	18	17	17	18	20	21	22	22	23	23	24

[2]

(b) *Experiment 2*

Empty the polystyrene cup and rinse it with water.

Use a measuring cylinder to pour 25 cm^3 of aqueous copper(II) sulfate into the polystyrene cup. Put the polystyrene cup into a 250 cm^3 beaker for support. Measure the initial temperature of the solution and then the temperature after 30 seconds and 60 seconds. Record your results in the table.

At 60 seconds add all of the magnesium to the aqueous copper(II) sulfate and stir the mixture continuously with the thermometer.

Measure the temperature of the mixture every 30 seconds for 300 seconds (5 minutes). Record your results in the table.

time/s	0	30	60	90	120	150	180	210	240	270	300
temperature /°C	18	18	18	60	78	80	80	78	77	74	73

[2]

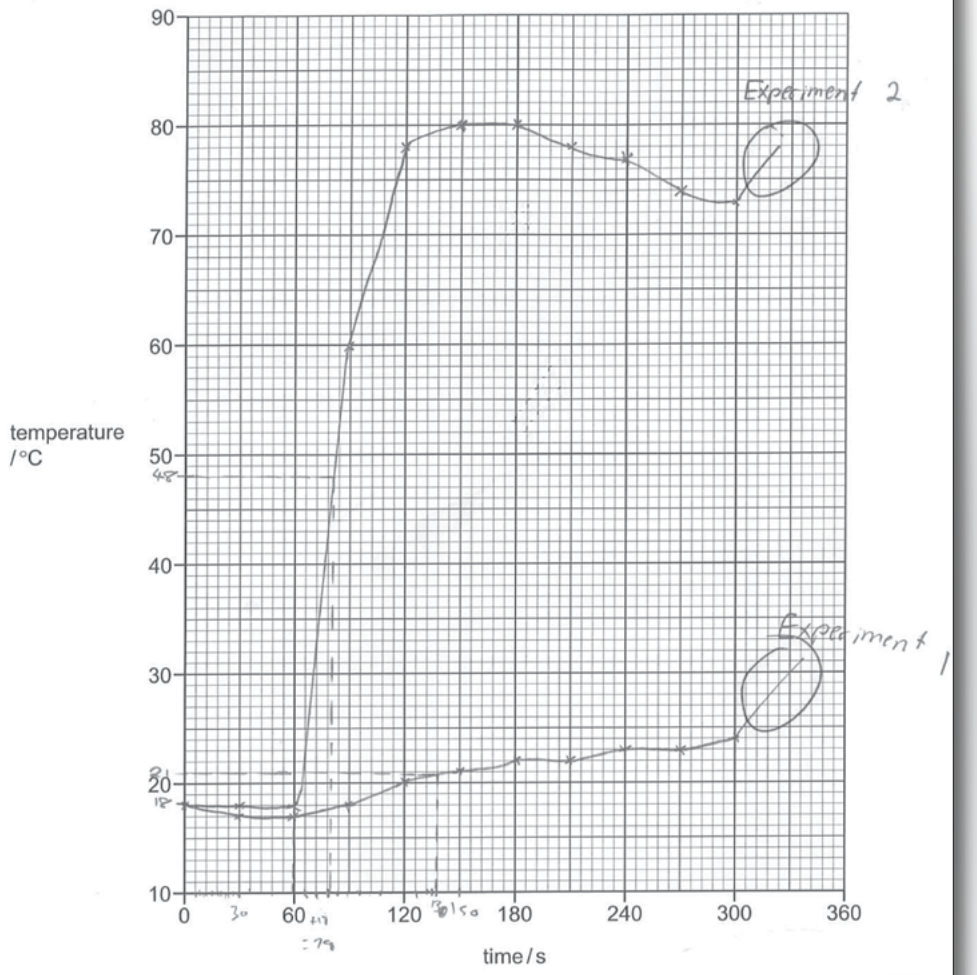
	Your Mark
1(a)	
1(b)	
1(c)	
1(d)(i)	
1(d)(ii)	
1(e)	
1(f)	
1(g)	

Q1	Mark scheme
(a)	table of results for Experiment 1 temperature boxes completed correctly results comparable to supervisor's
(b)	table of results for Experiment 2 temperature boxes completed correctly results comparable to supervisor's
(c)	all points correctly plotted ± half a small square smooth line graphs labelled
(d)(i)	value from graph –60 s
(d)(ii)	value from graph shown clearly
(e)	room temperature or initial temperature from results table reaction has finished/stopped
(f)	more readings/points/data smoother curve/better or more accurate graph
(g)	polystyrene is an insulator/copper is a (good) conductor reduced heat losses

EXAMINER COMMENTS

MARK SCHEME

(c) Plot the results for Experiments 1 and 2 on the grid and draw **two** smooth line graphs. Clearly label the graphs.



[4]

(d) (i) **From your graph**, deduce the temperature of the mixture in Experiment 1 after 135 seconds.
Show clearly **on the grid** how you worked out your answer.

21 °C ..... °C [2]

(ii) **From your graph**, deduce the time taken for the temperature of the mixture in Experiment 2 to change by 30 °C **after the magnesium was added**.
Show clearly **on the grid** how you worked out your answer.

18 ..... s [2]

Select page

HIGH | MIDDLE | LOW

	Your Mark
1(a)	
1(b)	
1(c)	
1(d)(i)	
1(d)(ii)	
1(e)	
1(f)	
1(g)	

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(g)	polystyrene is an insulator/copper is a (good) conductor reduced heat losses

EXAMINER COMMENTS | MARK SCHEME

(e) Predict the temperature of the mixture in Experiment 2 after one hour. Explain your answer.

19 °C, it would've naturally cooled down back to room temperature. [2]

(f) Suggest an advantage of taking the temperature readings every 15 seconds.

You will get more accurate results on the graph. [2]

(g) Explain why a polystyrene cup is used in the experiments and **not** a copper can.

Copper is conductive and also may react with the experiment, polystyrene is not conductive and will not react. [2]

[Total: 18]

Select page

HIGH | MIDDLE | LOW

	Your Mark
1(a)	
1(b)	
1(c)	
1(d)(i)	
1(d)(ii)	
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EXAMINER COMMENTS

MARK SCHEME

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At 60 seconds add all of the iron to the aqueous copper(II) sulfate and stir the mixture continuously with the thermometer.

Measure the temperature of the mixture every 30 seconds for 300 seconds (5 minutes). Record your results in the table.

time/s	0	30	60	90	120	150	180	210	240	270	300
temperature /°C	19	19	19	21	22	22	22.5	23	23	23.5	23.5

[2]

(b) *Experiment 2*

Empty the polystyrene cup and rinse it with water.

Use a measuring cylinder to pour 25 cm^3 of aqueous copper(II) sulfate into the polystyrene cup. Put the polystyrene cup into a 250 cm^3 beaker for support. Measure the initial temperature of the solution and then the temperature after 30 seconds and 60 seconds. Record your results in the table.

At 60 seconds add all of the magnesium to the aqueous copper(II) sulfate and stir the mixture continuously with the thermometer.

Measure the temperature of the mixture every 30 seconds for 300 seconds (5 minutes). Record your results in the table.

time/s	0	30	60	90	120	150	180	210	240	270	300
temperature /°C	19	19	19	78	85	87	85	84	81.5	79	77

[2]

