

Ce	ntre Number
71	
Cano	didate Number

General Certificate of Secondary Education 2013–2014

Double Award Science: Chemistry

Unit C1

Higher Tier

[GSD22]



THURSDAY 15 MAY 2014, MORNING

TIME

1 hour, plus your additional time allowance.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.

Write your answers in the spaces provided in this question paper. Answer **all eight** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 70.

Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question. Quality of written communication will be assessed in Question 7. A Data Leaflet, which includes a Periodic Table of the Elements, is included in this question paper.

For Examiner's use only	
Question Number	Marks
1	
2	
3	
4	
5	
6	
7	
8	

Total	
iotai	
Marks	

	assium is a soft metal that can be cut with a knife. It reacts violently chlorine to form potassium chloride.	Examin Marks	er Only Remark
(a)	Complete and balance the symbol equation below for the reaction of potassium with chlorine.		
	$K + Cl_2 \rightarrow$ [2]		
(b)	Describe the appearance of a piece of freshly cut potassium.		
	[1]		
(c)	What happens to the freshly cut potassium when it is left in the air for a few minutes?		
	[1]		
(d)	Why is potassium stored under oil in the laboratory?		
	[1]		
(e)	Before reacting Group 1 elements with water a risk assessment is carried out. Wearing safety glasses is one safety precaution that must be included in the risk assessment. Write down two other safety precautions.		
	2 [2]		

1

(f) Equal sized pieces of three Group 1 metals are added to separate troughs of water that contain universal indicator.

The observations made are recorded in the table below.

Examin	er Only
Marks	Remark

Name of Group 1 metal	Observation when the metal is added to water	Colour of universal indicator
potassium	 catches fire burns with a lilac flame on the surface of the water quickly disappears 	changes colour from green to blue
lithium	 floats moves about the surface of the water eventually disappears 	changes colour from green to blue
sodium	 melts into a silvery ball on the surface of the water disappears 	changes colour from green to blue

Read the information in the table carefully.

	ad the information in the table earling.	
(i)	What happens to the reactivity of the Group 1 elements as the Group is descended? You may find your Data Leaflet helpful.	
		[1]
(ii)	Explain fully why the universal indicator changed colour from green to blue.	
		[3]
(iii)	Write down one more observation which could be added to the table for all three reactions.	
		[1]
(iv)	Write a word equation to describe the reaction between sodium and water.	1

9476.04 ML 3 [Turn over

[2]

	what is meant by the		ay into Groups. Explai	n
				[1]
Fini	ish the sentence bel	OW.		
(b)	In his Periodic Tab	e, Mendeleev arranged	the elements in order	of
	increasing		·	[1]
	5 of the Periodic Ta	able. Fill in the missing i	nformation. Metal/Non-metal	
		-		
	phosphorus			
		Bi		
				[2]
(d)	Nitrogen is also a 0	Group 5 element. What	Period is nitrogen in?	
	Period			[1]
(e)		electronic configuration p 5 of the Periodic Tab	e.	
				[2]

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(Questions continue overleaf)

	gnesium chloride is produced in one type of fire extinguisher by the ction of acid A and the base, magnesium hydroxide.		Marks
(a)	Write down the name of acid A that reacts with magnesium hydroxic to produce magnesium chloride.	de	
		[1]	
(b)	Why is magnesium hydroxide described as a base and not as an alkali?		
		[1]	
(c)	Explain why the reaction between acid A and magnesium hydroxide a neutralisation reaction.	e is	
		[1]	
	gnesium chloride is also formed by the reaction of magnesium oxide acid A.		
(d)	What would you expect to observe when acid A is added to magnesium oxide?		
		[2]	

(e) A solution of 0.05 mol/dm³ acid Y was tested using a pH meter and universal indicator paper. The results are recorded in the table below.

Examiner Only		
Marks	Remark	

Test	Result
pH meter	pH = 3.03
Universal indicator	orange pH = 3

(i)	Explain how the colour of universal indicator is used to give a
	pH value.

		[1]

(ii) How do the results show that acid Y is a weak acid	(ii)	How do the	e results	show	that	acid	Υ	is	a weak	acio	? b
---	------	------------	-----------	------	------	------	---	----	--------	------	------------

[1

mass	volume	concentration	strength	
				[1]

4 (a) An investigation was carried out to find the solubility (g/100 g H₂O) of potassium chloride at different temperatures. The results are given in the table below.

