Rewarding Learning

General Certificate of Secondary Education 2015–2016

Science: Single Award

Unit 2 (Chemistry) Higher Tier

[GSS22] THURSDAY 25 FEBRUARY 2016, MORNING

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 eleven questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 75.

Quality of written communication will be assessed in Questions **3** and **10**.

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 for your use.

For Examiner's use only			
Question Number	Marks		
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
Total Marks			





1 (a) Gold is a metal element used in jewellery. The purity of gold is often measured in carats.

The table below shows how the number of carats is related to the percentage of gold.

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Remar

Marks

Percentage of gold	Number of carats
100	24
92	22
75	18
38	9

(i) On the grid below plot and draw a line graph for this information.



(ii) State the trend shown by this information.

[1]

(iii) Use the graph to find the percentage of gold in a 14 carat gold ring.

_____% [1]

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(b) Aluminium is often added to gold in jewellery. An atom of aluminium has 13 electrons. Complete the diagram below to show how all these electrons are arranged.



[1]

[Turn over

Sarah investigated the effect of heating a small amount of sodium 2 Examiner Only hydrogencarbonate using the apparatus shown below. Marks Remark sodium hydrogencarbonate stopwatch 00:34 limewater Sarah's observations are shown in the table below. Time interval/ **Observations** seconds Small number of gas bubbles observed in limewater. 0 to 30 The limewater remained colourless A large number of gas bubbles. 31 to 60 The limewater turned cloudy 61 to 90 No bubbles (a) In this investigation: (i) name the gas produced. [1] (ii) name the type of reaction that produced this gas. _ [1]

 Suggest one reason for Sarah's observations between 0 and 30 seconds.)	Examine Marks	er Only Remai
	[1]		
) Explain fully Sarah's observation between 61 and 90 seconds.			
	[2]		

Т	The fingerprint shown below was found on the door of a stolen black car.	Examiner Marks R
	© Science Source / Science Photo Library	
Г е	Describe how the fingerprint can be taken from the black car and kept as evidence.	
γ	/our answer should include:	
•	the type of fingerprint shown above, why the fingerprint may be useful in helping solve the crime.	
lı s	n this question you will be assessed on your written communication skills including the use of specialist scientific terms.	
_		
_		
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_		
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_		

_ [6]

4 The reactivity of three metals, copper, zinc and magnesium, was investigated by adding a small amount of each to sulfate solutions of the other metals.

Some results are shown below.

If there was a reaction a tick (\checkmark) was used; for no reaction a cross (X) was used.

Solution Metal	Copper sulfate	Zinc sulfate	Magnesium sulfate
Copper		×	
Zinc			
Magnesium		1	

- (a) Use your knowledge of the reactivity series to complete the table above. [2]
- (b) Complete the word equation for the reaction between magnesium and zinc sulfate.



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Marks Remark

5 The table shows some chemicals that car crude oil.

Chemicals	Amount in one barrel/gallons	
petrol	2.2	
jet fuel	4.8	
fuel oil	2.8	
diesel	8.0	-
others	7.4	_
Name one other chemical tha	at can be separated from crude oil.	
A plane needs 4800 gallons o many barrels of crude oil are i (Show your working out.)	of jet fuel for one journey. Calculate how needed for this journey.	w

- (b) Name one other chemical that can be
- (c) A plane needs 4800 gallons of jet fue many barrels of crude oil are needed



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 <i>b i i j j j j j j j j j j</i>	5.
(b) Give one way that a shop owner can test for counterfeit bank notes	S.
	[1]
(c) Paper and some modern plastics are biodegradable. Explain fully t term 'biodegradable'.	he
	_ [2]

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(Questions continue overleaf)

7 (a) The table below gives the properties of five materials.

Material	Density/ kg/m ³	Relative strength	Relative stiffness	Cost		
Nylon	1100	0.08	3	medium		
Steel	7800	1	210	low		
Polythene	960	0.02	0.6	low		
Kevlar	1250	3	190	high		
Carbon fibre- reinforced plastic	1600	1.8	200	high		
Using only the information in the table answer parts (i) and (ii) below						

(ii) Bulletproof vests are worn like a coat and are designed to stop a bullet hitting a person's body. Name the material that would be most suitable to make a bulletproof vest. Explain your answer.

- (b) Carbon fibre-reinforced plastic can be described as a composite material.
 - (i) Using carbon fibre-reinforced plastic as an example, explain what is meant by a composite material.
 - [2]

_____ [1]

_____ [2]

Examiner Only Marks Remark

(ii) Name **one** other composite material.

_____ [1]



8	(a)	The mag	element magnesium reacts wit nesium oxide.	h oxyg	en to form the compound	Examiner Only Marks Remark
		(i)	Balance the symbol equation for	or this r	eaction.	
			Mg + O ₂	\rightarrow	MgO	[1]
		(ii)	Explain in terms of electrons ho oxygen in magnesium oxide.	ow mag	gnesium forms bonds wit	h
						_ [3]
		(iii)	Choose one chemical compour bonding as magnesium oxide.	nd that	has the same type of	
			Circle the correct answer.			
			H ₂ O NaCl		C ₃ H ₈	[1]
	(b)	Ма	nesium hydrogencarbonate ha	s the cl	nemical formula Mg(HC0	D ₃) ₂ .
		(i)	How many different elements d hydrogencarbonate contain?	loes ma	agnesium	
						_ [1]
		(ii)	How many carbon atoms are re Mg(HCO ₃) ₂ ?	epreser	nted by the formula	
						_ [1]
		(iii)	What is the total number of ato $Mg(HCO_3)_2$?	ms rep	resented by the formula	
						_ [1]



9	(a) Some students investigated the hardness of water using the				
		apparatus below.	Ma	arks	Remark
		soap solution			
	conic	cal flask			
		25 cm ³ of hard water			
		© Charles D. Winters / Science Photo Library			
		(i) Name a piece of apparatus that could be used to accurately measure 25 cm ³ of hard water.			
		[1	1		
		(ii) Explain why it is better to use a conical flask rather than a beaker.			
		[1]		
		(iii) What is meant by the term hard water?			
		[1	1		
		t	-		



10 In 1912 Alfred Wegener proposed a theory to explain the formation of the Examiner Only continents. However, other scientists at the time did not agree that his Marks Remark theory was the correct explanation. Africa South America Sedimentary rocks containing fossils Referring to the diagram above, describe Wegener's theory, including evidence that supports it and reasons why scientists at the time thought he was wrong. In this question you will be assessed on your written communication skills including the use of specialist scientific terms.

_____[6]

11 (a) The following chemical compounds are all hydrocarbons.

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