	Your Mark
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1(b)	
1(c)	
1(d)(i)	
1(d)(ii)	
1(e)	
1(f)	
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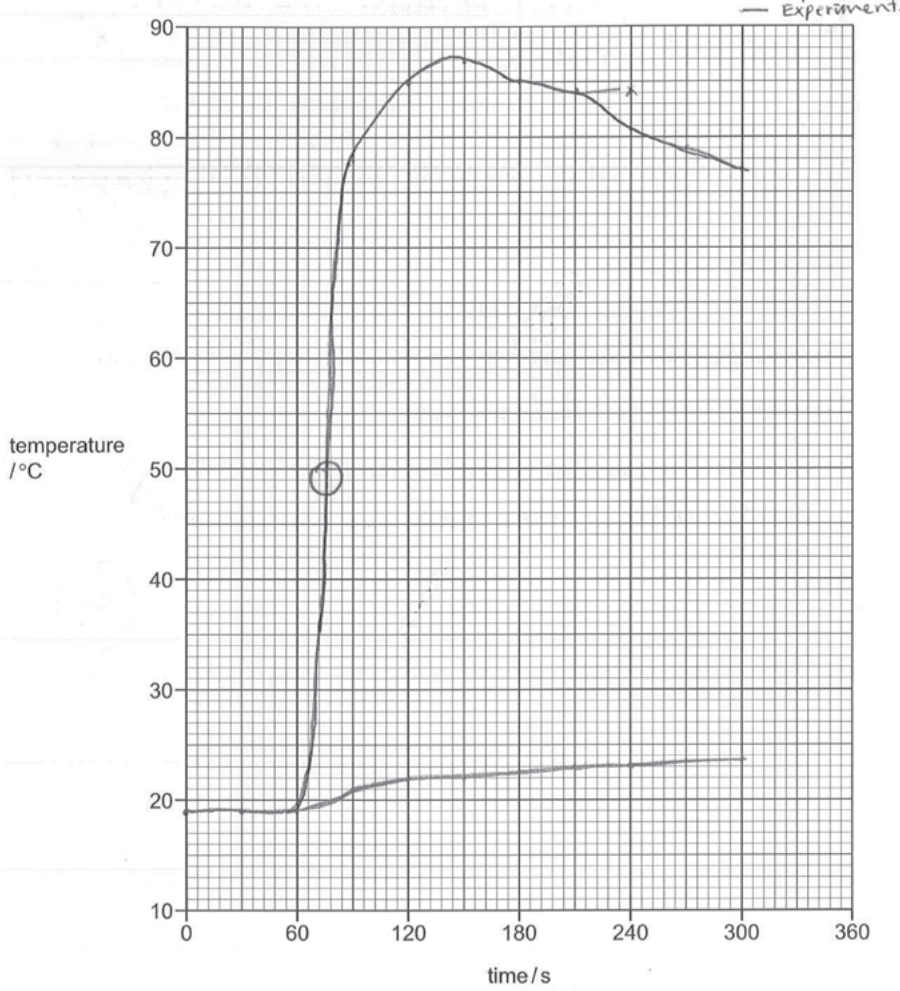
(c) Plot the results for Experiments 1 and 2 on the grid and draw **two** smooth line graphs.
Clearly label the graphs.



[4]

(d) (i) **From your graph**, deduce the temperature of the mixture in Experiment 1 after 135 seconds.
Show clearly **on the grid** how you worked out your answer.

22 °C [2]

(ii) **From your graph**, deduce the time taken for the temperature of the mixture in Experiment 2 to change by 30 °C **after the magnesium was added**.
Show clearly **on the grid** how you worked out your answer.

60 s [2]

Select page

HIGH MIDDLE LOW

	Your Mark
1(a)	
1(b)	
1(c)	
1(d)(i)	
1(d)(ii)	
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EXAMINER COMMENTS MARK SCHEME

(e) Predict the temperature of the mixture in Experiment 2 after one hour. Explain your answer.

It's getting lower. Because the mixture is getting cold. [2]

(f) Suggest an advantage of taking the temperature readings every 15 seconds.

We can see more details while it's changing. [2]

(g) Explain why a polystyrene cup is used in the experiments and **not** a copper can.

~~Because if the mixture is getting hot, then copper can is going hot together.~~ [2]

Because the chemicals might be able to reacts with copper can. [Total: 18]

Select page

HIGH MIDDLE LOW

	Your Mark
1(a)	
1(b)	
1(c)	
1(d)(i)	
1(d)(ii)	
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EXAMINER COMMENTS

MARK SCHEME

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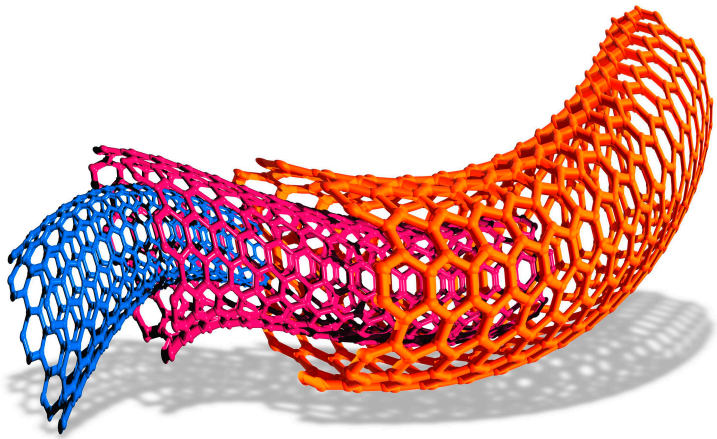
Cambridge Assessment International Education

Interactive

Interactive Example Candidate Responses

Paper 5 (May / June 2016), Question 2

Cambridge IGCSE™
Chemistry 0620



Version 2.0

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www.surveymonkey.co.uk/r/GL6ZNJB

Would you like to become a Cambridge International consultant and help us develop support materials?

Please follow the link below to register your interest.

www.cambridgeinternational.org/cambridge-for/teachers/teacherconsultants/

Select page

HIGH | MIDDLE | LOW

2 You are provided with two solutions, solution **Q** and solution **R**.
Carry out the following tests on solution **Q** and solution **R**, recording all of your observations at each stage.

tests on solution Q

(a) Divide solution **Q** into four equal portions in four test-tubes. Carry out the following tests.

(i) Use pH indicator paper to measure the pH of the first portion of solution **Q**.

pH 2 [1]

(ii) Add a 2 cm strip of magnesium ribbon to the second portion of solution **Q**. Test the gas given off.
Record your observations.

Fizzing, bubbles produced. Lit splint went 'pop' when introduced to the test-tube. [2]

(iii) Add a spatula measure of sodium carbonate to the third portion of solution **Q**. Test the gas given off.
Record your observations.

Fizzing. Limewater went cloudy when gas given off was ran through it, used a pippette. [2]

(iv) Add a few drops of dilute nitric acid and about 1 cm^3 of aqueous barium nitrate to the fourth portion of solution **Q**.
Record your observations.

White precipitate formed. [1]

tests on solution R

(b) Divide solution **R** into four equal portions in four test-tubes. Carry out the following tests.

(i) Measure the pH of the first portion of solution **R**.

pH 10 [1]

(ii) Add several drops of aqueous sodium hydroxide to the second portion of solution **R** and shake the test-tube.
Then add excess aqueous sodium hydroxide to the test-tube.
Record your observations.

~~When added excess drops of NaOH the solution went white colourless with white precipitate~~ [2]

when added few drops white precipitate
when added excess NaOH clear colourless solution
with no precipitate.

	Your Mark
2(a)(i)	
2(a)(ii)	
2(a)(iii)	
2(a)(iv)	
2(b)(i)	
2(b)(ii)	
2(b)(iii)	
2(b)(iv)	
2(c)	
2(d)	

Examiner marks and comments

Mark	Comment
1/1	pH is in the correct range (0–3).
2/2	Fizzing is observed. The correct tests on gases are produced and the results of the tests are clearly stated.
2/2	Fizzing is observed. The correct tests on gases are produced and the results of the tests are clearly stated.
1/1	The expected observation is given.
1/1	pH value is in the allowed range (10–14).
1/2	The wrong result is given for when excess aqueous sodium hydroxide is added. The answer should be insoluble.
1/2	The precipitate is incorrectly described as yellow instead of brown.
0/1	The candidate fails to note the presence of a precipitate.
2/2	Correct.
0/2	The candidate fails to work out that the pH value of 10 obtained in **(b)(i)** indicates the presence of hydroxide ions. The presence of iodide ions has been inferred from an erroneous observation in **(b)(iii)**.

EXAMINER COMMENTS | MARK SCHEME

(iii) Add aqueous silver nitrate to the third portion of solution **R** and leave to stand for about 5 minutes.
Record your observations.

Yellow ppt precipitate formed with colourless solution [2]

(iv) Add a spatula measure of iron(II) sulfate crystals to the fourth portion of solution **R** and shake the mixture.
Record your observations.

Solution went dark green. [1]

(c) Identify solution **Q**.

~~Sulphate~~ Sulfuric acid [2]

(d) Identify solution **R**.

Aluminium (III) iodide [2]

[Total: 16]

Select page

HIGH | MIDDLE | LOW

	Your Mark
2(a)(i)	
2(a)(ii)	
2(a)(iii)	
2(a)(iv)	
2(b)(i)	
2(b)(ii)	
2(b)(iii)	
2(b)(iv)	
2(c)	
2(d)	

Examiner marks and comments

Mark	Comment
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1/1	The expected observation is given.
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1/2	The wrong result is given for when excess aqueous sodium hydroxide is added. The answer should be insoluble.
1/2	The precipitate is incorrectly described as yellow instead of brown.
0/1	The candidate fails to note the presence of a precipitate.
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0/2	The candidate fails to work out that the pH value of 10 obtained in **(b)(i)** indicates the presence of hydroxide ions. The presence of iodide ions has been inferred from an erroneous observation in **(b)(iii)**.

EXAMINER COMMENTS | MARK SCHEME

Select page

HIGH | MIDDLE | LOW

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Carry out the following tests on solution **Q** and solution **R**, recording all of your observations at each stage.

tests on solution Q

(a) Divide solution **Q** into four equal portions in four test-tubes. Carry out the following tests.