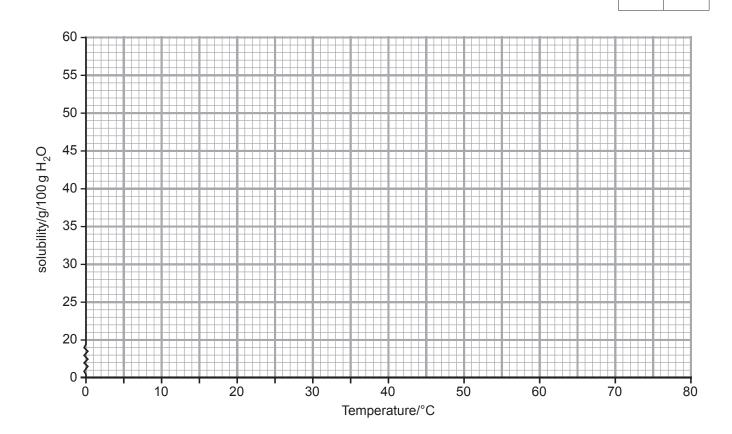
Temperature (°C)	0	10	20	30	40	50	60	80
Solubility (g/100 g H ₂ O)	27.8	30.9	34.0	37.1	40.0	42.9	45.8	51.2

(i) At 70 °C, 12.1 g of potassium chloride will saturate 25 g of water. Calculate the solubility of potassium chloride at 70 °C. (You must show your working out.)

g/	100	g	H_2O	[1]
 _		_		

Examiner Only

(ii) Draw the solubility curve for potassium chloride. Do this on the grid below. [3]



(b) Look at the table below. It gives the solubility (g/100 g H₂O) at different temperatures for four **solid** compounds, A, B, C and D.

Solid	Calid		Solubi	lity (g/100 g	g H ₂ O)		
Solid	0°C	10 °C	20 °C	30 °C	40 °C	60 °C	80 °C
Α	60.0	66.7	73.9	81.8	88.7	106.0	132.0
В	12.3	16.4	18.6	25.0	31.6	40.4	49.0
С	0.22	0.24	0.25	0.26	0.26	0.24	0.23
D	79.2	85.4	94.2	105.0	119.0	158.0	187.0

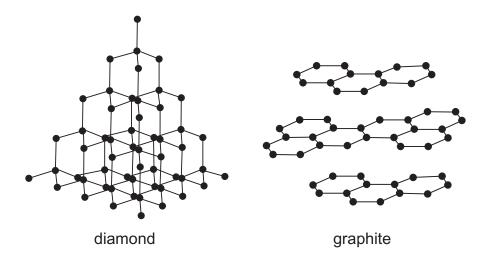
(i)	Use the data in the table to complete the following general	rulo	Examin	er Only
(1)	, , , , , , , , , , , , , , , , , , ,		Marks	Remark
	For most solids the solubility	as the		
	temperature	[1]		
(ii)	One of the compounds in the table does not follow this solurule. Describe fully what happens to the solubility of this solid as temperature is increased from 0 °C to 80 °C.	s the		
		[2]		
(iii)	Calculate the mass of solid B which will crystallise when a saturated solution of B, in 50 g of water, is cooled from 60° 10°C. (You must show your working out.)	°C to		
	Answer	g [2]		

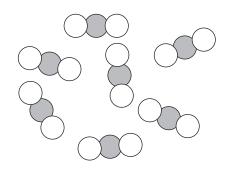
The formula for sodium oxide is Na ₂ O.		Examin	
(a) Draw diagrams to show how two sodium ions and an oxide ion at formed when two sodium atoms react with an oxygen atom.	·e	Marks	Remark
	[4]		
(b) Explain how the ions are held together in the compound, sodium			
oxide.			
	 [2]		
	[-]		

5

6 Look at the diagrams below. They show the structures of two allotropes of carbon, diamond and graphite, and of carbon dioxide. The atoms of each substance are held together by covalent bonds.

Examin	er Only
Marks	Remark





carbon dioxide

(a) What are allotropes?

Allotropes are _____

_____[2]

(b) Explain how a covalent bond is formed.

______[1]

(c)	Draw a dot and cross diagram to carbon dioxide. (Show all the example)	o show the bonding in a molecuelectrons)	le of	Examine Marks	r Only Remark
			[3]		
(d)	Write down the names of the ty the table below. The first one is	pe of structure of each substanc done for you.	e in		
	Substance	Type of structure			
	diamond	giant covalent			
	graphite				
	carbon dioxide				
L	,		[2]		
Gra	phite is used in pencil leads.				
(e)	Explain why it is used in pencil graphite in your answer.	leads. Write about the structure	of		
			[2]		

Describe the structure and bonding in a metal and explain why metals luctile.	are Exam
ou will be assessed on your written communication skills include he use of specialist science terms.	ding
	[6]

		ing information in the table e conduct electricity.	below to show how lead a	and
Substance		Name of particle which moves and carries the charge	Effect on the substance due to the passage of electricity	
ļ	ead			
lead(I) bromide			
` '	•	questions are about the rea he electrolysis of molten lea		[4]
an	•	he electrolysis of molten lea		
(i)	ode during t What is ar	he electrolysis of molten lea	ad(II) bromide.	[4 _]
(i)	ode during t What is ar Write a ha	he electrolysis of molten lean anode?	ad(II) bromide.	_ [1]

Examiner Only

Marks Remark

THIS IS THE END OF THE QUESTION PAPER

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