

Centre Number				
71				
Cano	didate Number			

General Certificate of Secondary Education 2013–2014

Science: Single Award

Unit 2 (Chemistry)

Higher Tier

[GSS22]





TIME

1 hour 15 minutes.

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 nine** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 75.

Quality of written communication will be assessed in Questions 3(a) and 9.

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

For Exa use	miner's only
Question Number	Marks
1	
2	
3	
4	
5	
6	
7	
8	
9	
Total Marks	

The diagram below shows an atom of an element.		Examin Marks	ier C Re
Key Key Ne X Ele	oton eutron ectron	Marks	Re
(a) Complete the diagram above by adding labels to the two boxes.(b) What is the atomic number of this element?	[2]		
(c) What is meant by the term mass number?	[1]		
	[1]		
(d) To which group of the Periodic Table does this element belong? Explain your answer in terms of its electronic structure.			
	_ [2]		

(e)	Oxy	ygen has eight electrons. Complete the diagram below to show the	Examin	er Only Romark
	ele	ctronic structure of oxygen.	Marks	Remark
		[1]	
(f)	(i)	Name the compound formed in the reaction between magnesium		
			_	
		[1]	
	(ii)	What is the name given to this type of reaction?		
	()		_	
		[1]	

2 The table below shows the percentage of the most common elements found in the igneous rocks in the Earth's crust.

Element	Percentage
Aluminium	8.1
Calcium	3.6
Iron	5.0
Magnesium	2.1
Oxygen	47.0
Phosphorus	0.1
Potassium	2.6
Silicon	28.0
Sodium	2.9
Titanium	0.6

Use the information in the table and your knowledge to answer the following questions.

You may find your Data Leaflet helpful.

(a) Igneous rocks are only one type of rock. Name the other two types.

	and	[2]
(b)	Name the most common metal in the Earth's crust.	
		[1]

(c) Calculate the total percentage of alkaline earth metals in the Earth's crust.

_____% [1]

Examiner Only

Marks Remark

(a)	Potassium and sodium are Group 1 metals. Compare their reactivity with water.	Examiner Only Marks Rema
	Your answer should include:	
	 two similarities between the reactions two differences between the reactions the products of one of the reactions 	
	In this question you will be assessed on your written communication skills including the use of specialist scientific terms.	
	[6]	
(b)	Francium is another Group 1 metal. Explain fully why it is not used in the school laboratory to demonstrate the reactions of Group 1 metals with water.	
	[2]	

- ANTACL © ZernLiew/iStock/Thinkstock (a) Complete the word equation for the reaction between stomach acid and the antacid tablet. + hydrochloric sodium ++ \rightarrow acid hydrogencarbonate [3] (b) Suggest one reason why antacid tablets do **not** contain sodium hydroxide. _ [1] (c) Sodium hydrogencarbonate is also found in baking soda. The symbol equation showing the effect of heat on sodium hydrogencarbonate is given below. Balance this equation. $NaHCO_3 \rightarrow Na_2CO_3 + H_2O + CO_2$ [1]
- Acid indigestion is caused by excess hydrochloric acid in the stomach. 4 It can be treated using antacid tablets which contain sodium hydrogencarbonate.

Examiner Only

Marks Remark

(a)	Spii	nel (MgAl ₂ O ₄) is a mineral that contains aluminium.	Examiner Marks F	· On Rem
	(i)	How many elements are present in spinel?		
			[1]	
	(ii)	Name the metals present in spinel.	[1]	
	(iii)	How many atoms are represented in the formula for spinel?		
			[1]	
(b)	Bau two forn	ixite is the most common mineral containing aluminium. It contain aluminium atoms and three oxygen atoms. Write the chemical nula for bauxite.	ins	
			[1]	
(c)	Belo	ow is a displacement reaction involving aluminium.		
(-)		aluminium + iron sulfate \rightarrow iron + aluminium sulfate		
	Usir dis j	ng this example, explain fully what is meant by the term placement .		
			[2]	

sho	avol is bottled natural spring water. The label from a bottle is wn below.	Examiner Only Marks Rema
	Aquavol Analysis	
	Bottle contents in 0.25 litres	
	Ionsmgcalcium2.5magnesium1.0sodium1.6potassium1.75chlorides2.0nitrates1.0sulfates1.5	
	Aquavol is suitable for a low sodium diet	
	9 781565 924796	
(i)	Calculate the mass of sodium ions you would consume if you drank one litre of Aquavol water. (Show your working out.)	
	mg [2]	
	mg [2]	
(ii)	Name two metal ions from the label that are responsible for hard water.	

6



A 8 8 B 15 24 C 28 28 i) What can be concluded about the type of water in sample B? Explain your answer. [2] ii) Suggest how the student could have carried out this investigation. [2] iii) Describe how the student could have ensured this investigation was valid (fair). [3]	Sample	Height of lather before boiling/mm	Height of lather after boiling/mm		
B 15 24 C 28 28 i) What can be concluded about the type of water in sample B? Explain your answer. [2] iii) Suggest how the student could have carried out this investigation. [2] iii) Suggest how the student could have carried out this investigation. [3] iii) Describe how the student could have ensured this investigation was valid (fair).	Α	8	8		
c 28 28 i) What can be concluded about the type of water in sample B? Explain your answer. [2] iii) Suggest how the student could have carried out this investigation. [2] iii) Suggest how the student could have carried out this investigation. [3] iii) Describe how the student could have ensured this investigation was valid (fair). [3]	В	15	24		
 i) What can be concluded about the type of water in sample B? Explain your answer. 	С	28	28		
 [3] iii) Describe how the student could have ensured this investigation was valid (fair). 					
	ii) Suggest h	now the student could hav	e carried out this inves	[2] stigation.	

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7	Cor	npoi	unds can be formed by two different types of bonds.	Examin	ner Only Remark
	(a)	(i)	Describe in terms of electrons how the compound sodium chlo is formed from sodium and chlorine.	ride	
				[3]	
		(ii)	Name another compound that has the same type of bonding as sodium chloride.	5	
				[1]	
	(b)	Wa chlo	ter is a compound that has a different type of bond to sodium pride.		
		(i)	Draw a diagram (showing the outer electrons only) of the bond in a molecule of water.	ing	
				[3]	
		(ii)	The bonding in a hydrogen molecule is the same type as in a water molecule. Why is the hydrogen molecule not described a compound?	as a	
				. [1]	

8 (a) The table shows some information about different plastics.

Plastic	Density kg/m³	Maximum usable temperature/°C	Solubility in oil
low density polyethene	920	85	insoluble below 80 °C
high density polyethene	960	120	insoluble below 110°C
polystyrene	1050	65	soluble
polychloroethene	1390	60	soluble
polypropene	900	150	soluble above 80 °C

- (i) The boiling point of water is 100 °C. Explain which type of polyethene is most suitable to be used to make a kettle.
- (ii) Which plastic would be the most suitable to make a pipe to carry oil at 90 °C? Explain your choice fully.

(b) Scientists are trying to make more plastics that are biodegradable. Explain fully why it is important to the environment to make such plastics.

_____[2]

_____ [1]

_____ [3]

Examiner Only Marks Remark



9	Aluminium metal can be extracted from all shown in the diagram below.	uminium oxide by electrolysis as	Examiner Only Marks Remark
		aluminium oxide dissolved in molten cryolite	
L			
steel	tank cathode	/ molten aluminium tanned off	
	ions involved in the extraction of aluminium In this question you will be assessed or skills including the use of specialist sci	n. n your written communication ientific terms.	
		[6]	

THIS IS THE END OF THE QUESTION PAPER

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