(i) Use pH indicator paper to measure the pH of the first portion of solution **Q**.

pH 1 [1]

(ii) Add a 2 cm strip of magnesium ribbon to the second portion of solution **Q**. Test the gas given off.
Record your observations.

when magnesium was added it bubbled and when a lit splint was added it poped gas is hydrogen [2]

(iii) Add a spatula measure of sodium carbonate to the third portion of solution **Q**. Test the gas given off.
Record your observations.

bubble put gas through limewater turned cloudy, gas is co2 [2]

(iv) Add a few drops of dilute nitric acid and about 1 cm^3 of aqueous barium nitrate to the fourth portion of solution **Q**.
Record your observations.

cloudy percipate formed from colourless solution [1]

tests on solution R

(b) Divide solution **R** into four equal portions in four test-tubes. Carry out the following tests.

(i) Measure the pH of the first portion of solution **R**.

pH 3 [1]

(ii) Add several drops of aqueous sodium hydroxide to the second portion of solution **R** and shake the test-tube.
Then add excess aqueous sodium hydroxide to the test-tube.
Record your observations.

When added in small amounts unreacted when in excess still unreactive [2]

	Your Mark
2(a)(i)	
2(a)(ii)	
2(a)(iii)	
2(a)(iv)	
2(b)(i)	
2(b)(ii)	
2(b)(iii)	
2(b)(iv)	
2(c)	
2(d)	

Examiner marks and comments

Mark	Comment
1/1	pH is in the correct range (0–3).
2/2	Bubbles are seen and recorded. The lighted splint test is stated and the result obtained gains full credit.
2/2	Bubbles are recorded and 'limewater turns cloudy' is the expected test for carbon dioxide gas.
0/1	Cloudy, milky and turbid are not specific descriptions for a positive sulfate test. White precipitate is specific.
0/1	Incorrect.
0/2	The candidate shows a lack of knowledge and understanding of the use of aqueous sodium hydroxide to identify metal cations.
1/2	
0/1	The formation of precipitates in **(ii)** and **(iii)** is not recorded.
2/2	Solution Q is sulfuric acid. Hydrogen sulfate is allowed as an alternative name.
0/2	Solution R is aqueous calcium hydroxide. This is a guessed answer. Incorrect observations made earlier in the question lead to this error.

EXAMINER COMMENTS | MARK SCHEME

(iii) Add aqueous silver nitrate to the third portion of solution **R** and leave to stand for about 5 minutes.
Record your observations.

turned from clo colourless Solution to dark brown then to light brown then finally Stayed the same [2]

(iv) Add a spatula measure of iron(II) sulfate crystals to the fourth portion of solution **R** and shake the mixture.
Record your observations.

turned colourless clear ~~substance~~ solution to dark cream [1]

(c) Identify solution **Q**.

Hydrogen sulfate [2]

(d) Identify solution **R**.

ammonium ~~carbonate~~ sulfite [2]

[Total: 16]

Select page

HIGH | MIDDLE | LOW

Your Mark	
2(a)(i)	
2(a)(ii)	
2(a)(iii)	
2(a)(iv)	
2(b)(i)	
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EXAMINER COMMENTS | MARK SCHEME

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Carry out the following tests on solution **Q** and solution **R**, recording all of your observations at each stage.

tests on solution Q

(a) Divide solution **Q** into four equal portions in four test-tubes. Carry out the following tests.

(i) Use pH indicator paper to measure the pH of the first portion of solution **Q**.

pH ..... 2 ..... [1]

(ii) Add a 2 cm strip of magnesium ribbon to the second portion of solution **Q**. Test the gas given off.
Record your observations.

Tested for hydrogen and popping sound was heard. Hydrogen is given off [2]

(iii) Add a spatula measure of sodium carbonate to the third portion of solution **Q**. Test the gas given off.
Record your observations.

Tested for oxygen with a glowing splint and the splint relighted. Oxygen is present [2]

(iv) Add a few drops of dilute nitric acid and about 1 cm^3 of aqueous barium nitrate to the fourth portion of solution **Q**.
Record your observations.

Milky precipitate forms on top and when mixed becomes a solution [1]

tests on solution R

(b) Divide solution **R** into four equal portions in four test-tubes. Carry out the following tests.

(i) Measure the pH of the first portion of solution **R**.

pH ..... 12 ..... [1]

(ii) Add several drops of aqueous sodium hydroxide to the second portion of solution **R** and shake the test-tube.
Then add excess aqueous sodium hydroxide to the test-tube.
Record your observations.

Nothing happens. No reaction

..... [2]

	Your Mark
2(a)(i)	
2(a)(ii)	
2(a)(iii)	
2(a)(iv)	
2(b)(i)	
2(b)(ii)	
2(b)(iii)	
2(b)(iv)	
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2(d)	

Examiner marks and comments

Mark	Comment
1/1	Solution Q is sulfuric acid. pH is in the correct range (0–3).
0/2	The candidate does not record the observation that the mixture fizzes/bubbles. A test result is given but the test using a lighted splint is not given.
0/2	No observation is given. The candidate shows a lack of knowledge and understanding – the gas tested is thought to be oxygen instead of carbon dioxide.
0/1	The vague description of a milky precipitate instead of a white precipitate is penalised.
1/1	Solution R is aqueous calcium hydroxide and a pH in the allowed range (10–14) gained credit.
0/2	The formation of a white precipitate which does not dissolve in excess aqueous sodium hydroxide is the expected observation.
0/2	The candidate recognises the formation of a solid but no colour is described. No credit is given as a brown precipitate is not described.
0/1	The formation of a precipitate is recorded but the colour is described as black instead of green.
0/2	The candidate is unable to conclude that an acid is present despite the correct result for the test in **(a)(i)**.
0/2	The presence of hydroxide ions has not been inferred from the test in **(b)(i)**.

(iii) Add aqueous silver nitrate to the third portion of solution **R** and leave to stand for about 5 minutes.
Record your observations.

Clear on top and solid has formed at the bottom [2]

(iv) Add a spatula measure of iron(II) sulfate crystals to the fourth portion of solution **R** and shake the mixture.
Record your observations.

Dark Black precipitate [1]

(c) Identify solution **Q**.

Calcium [2]

(d) Identify solution **R**.

Ammonium [2]

[Total: 16]

Select page

HIGH | MIDDLE | LOW

	Your Mark
2(a)(i)	
2(a)(ii)	
2(a)(iii)	
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Examiner marks and comments

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EXAMINER COMMENTS | MARK SCHEME

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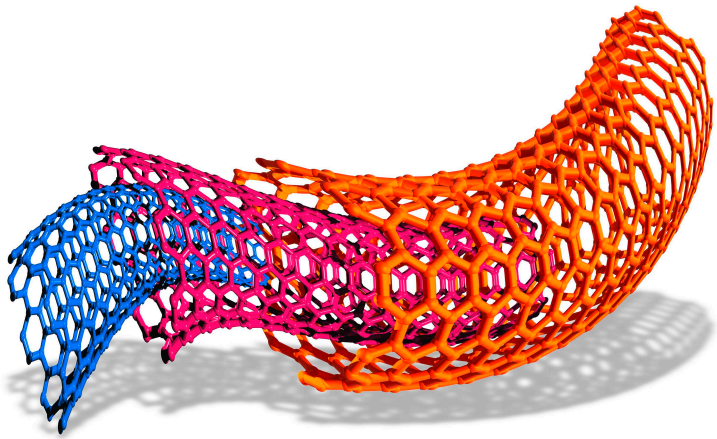
Interactive Example Candidate Responses

Paper 5 (May / June 2016), Question 3

Cambridge IGCSE™
Chemistry 0620



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3 A liquid cleaner is a mixture of three substances. These substances are shown in the table.

name of substance	properties of substance
water	liquid, boiling point 100 °C
sodium carbonate	solid, soluble in water
silica	solid, insoluble in water

Plan experiments to obtain separate pure samples of each substance from the mixture in the liquid cleaner. You are provided with common laboratory apparatus.

~~1) Divide 1) Pour 30cm³ of liquid~~
1) Measure 30cm³ of liquid cleaner using a burette and pour it into an ~~evaporating dish~~ flask with a conde on top
2) Heat it till 100°C. Condense the gas given off.
3) After condensation has occured add ~~a~~ anhydrous copper (II) sulfate ~~to measure~~ to the ~~liquid~~ gas conden (liquid). If ~~it~~ the solution goes blue, then the solution is pure water.
~~4) Now there are 2 substance left in the liquid~~

[6]

[Total: 6]

1) Measure 30cm³ of liquid cleaner using a burette.
2) Pour it into a funnel with filter paper and collect the left over in a ~~beak~~ flask
~~3) The residue left is the silica,~~
3) Take the residue off the filter paper, which is silica.
4) On top of the flask attach a condenser pipe and heat the flask till 100°C and condense the gas using i.e Have a thermometer to measure the temperatu inside the flask.
5) Test the condensed gas (liquid) ~~with~~ by adding anhydrous copper (II) sulfate, if the solution changes to ~~colour~~ blue then that means it is pure water.
6) ~~There must be crystals formed on the flask too~~

Continued on Pg 8

Your Mark

3 [ ]

Q3	Mark scheme
	silica filter (the cleaner) wash the residue dry the residue water heat (the filtrate/cleaner) condense the vapour sodium carbonate heat to dryness/no liquid left (then solid) sodium carbonate is left OR heat until saturated then cool to crystallise/leave to crystallise

Q3) 6) There must be crystals formed in the flask, wait for it to cool down, that is pure Sodium carbonate.

Select page

HIGH | MIDDLE | LOW

Your Mark

3

Q3	Mark scheme
	silica filter (the cleaner) wash the residue dry the residue water heat (the filtrate/cleaner) condense the vapour sodium carbonate heat to dryness/no liquid left (then solid) sodium carbonate is left OR heat until saturated then cool to crystallise/leave to crystallise

EXAMINER COMMENTS

MARK SCHEME

3 A liquid cleaner is a mixture of three substances. These substances are shown in the table.

name of substance	properties of substance
water	liquid, boiling point 100 °C
sodium carbonate	solid, soluble in water
silica	solid, insoluble in water

Plan experiments to obtain separate pure samples of each substance from the mixture in the liquid cleaner. You are provided with common laboratory apparatus.

Step 1: Boil off the water by using a bunsen and solution in a beaker. Collect the gas.
Step 2: Mix the remander with water then filter using filter paper and a funnel. The solid will be the silica
Step 3: again boil off the remaining liquid to obtain the sodium carbonate
Step 4: cool down the gas collected in step 1 to obtain the water

[6]

[Total: 6]

Your Mark

3

Examiner marks and comments

Mark	Comment
4/6	Silica is obtained from the mixture by filtration. The idea of purifying the silica by washing it with water and then drying the residue is not realised. Sodium carbonate is separated by evaporation. The candidate separates the water successfully in Steps 1 and 2.

3 A liquid cleaner is a mixture of three substances. These substances are shown in the table.

name of substance	properties of substance
water	liquid, boiling point 100 °C
sodium carbonate	solid, soluble in water
silica	solid, insoluble in water

Plan experiments to obtain separate pure samples of each substance from the mixture in the liquid cleaner. You are provided with common laboratory apparatus.

Filter the liquid cleaner to get the silica out of the mixture. Then use the distillation method to separate the water from the soluble sodium carbonate. Filtration method then simple distillation is the way to separate all of the substances

[6]

[Total: 6]

Select page

HIGH MIDDLE LOW

Your Mark

3

Examiner marks and comments

Mark	Comment
3/6	The candidate separates the silica from the mixture but does not purify it by washing with water and drying. Distillation separates the water. There is no detail as to how the sodium carbonate is obtained.

EXAMINER COMMENTS

MARK SCHEME

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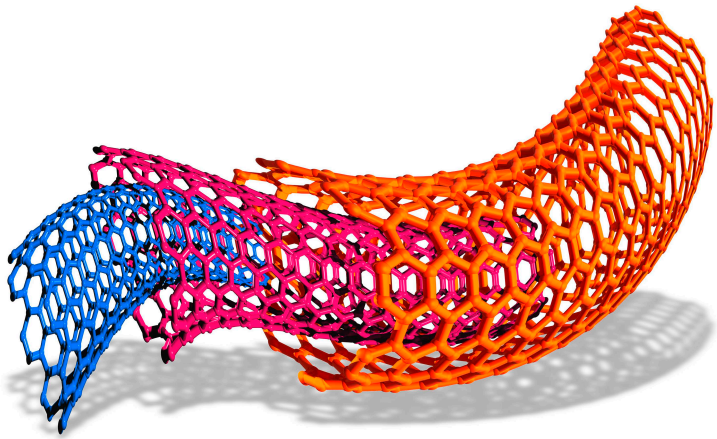
Interactive

Interactive Example Candidate Responses

Paper 6 (May / June 2016), Question 1

Cambridge IGCSE™
Chemistry 0620



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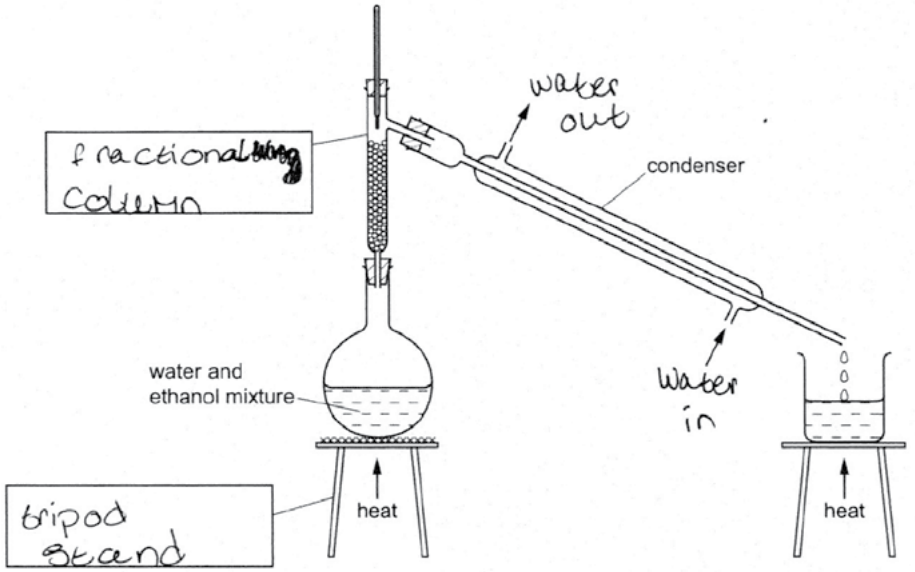
1 The diagram shows the apparatus used to separate a mixture of water, boiling point 100 °C, and ethanol, boiling point 78 °C.



(a) Complete the boxes to name the apparatus. [2]

(b) Label the arrows on the condenser. [1]

(c) Identify **one** mistake in the apparatus.

applying heat to beaker [1]

(d) Which liquid would collect first? Explain your answer.

ethanol water's ~~water~~; its boiling point is lower than ~~ethanols~~, boiling point ~~was lower than the boiling point of water~~ [2]

(e) Why would it be better to use an electrical heater instead of a Bunsen burner to heat the water and ethanol mixture?

ethanol is flammable [1]

[Total: 7]

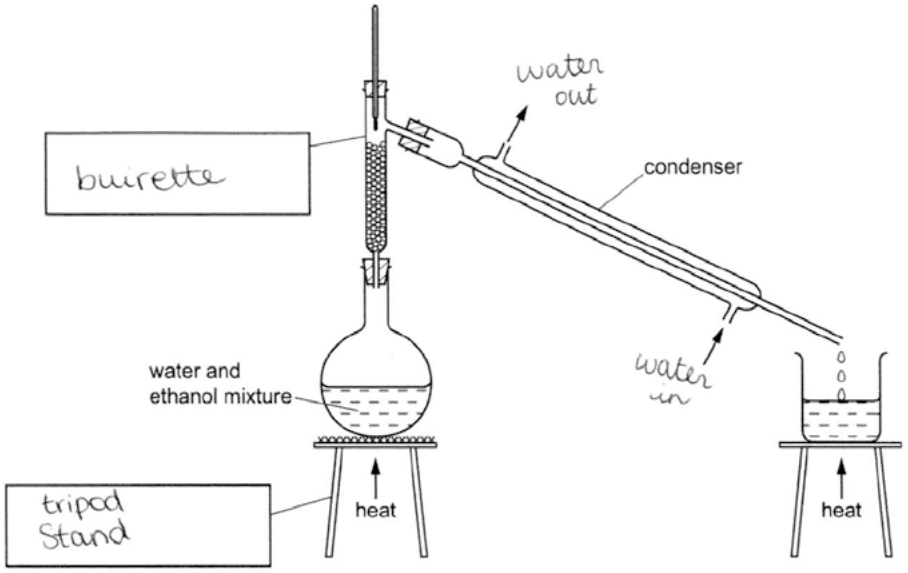
Select page

HIGH MIDDLE LOW

Your Mark		Examiner marks and comments	
		Mark	**Comment**
1(a)		**2/2**	Box 1: The mark scheme has 'fractionating column' but the answer given is close enough to score a mark. Box 2: The word 'tripod' alone scores the mark but the word 'stand' alone would not.
1(b)		**1/1**	Water' is all that was required for each of these labels, but the answers given are still better.
1(c)		**1/1**	The candidate does not use the wording in the mark scheme, but it is clear from their answer that they understand this.
1(d)		**2/2**	An incorrect answer has been crossed out and replaced with the correct one. It is important that incorrect answers are completely deleted by candidates. If two conflicting answers are given, no marks are scored.
1(e)		**1/1**	Almost the exact words on the mark scheme. It was not necessary for the candidate to state that an electrical heater would avoid the risk of fire.

EXAMINER COMMENTS MARK SCHEME

1 The diagram shows the apparatus used to separate a mixture of water, boiling point 100 °C, and ethanol, boiling point 78 °C.



(a) Complete the boxes to name the apparatus. [2]

(b) Label the arrows on the condenser. [1]

(c) Identify **one** mistake in the apparatus.

heat applied to condensed liquid [1]

(d) Which liquid would collect first? Explain your answer.

ethanol , it has a lower boiling point

[2]

(e) Why would it be better to use an electrical heater instead of a Bunsen burner to heat the water and ethanol mixture?

you can choose the exact temperature [1]

[Total: 7]

Select page

HIGH MIDDLE LOW

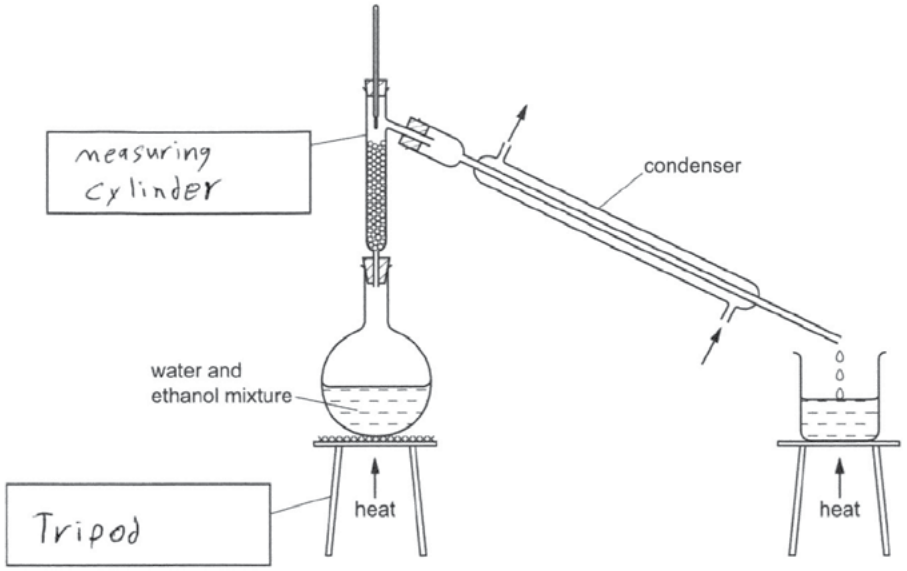
Your Mark	Examiner marks and comments	
	Mark	Comment
1(a)	1/2	Box 1: The candidate gives the name of a piece of apparatus with a similar shape but is clearly not familiar with the name specified in the mark scheme. Box 2: The word 'stand' is superfluous and would not have scored marks if used alone.
1(b)	1/1	No problems here. The word 'water' would have sufficed but there is nothing wrong with the answer given. Simply labelling 'in' and 'out' would not have scored marks.
1(c)	1/1	The mark scheme has 'heat applied under the beaker', but, since the beaker contains the condensed liquid, it is clear what the candidate means and the answer is still judged to be correct.
1(d)	2/2	A straightforward answer which almost exactly matches the mark scheme.
1(e)	0/1	It is true that an electrical heater allows the choice of a particular temperature. This is, however, not important in this experiment and it is not the reason given in the mark scheme.

EXAMINER COMMENTS MARK SCHEME

Select page

HIGH | MIDDLE | LOW

1 The diagram shows the apparatus used to separate a mixture of water, boiling point 100 °C, and ethanol, boiling point 78 °C.



(a) Complete the boxes to name the apparatus. [2]

(b) Label the arrows on the condenser. [1]

(c) Identify **one** mistake in the apparatus.

~~(Water and ethanol mixture)~~ Heat applied on collecting burrette. ~~(Heat in the)~~ [1]

(d) Which liquid would collect first? Explain your answer.

Water, because it will get seperated from ethanol. [2]

(e) Why would it be better to use an electrical heater instead of a Bunsen burner to heat the water and ethanol mixture?

For accurate heating. [1]

[Total: 7]

Your Mark	Examiner marks and comments	
	Mark	Comment
1(a)	1/2	Box 1: The candidate appears not to know the name of this piece of apparatus, perhaps because they haven't seen or done this experiment. Box 2: Correct and to the point.
1(b)	0/1	No answer given here. Candidates sometimes fail to answer questions which do not involve writing an answer on a line.
1(c)	0/1	Here the candidate has deleted a correct answer only to replace it with a wrong one. The use of the word 'burette' makes it wrong even though the word 'collecting' has been added. It is not wise for candidates to use words which they don't understand.
1(d)	0/2	The initial answer is wrong here, and so the reason, although there is some truth in it, cannot be correct either. Again, the candidate appears to be unfamiliar with this experiment.
1(e)	0/1	An electrical heater may result in 'accurate heating' but this is not the reason why it is used in this case.

EXAMINER COMMENTS | MARK SCHEME

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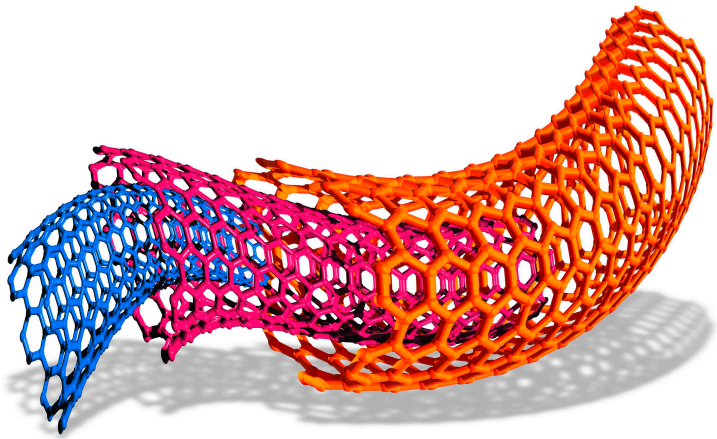
Interactive Example Candidate Responses

Paper 6 (May / June 2016), Question 2

Cambridge IGCSE™
Chemistry 0620



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Select page

HIGH | MIDDLE | LOW

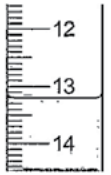
2 A student investigated the reaction between aqueous sodium carbonate and two different solutions of dilute hydrochloric acid, **A** and **B**.
The reaction is:

$$Na_2CO_3(aq) + 2HCl(aq) \rightarrow 2NaCl(aq) + H_2O(l) + CO_2(g)$$

Three experiments were carried out.

(a) *Experiment 1*

Using a measuring cylinder, 25 cm^3 of aqueous sodium carbonate were poured into a conical flask.
Thymolphthalein indicator was added to the conical flask.
A burette was filled up to the 0.0 cm^3 mark with solution **A** of dilute hydrochloric acid. **A** was added to the flask, until the solution just changed colour.
Use the burette diagram to record the reading in the table.

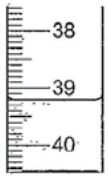


final reading

Experiment 2

Experiment 1 was repeated using methyl orange indicator instead of thymolphthalein.
Methyl orange is red-orange in acidic solutions and yellow in alkaline solutions.
Use the burette diagrams to record the readings in the table and complete the table.

initial reading



final reading

	experiment 1	experiment 2
final burette reading/cm^3	13.2	39.2
initial burette reading/cm^3	0.0	12.8
difference/cm^3	13.2	26.4

[4]

Your Mark

2(a) ☐
2(b) ☐
2(c) ☐
2(d) ☐
2(e) ☐
2(f) ☐
2(g) ☐
2(h)(i) ☐
2(h)(ii) ☐
2(i) ☐

Q2	Mark scheme
(a)	final readings completed correctly: 13.2, 39.2; initial readings completed correctly: 0.0, 12.8; differences completed correctly: 13.2, 26.4; all readings and differences to 1 decimal place;
(b)	yellow to orange/red/pink;
(c)	initial and final readings completed correctly: 9.9, 16.5; difference completed correctly: 6.6;
(d)	bubbles/fizzing/effervescence;
(e)	Experiment 2;
(f)	use a pipette/burette;
(g)	effect on results: none owtte; reason: no change in concentration owtte;
(h)(i)	2:1;
(h)(ii)	acid **B** is double the concentration of acid **A** ora/acid **B** is more concentrated ora;
(i)	any suitable correct and different method **M1** method; **M2** reagents; **M3** result;

EXAMINER COMMENTS | MARK SCHEME

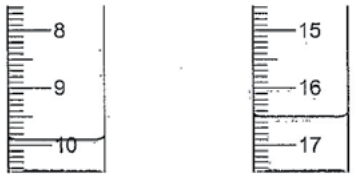
(b) What colour change was observed in the flask in experiment 2?

from ....yellow.... to ....orange.... [1]

(c) *Experiment 3*

Experiment 1 was repeated using solution **B** of acid instead of solution **A**.

Use the burette diagrams to record the readings in the table and complete the table.



initial reading final reading

	experiment 3
final burette reading/cm³	16.5
initial burette reading/cm³	9.9
difference/cm³	6.6

[2]

(d) Suggest **one** observation, other than colour change, that is made when hydrochloric acid is added to sodium carbonate.

....Effervescence and bubbles of a colourless gas.... [1]

(carbon dioxide)

(e) Complete the sentence below.

Experiment ...2... needed the largest volume of hydrochloric acid to change the colour of the indicator. [1]

(f) What would be a more accurate method of measuring the volume of the aqueous sodium carbonate?

....using a burette.... [1]

Select page

HIGH MIDDLE LOW

Your Mark

2(a) 2(b) 2(c) 2(d) 2(e) 2(f) 2(g) 2(h)(i) 2(h)(ii) 2(i)

Q2	Mark scheme
(a)	final readings completed correctly: 13.2, 39.2; initial readings completed correctly: 0.0, 12.8; differences completed correctly: 13.2, 26.4; all readings and differences to 1 decimal place;
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(c)	initial and final readings completed correctly: 9.9, 16.5; difference completed correctly: 6.6;
(d)	bubbles/fizzing/effervescence;
(e)	Experiment 2;
(f)	use a pipette/burette;
(g)	effect on results: none owtte; reason: no change in concentration owtte;
(h)(i)	2:1;
(h)(ii)	acid **B** is double the concentration of acid **A** ora/acid **B** is more concentrated ora;
(i)	any suitable correct and different method **M1** method; **M2** reagents; **M3** result;

EXAMINER COMMENTS MARK SCHEME

(g) What would be the effect on the results, if any, if the solutions of sodium carbonate were warmed before adding the hydrochloric acid? Give a reason for your answer.

effect on results ~~decrease~~ No change

reason Hard to decompose sodium (reactive metal) [2]

(h) (i) Determine the ratio of volumes of dilute hydrochloric acid used in experiments 1 and 3.

Experiment 3 used double volume of experiment 2 ~~1:1~~ 2:1 [1]

(ii) Use your answer to **(h)(i)** to deduce how the concentration of solution **A** differs from that of solution **B**.

Solution A is more concentrated (double) than solution B [1]

(i) Suggest a **different** method, using standard laboratory chemicals, to determine which of the solutions of dilute hydrochloric acid, **A** or **B**, is more concentrated.

Using the same mass and particle size of a reactive metal (e.g. magnesium), add each to a separate conical flask. Add a known volume of solution A (25cm³) to the first conical flask and measure the rate of gas (hydrogen) production over a period of time. Repeat with solution B (same volume of 25cm³) in the other flask, measure the rate of gas production over the same time. Compare. One that produced more gas at time interval has more concentrated acid solution. [3]

[Total: 17]

	Your Mark
2(a)	
2(b)	
2(c)	
2(d)	
2(e)	
2(f)	
2(g)	
2(h)(i)	
2(h)(ii)	
2(i)	

Q2	Mark scheme
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(d)	bubbles/fizzing/effervescence;
(e)	Experiment 2;
(f)	use a pipette/burette;
(g)	effect on results: none owtte; reason: no change in concentration owtte;
(h)(i)	2:1;
(h)(ii)	acid **B** is double the concentration of acid **A** ora/acid **B** is more concentrated ora;
(i)	any suitable correct and different method **M1** method; **M2** reagents; **M3** result;

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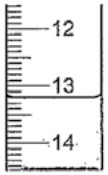
Thymolphthalein indicator was added to the conical flask.
A burette was filled up to the 0.0 cm³ mark with solution **A** of dilute hydrochloric acid. **A** was added to the flask, until the solution just changed colour.
Use the burette diagram to record the reading in the table.

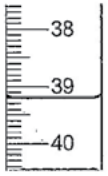


final reading

Experiment 2

Experiment 1 was repeated using methyl orange indicator instead of thymolphthalein.
Methyl orange is red-orange in acidic solutions and yellow in alkaline solutions.
Use the burette diagrams to record the readings in the table and complete the table.

initial reading



final reading

	experiment 1	experiment 2
final burette reading/cm³	14.8cm³	40.8cm³
initial burette reading/cm³	0.0cm³	13.2cm³
difference/cm³	14.8cm³	27.6cm³

[4]

Your Mark

2(a) 2(b) 2(c) 2(d) 2(e) 2(f) 2(g) 2(h)(i) 2(h)(ii) 2(i)

Q2	Mark scheme
(a)	final readings completed correctly: 13.2, 39.2; initial readings completed correctly: 0.0, 12.8; differences completed correctly: 13.2, 26.4; all readings and differences to 1 decimal place;
(b)	yellow to orange/red/pink;
(c)	initial and final readings completed correctly: 9.9, 16.5; difference completed correctly: 6.6;
(d)	bubbles/fizzing/effervescence;
(e)	Experiment 2;
(f)	use a pipette/burette;
(g)	effect on results: none owtte; reason: no change in concentration owtte;
(h)(i)	2:1;
(h)(ii)	acid **B** is double the concentration of acid **A** ora/acid **B** is more concentrated ora;
(i)	any suitable correct and different method **M1** method; **M2** reagents; **M3** result;

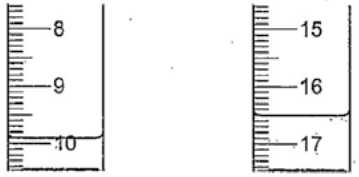
(b) What colour change was observed in the flask in experiment 2?

from ..yellow.. to ..red-orange.. [1]

(c) *Experiment 3*

Experiment 1 was repeated using solution **B** of acid instead of solution **A**.

Use the burette diagrams to record the readings in the table and complete the table.



initial reading final reading

	experiment 3
final burette reading/cm³	17.5cm³ ~~10.1~~
initial burette reading/cm³	10.1 cm³
difference/cm³	7.4 cm³

[2]

(d) Suggest **one** observation, other than colour change, that is made when hydrochloric acid is added to sodium carbonate.

..a gas is formed.. [1]

(e) Complete the sentence below.

Experiment ...2.... needed the largest volume of hydrochloric acid to change the colour of the indicator. [1]

(f) What would be a more accurate method of measuring the volume of the aqueous sodium carbonate?

..using a Volumetric pipette.. [1]

Select page

HIGH MIDDLE LOW

	Your Mark
2(a)	
2(b)	
2(c)	
2(d)	
2(e)	
2(f)	
2(g)	
2(h)(i)	
2(h)(ii)	
2(i)	

Q2	Mark scheme
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(e)	Experiment 2;
(f)	use a pipette/burette;
(g)	effect on results: none owtte; reason: no change in concentration owtte;
(h)(i)	2:1;
(h)(ii)	acid **B** is double the concentration of acid **A** ora/acid **B** is more concentrated ora;
(i)	any suitable correct and different method **M1** method; **M2** reagents; **M3** result;

EXAMINER COMMENTS MARK SCHEME

(g) What would be the effect on the results, if any, if the solutions of sodium carbonate were warmed before adding the hydrochloric acid? Give a reason for your answer.

effect on results The reaction would be fast.

reason There are particles with the activation energy [2]

(h) (i) Determine the ratio of volumes of dilute hydrochloric acid used in experiments 1 and 3.

2 : 1 [1]

(ii) Use your answer to **(h)(i)** to deduce how the concentration of solution **A** differs from that of solution **B**.

Solution A is twice the Concentration of Concentrated than solution B [1]

(i) Suggest a **different** method, using standard laboratory chemicals, to determine which of the solutions of dilute hydrochloric acid, **A** or **B**, is more concentrated.

You could react it with a base. You let take 20mg of Sodium Carbonate and then add 5a 40cm³ of Sample A of an HCl and then note the time. You repeat this for the other sample of the acid. You then Compare the time, so that the fastest is more Concentrated than the other one. [3]

[Total: 17]

Select page

HIGH | MIDDLE | LOW

	Your Mark
2(a)	
2(b)	
2(c)	
2(d)	
2(e)	
2(f)	
2(g)	
2(h)(i)	
2(h)(ii)	
2(i)	

Q2	Mark scheme
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(e)	Experiment 2;
(f)	use a pipette/burette;
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(h)(i)	2:1;
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(i)	any suitable correct and different method **M1** method; **M2** reagents; **M3** result;

EXAMINER COMMENTS | MARK SCHEME

Select page

HIGH | MIDDLE | LOW

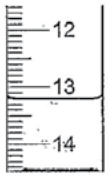
2 A student investigated the reaction between aqueous sodium carbonate and two different solutions of dilute hydrochloric acid, **A** and **B**.
The reaction is:

$$Na_2CO_3(aq) + 2HCl(aq) \rightarrow 2NaCl(aq) + H_2O(l) + CO_2(g)$$

Three experiments were carried out.

(a) *Experiment 1*

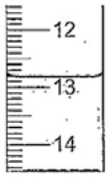
Using a measuring cylinder, 25 cm^3 of aqueous sodium carbonate were poured into a conical flask.
Thymolphthalein indicator was added to the conical flask.
A burette was filled up to the 0.0 cm^3 mark with solution **A** of dilute hydrochloric acid. **A** was added to the flask, until the solution just changed colour.
Use the burette diagram to record the reading in the table.



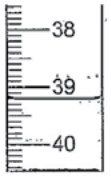
final reading

Experiment 2

Experiment 1 was repeated using methyl orange indicator instead of thymolphthalein.
Methyl orange is red-orange in acidic solutions and yellow in alkaline solutions.
Use the burette diagrams to record the readings in the table and complete the table.



initial reading



final reading

	experiment 1	experiment 2
final burette reading/cm^3	13.2	39.2
initial burette reading/cm^3	0	12.8
difference/cm^3	13.2	26.4

[4]

Your Mark

2(a) ☐
2(b) ☐
2(c) ☐
2(d) ☐
2(e) ☐
2(f) ☐
2(g) ☐
2(h)(i) ☐
2(h)(ii) ☐
2(i) ☐

Q2	Mark scheme
(a)	final readings completed correctly: 13.2, 39.2; initial readings completed correctly: 0.0, 12.8; differences completed correctly: 13.2, 26.4; all readings and differences to 1 decimal place;
(b)	yellow to orange/red/pink;
(c)	initial and final readings completed correctly: 9.9, 16.5; difference completed correctly: 6.6;
(d)	bubbles/fizzing/effervescence;
(e)	Experiment 2;
(f)	use a pipette/burette;
(g)	effect on results: none owtte; reason: no change in concentration owtte;
(h)(i)	2:1;
(h)(ii)	acid **B** is double the concentration of acid **A** ora/acid **B** is more concentrated ora;
(i)	any suitable correct and different method **M1** method; **M2** reagents; **M3** result;

EXAMINER COMMENTS | MARK SCHEME

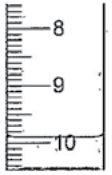
(b) What colour change was observed in the flask in experiment 2?

from ..red-orange.. to ..Yellow.. [1]

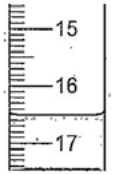
(c) *Experiment 3*

Experiment 1 was repeated using solution **B** of acid instead of solution **A**.

Use the burette diagrams to record the readings in the table and complete the table.



initial reading



final reading

	experiment 3
final burette reading/cm³	16.5
initial burette reading/cm³	9.9
difference/cm³	6.6

[2]

(d) Suggest **one** observation, other than colour change, that is made when hydrochloric acid is added to sodium carbonate.

..~~Bubbles~~ Bubbles are formed.. [1]

(e) Complete the sentence below.

Experiment ..3.. needed the largest volume of hydrochloric acid to change the colour of the indicator. [1]

(f) What would be a more accurate method of measuring the volume of the aqueous sodium carbonate?

..~~Measuring cylinder~~ Pipette.. [1]

Select page

HIGH MIDDLE LOW

Your Mark

2(a) 2(b) 2(c) 2(d) 2(e) 2(f) 2(g) 2(h)(i) 2(h)(ii) 2(i)

Q2	Mark scheme
(a)	final readings completed correctly: 13.2, 39.2; initial readings completed correctly: 0.0, 12.8; differences completed correctly: 13.2, 26.4; all readings and differences to 1 decimal place;
(b)	yellow to orange/red/pink;
(c)	initial and final readings completed correctly: 9.9, 16.5; difference completed correctly: 6.6;
(d)	bubbles/fizzing/effervescence;
(e)	Experiment 2;
(f)	use a pipette/burette;
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(h)(i)	2:1;
(h)(ii)	acid **B** is double the concentration of acid **A** ora/acid **B** is more concentrated ora;
(i)	any suitable correct and different method **M1** method; **M2** reagents; **M3** result;

EXAMINER COMMENTS

MARK SCHEME

(g) What would be the effect on the results, if any, if the solutions of sodium carbonate were warmed before adding the hydrochloric acid? Give a reason for your answer.

effect on results ....Different temperature....

reason ....the sodium carbonate ~~is should be eat~~ will react faster....

[2]

(h) (i) Determine the ratio of volumes of dilute hydrochloric acid used in experiments 1 and 3.

....19.8.... [1]

(ii) Use your answer to **(h)(i)** to deduce how the concentration of solution **A** differs from that of solution **B**.

....The ratio of solution A is higher and more concentrated.... [1]

(i) Suggest a **different** method, using standard laboratory chemicals, to determine which of the solutions of dilute hydrochloric acid, **A** or **B**, is more concentrated.

Using ~~Conical flask~~ Burrette and thymolphthalein indicator and ~~adding~~ adding dilute ~~hydro~~ hydrochloric acid and the more acidic solution is the more concentrated and we can know that by the red ~~color~~ or orange or orange color. [3]

[Total: 17]

Select page

HIGH | MIDDLE | LOW

	Your Mark
2(a)	
2(b)	
2(c)	
2(d)	
2(e)	
2(f)	
2(g)	
2(h)(i)	
2(h)(ii)	
2(i)	

Q2	Mark scheme
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(i)	any suitable correct and different method **M1** method; **M2** reagents; **M3** result;

EXAMINER COMMENTS

MARK SCHEME

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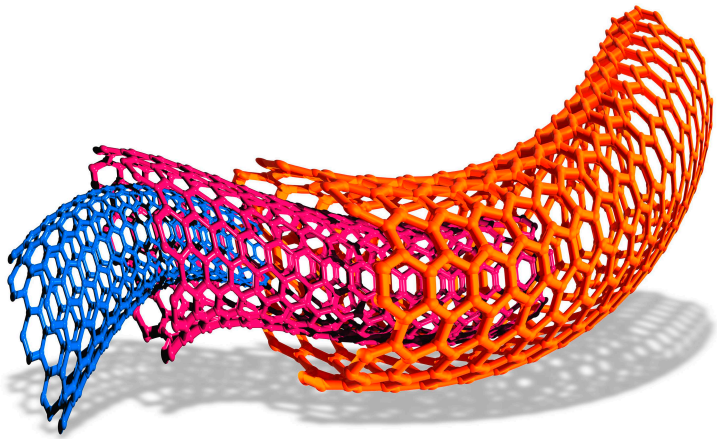
Interactive

Interactive Example Candidate Responses

Paper 6 (May / June 2016), Question 3

Cambridge IGCSE™
Chemistry 0620



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Select page

HIGH | MIDDLE | LOW

3 Two substances, **C** and **D**, were analysed. Solid **C** was a salt and solution **D** was an aqueous solution of chromium(III) chloride.
The tests on solid **C**, and some of the observations, are in the following table.

tests	observations
tests on solid **C** Solid **C** was added to distilled water in a test-tube and shaken to dissolve. The solution was divided into two portions in test-tubes, and the following tests carried out. Appearance of the solution. The pH of the first portion of the solution was tested.	 colourless liquid pH = 7
Dilute nitric acid was added to the second portion of the solution followed by aqueous silver nitrate.	cream precipitate
A flame test was carried out on solid **C**.	yellow flame colour

(a) Identify solid **C**.

Sodium Bromide ..... [2]

(b) Describe the appearance of solution **D**.

green colour solution ..... [1]

(c) Tests were carried out on solution **D**.

Complete the observations for tests 1, 2 and 3.

(i) test 1

Drops of aqueous sodium hydroxide were added to solution **D**.

Excess aqueous sodium hydroxide was then added to the mixture.

observations green precipitate soluble in excess so aqueous sodium hydroxide ..... [3]

Your Mark

3(a) ☐

3(b) ☐

3(c)(i) ☐

3(c)(ii) ☐

3(c)(iii) ☐

3(d) ☐

Q3	Mark scheme
(a)	sodium; bromide;
(b)	green;
(c)(i)	green; precipitate; with excess, green solution/clear/dissolves;
(c)(ii)	grey-green; precipitate;
(c)(iii)	white precipitate;
(d)	fume cupboard/protective clothing, e.g. gloves or goggles;

EXAMINER COMMENTS | MARK SCHEME

(ii) **test 2**

Excess aqueous ammonia was added to solution **D**.

observations grey-green precipitate insoluble in excess [2]

(iii) **test 3**

Dilute nitric acid was added to solution **D** followed by aqueous silver nitrate.

observations White precipitate [1]

(d) Chromium(III) can be converted to chromium(VI). Chromium(VI) is hazardous.

Suggest **one** safety precaution when using chromium(VI).

Wear gloves [1]

[Total: 10]

NaOH
green ppt
soluble

NH4OH
grey-green
insoluble

C
Salt
soluble
no transition
bromide ion
Na

D
solution
chromium (III) chloride

Select page

HIGH | MIDDLE | LOW

	Your Mark
3(a)	
3(b)	
3(c)(i)	
3(c)(ii)	
3(c)(iii)	
3(d)	

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EXAMINER COMMENTS

MARK SCHEME

Select page

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Dilute nitric acid was added to the second portion of the solution followed by aqueous silver nitrate.	cream precipitate
A flame test was carried out on solid **C**.	yellow flame colour

(a) Identify solid **C**.

bromide ion ..... [2]

(b) Describe the appearance of solution **D**.

blue liquid ..... [1]

(c) Tests were carried out on solution **D**.

Complete the observations for tests 1, 2 and 3.

(i) test 1

Drops of aqueous sodium hydroxide were added to solution **D**.

Excess aqueous sodium hydroxide was then added to the mixture.

observations green precipitate, which is soluble in excess ..... [3]

Your Mark

3(a) ☐

3(b) ☐

3(c)(i) ☐

3(c)(ii) ☐

3(c)(iii) ☐

3(d) ☐

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(c)(i)	green; precipitate; with excess, green solution/clear/dissolves;
(c)(ii)	grey-green; precipitate;
(c)(iii)	white precipitate;
(d)	fume cupboard/protective clothing, e.g. gloves or goggles;

EXAMINER COMMENTS | MARK SCHEME

(ii) test 2

Excess aqueous ammonia was added to solution **D**.

observations ....green precipitate which is insoluble [2]

(iii) test 3

Dilute nitric acid was added to solution D followed by aqueous silver nitrate.

observations White precipitate which is soluble [1]

(d) Chromium(III) can be converted to chromium(VI). Chromium(VI) is hazardous.

Suggest **one** safety precaution when using chromium(VI).

~~Using it in a fume cupboard and~~ wearing gloves and goggles while using ~~it~~ it. [1]

[Total: 10]

Select page

HIGH | MIDDLE | LOW

	Your Mark
3(a)	
3(b)	
3(c)(i)	
3(c)(ii)	
3(c)(iii)	
3(d)	

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EXAMINER COMMENTS

MARK SCHEME

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Dilute nitric acid was added to the second portion of the solution followed by aqueous silver nitrate.	cream precipitate
A flame test was carried out on solid **C**.	yellow flame colour

(a) Identify solid **C**.

Bromine ..... [2]

(b) Describe the appearance of solution **D**.

Shiny ..... [1]

(c) Tests were carried out on solution **D**.

Complete the observations for tests 1, 2 and 3.

(i) test 1

Drops of aqueous sodium hydroxide were added to solution **D**.

Excess aqueous sodium hydroxide was then added to the mixture.

observations becomes ~~green~~ Shiner more Shiny ..... [3]

Your Mark

3(a) ☐

3(b) ☐

3(c)(i) ☐

3(c)(ii) ☐

3(c)(iii) ☐

3(d) ☐

Q3	Mark scheme
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(c)(ii)	grey-green; precipitate;
(c)(iii)	white precipitate;
(d)	fume cupboard/protective clothing, e.g. gloves or goggles;

(ii) **test 2**

Excess aqueous ammonia was added to solution **D**.

observations Gets Soft [2]

(iii) **test 3**

Dilute nitric acid was added to solution **D** followed by aqueous silver nitrate.

observations ..... [1]

(d) Chromium(III) can be converted to chromium(VI). Chromium(VI) is hazardous.

Suggest **one** safety precaution when using chromium(VI).

Safety goggles. [1]

[Total: 10]

Select page

HIGH | MIDDLE | LOW

Your Mark

3(a)

3(b)

3(c)(i)

3(c)(ii)

3(c)(iii)

3(d)

Q3	Mark scheme
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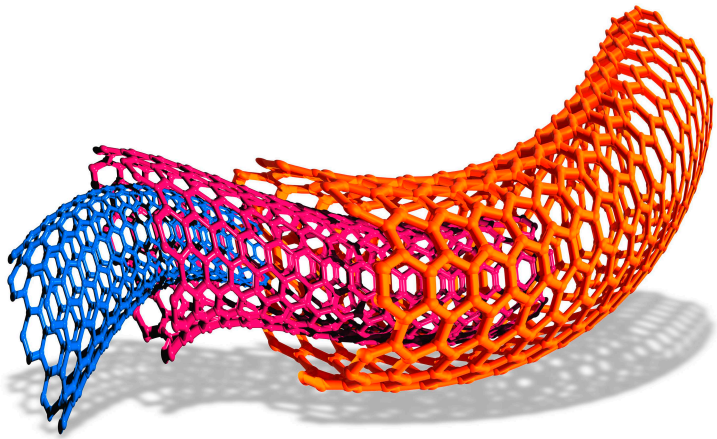
Paper 6 (May / June 2016), Question 4

Cambridge IGCSE™
Chemistry 0620



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4 Calcium burns in air to form calcium oxide. The reaction is vigorous and some of the calcium oxide can be lost as smoke.
Plan an investigation to determine the maximum mass of oxygen that combines to form calcium oxide when 2g of calcium granules are burnt in air.
You are provided with common laboratory apparatus and calcium granules.

First weigh out exactly 2g of calcium, then place them in a crucible in a fume cuboard. Start heating it slowly, and occasionally open the crucible to allow more oxygen through. When all of the calcium has reacted, (calcium oxide) let the CaO cool for a while. Then reweigh it. To calculate the mass of oxygen formed, (calcium oxide) subtract the mass of the CaO from the mass of calcium.

[6]

[Total: 6]

Select page

HIGH | MIDDLE | LOW

Your Mark

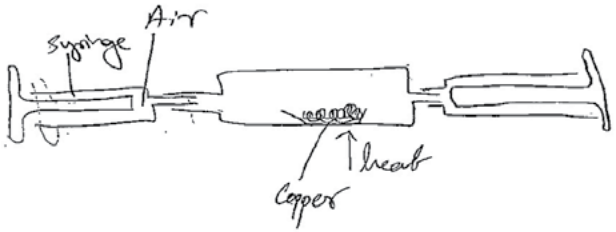
4 ☐

Q4	Mark scheme
	any 6 from: weigh calcium; with lid/cover; heat/burn; allow air to enter/lift lid; cool; reweigh CaO; reheat to constant mass; calculate/find the difference;

EXAMINER COMMENTS

MARK SCHEME

4 Calcium burns in air to form calcium oxide. The reaction is vigorous and some of the calcium oxide can be lost as smoke.
Plan an investigation to determine the maximum mass of oxygen that combines to form calcium oxide when 2 g of calcium granules are burnt in air.
You are provided with common laboratory apparatus and calcium granules.



take 2g of Calcium granules in dish Connect it to 2 air syringes one of them must be filled with air then ~~be~~ put at and under the Copper and push the air from side to side by the syringes the Volume of air will start decreasing till it reaches Volume then you remove all the apparatus take the Calcium oxide after the reaction measure the mass then subtract it from 2g it will give you the mass of oxygen reacted with 2g of Calcium use gloves and wear eye ~~goggles~~ goggles [6]

[Total: 6]

Select page

HIGH | MIDDLE | LOW

Your Mark

4

Q4	Mark scheme
	any 6 from: weigh calcium; with lid/cover; heat/burn; allow air to enter/lift lid; cool; reweigh CaO; reheat to constant mass; calculate/find the difference;

EXAMINER COMMENTS

MARK SCHEME

Select page

HIGH | MIDDLE | LOW

4 Calcium burns in air to form calcium oxide. The reaction is vigorous and some of the calcium oxide can be lost as smoke.
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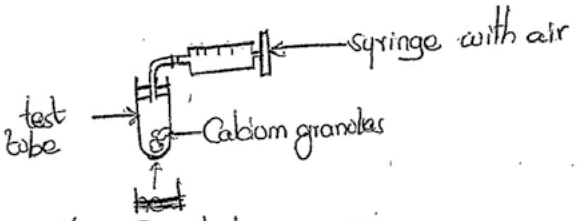
You are provided with common laboratory apparatus and calcium granules.



You ~~Can~~ take a 50cm³ syringe and fill it in with air which Contains oxygen. You take the Calcium granules and place them inside the test tube. You the starting releasing the air using a tube into the test to make sure there is no air already or no air Comes in. You then wait for Smoke to be produced and then you check the initial temperature of the air on the Cylinder and Compare it to the final [6]
The Volume you get you sublimate to a solid [Total: 6]
and then you measure the mass of the solid.

Your Mark

4 ☐

Q4	Mark scheme
	any 6 from: weigh calcium; with lid/cover; heat/burn; allow air to enter/lift lid; cool; reweigh CaO; reheat to constant mass; calculate/find the difference;

EXAMINER COMMENTS

MARK SCHEME

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