GCSE MARKING SCHEME

SUMMER 2016

SCIENCE - CHEMISTRY C1
4462/01/02

INTRODUCTION

This marking scheme was used by WJEC for the 2016 examination. It was finalised after detailed discussion at examiners' conferences by all the examiners involved in the assessment. The conference was held shortly after the paper was taken so that reference could be made to the full range of candidates' responses, with photocopied scripts forming the basis of discussion. The aim of the conference was to ensure that the marking scheme was interpreted and applied in the same way by all examiners.

It is hoped that this information will be of assistance to centres but it is recognised at the same time that, without the benefit of participation in the examiners' conference, teachers may have different views on certain matters of detail or interpretation.

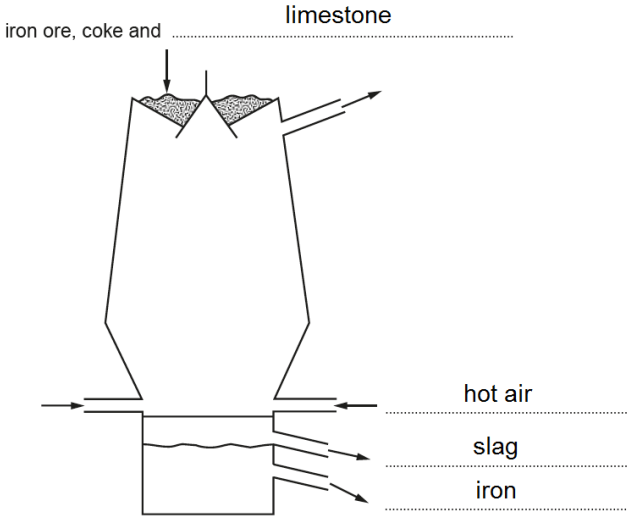
WJEC regrets that it cannot enter into any discussion or correspondence about this marking scheme.

GCSE Science - Chemistry 1

Summer 2016

Mark Scheme

Question Number		Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
FT	HT								
1		*(a)*			3	**Stage 1** beaker (containing sulfuric acid and copper(II) carbonate) (1) **Stage 2** filter funnel & paper (containing unreacted copper(II) carbonate) (1) **Stage 3** evaporating basin (containing solution and tripod, gauze and Bunsen burner) (1)	 beaker	ignore stirring rod, heating apparatus ignore collecting vessel	funnel evaporating basin heating apparatus funnel
		(b)			1	filtration / filtering	filter		
		(c)			1	copper(II) sulfate + water + carbon dioxide all **three** needed - any order	correct formulae	incorrect balancing if correct formulae given	

Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
2		*(a)*			4	 award (1) for each correct label			
		(b)	(i)		1	coke …… (hot) air both needed	carbon	oxygen	
			(ii)		1	limestone ……. slag both needed			
		(c)			1	3			
		(d)			2	55 (2) if answer incorrect award (1) for 1100/2000			

Question Number					Mark	Answer	Accept	Neutral answer	Do not accept
FT	HT	Sub-section							
3		*(a)*			1	**C** **D** **A** **B** must be in correct order			
		(b)			2	any 2 of following for (1) each • jig-saw fit of coastlines / continents (e.g. South America and Africa) close fit of coastlines / continents (e.g. South America and Africa) • <u>similar</u> fossils / fossil types / fossilised plants / fossilised animals • <u>similar</u> rock types / common mountain ranges	 same / matching fossils same / matching	 reference to 'countries' 'similar shape of coastlines' 'fit like puzzle' reference to 'animals' and/or 'plants'	
		(c)			1	earthquake			

Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
4		*(a)*	(i)		1	15			
			(ii)		1	petrol	40 to 100	4-12	
			(iii)		1	refinery gases	-160 to 40	1-4	
			(iv)		1	hydrogen /H		H_2	
		(b)			3	any 3 of following for (1) each • doesn't corrode/rust/rot • flexible/not brittle • can be coloured • easier installation/easer to replace • less dense /lighter		strong/won't break water proof poor conductor	

Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
5		*(a)*			2	any 2 of following for (1) each • contains (the elements) hydrogen and oxygen / it is a compound / formula is H_2O • ratio of elements is 2:1 credit points 1 and 2 for ratio of hydrogen to oxygen is 2:1 / twice as much hydrogen as oxygen • (water) conducts electricity / is broken down by an electric current / is an electrolyte	contains H and O	contains H_2 and O_2 can be electrolysed	
		(b)			1	**B**			

Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
6		*(a)*	(i)		3	all four points plotted correctly (2) any three correct (1) tolerance ± ½ square straight line of best fit through origin (using ruler) (1)	judgement by eye		
			(ii)		1	1.8-1.9 ecf possible from incorrect line - tolerance ± 1 square			
			(iii)		1	**dry** it / remove water/evaporate <u>water</u>		heat / put in an oven / evaporate it	
			(iv)		1	$MgSO_4$ + Cu both needed – either order		ignore incorrect balancing if formulae are correct	
		(b)			2	correct order Mg Cu Ag (1) any of following for (1) • metals high in the reactivity series displace metals lower (from solution) • Mg displaces Cu , and Cu displaces Ag (therefore Mg most reactive and Ag least reactive)			

Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
7	1	*(a)*	(i)		2	Group **2** (1) Period **3** (1)			
			(ii)		2	**D** (1) on the boundary / divide <u>between</u> metals and non-metals (1)		in the middle of the Periodic Table because it is silicon / in Group 4 / a semi-metal / a metalloid	
		(b)	(i)		1	3			
			(ii)		1	Li_2CO_3	$Li^+_2CO_3^{2-}$		

Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
8	2	*(a)*			1	increases			
		(b)			1	fluorine	F / F_2		
		(c)			2	melting point any value above iodine's i.e. higher than 115°C (1) boiling point any value above iodine's i.e. higher than 185°C **and** higher than given melting point (1)			
		(d)			1	chlorine	Cl/ Cl_2		

Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
9	3	*(a)*	(i)		1	liquid	molten		
			(ii)		3	aluminium ions go to cathode **and** oxide ions go to anode (1) cathode is negative **and** anode is positive (1) movements is due to attraction / because opposite charges attract (1)		oxygen ions	
		(b)			1	any correct property **and** relevant use for (1) e.g. low density **and** aircraft / window frames / ladders / overhead power lines / gutters / cars / bike frames corrosion resistance **and** aircraft / window frames / ladders / gutters / cars / saucepans	light forms an oxide layer/ forms a protective layer	foil / cans doesn't rust	
		(c)			2	**B** (1) increased from 22 to 44 (1)			

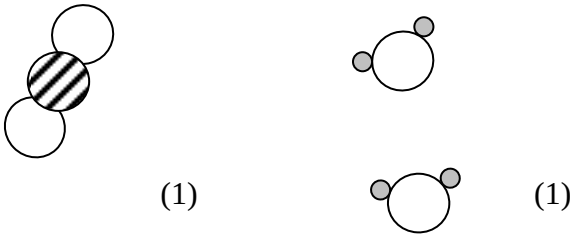
Question Number			
FT	HT	Mark	Answer
10	4	6	**Indicative content** **Benefits** • saves raw materials / crude oil / energy • reduces litter • reduces need for landfill sites • cheaper to make new objects • avoids air pollution caused by burning waste plastic - toxic fumes / carbon dioxide **Drawbacks** • collection costs • dependent on public support • households need to store bins • not all plastics can be recycled • separation cost **5-6 marks** The candidate constructs an articulate, integrated account correctly linking relevant points, such as those in the indicative content, which shows sequential reasoning. The answer fully addresses the question with no irrelevant inclusions or significant omissions. The candidate uses appropriate scientific terminology and accurate spelling, punctuation and grammar. **3-4 marks** The candidate constructs an account correctly linking some relevant points, such as those in the indicative content, showing some reasoning. The answer addresses the question with some omissions. The candidate uses mainly appropriate scientific terminology and some accurate spelling, punctuation and grammar. **1-2 marks** The candidate makes some relevant points, such as those in the indicative content, showing limited reasoning. The answer addresses the question with significant omissions. The candidate uses limited scientific terminology and inaccuracies in spelling, punctuation and grammar. **0 marks** The candidate does not make any attempt or give a relevant answer worthy of credit.

Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
	5	*(a)*			5	**A** zinc / Zn (1) **B** copper(II) carbonate / $CuCO_3$ (1) **C** carbon dioxide / CO_2 (1) **D** sodium hydroxide / NaOH (1) **E** copper(II) oxide / CuO copper(II) hydroxide / $Cu(OH)_2$ (1)		sodium oxide /Na_2O	
		(b)			1	$(NH_4)_2SO_4$	$(NH_4^+)_2\,SO_4^{2-}$		

Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
	6	*(a)*			3	• **burns** (forming heat) / acts as a fuel (1) • **carbon dioxide** reacts (with carbon / coke) to form **carbon monoxide** (1) • carbon monoxide / coke is a **reducing agent** (1)	appropriate equations for all marking points		
		(b)	(i)		1	$2Fe_2O_3 + 3C \rightarrow 4Fe + 3CO_2$			
			(ii)		2	substance reduced: Fe_2O_3 / iron(III) oxide substance oxidised: C / carbon **both** needed for (1) Fe_2O_3 / iron(III) oxide loses oxygen C / carbon gains oxygen **both** needed for (1)	award (1) for carbon oxidised because it gains oxygen	iron ore coke	loses oxide
		(c)			1	mixture of a metals / mixture of a metal and a non-metal			compound of two metals

Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
	7	*(a)*			3	• **displacement identified** e.g. displacement reaction / iron removes silver from solution (1) • **products identified** e.g. silver **and** iron nitrate formed / word equation / symbol equation (1) • **explanation in terms of reactivity** e.g. iron is more reactive than silver / iron is above silver in reactivity series (1)			
		(b)			2	either of following for (1) • pollutes / gets into **water supplies** on **washing** • absorbed into the body / through the skin / inhaled **could be** harmful in the long term / **don't know** long term effects – uncertainty must be implied (1)	lakes / rivers / streams blood	'gets into body'	

Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
	8	*(a)*			2	6.4 (1) atoms cannot be created or destroyed / atoms are re-arranged (in a chemical reaction) (1)		explanation using masses	
		(b)	(i)		3	all five points plotted correctly (2) any four correct (1) tolerance ± ½ square straight line of best fit (using ruler) (1)	judgement by eye		
			(ii)		2	as the mass of magnesium used increases, the mass of copper formed increases / positive correlation between magnesium and copper masses (1) linear / proportional (1) **OR** award (2) for mass of magnesium used and mass of copper formed are directly proportional / doubling mass of magnesium used, doubles mass of copper formed			
			(iii)		1	0.79 if not 0.79 refer to graph – award (1) for correct reading from graph			

Question Number					Mark	Answer	Accept	Neutral answer	Do not accept
FT	HT	Sub-section							
	9	*(a)*			2	**Support** as carbon dioxide level increases, (5 year) average temperature increases / is on an upward trend (1) **Oppose** at certain points (e.g. from 1960-65) the carbon dioxide level increases but the temperature decreases / temperature fluctuates (1)			
		(b)			2	 (1) (1) must show two water molecules			

Question Number			
FT	HT	Mark	Answer
	10	6	**Indicative content** **Advantages** • raw material (water) is readily available / renewable / sustainable • reduced dependency on crude oil • only water formed on combustion / no CO_2 which causes global warming **Disadvantages** • expensive extraction method/ electrolysis is expensive • electricity generation (for production) might cause environmental issues (unless 'green' method of production e.g. solar, wind, etc.) • transport of liquefied gas (no infrastructure) • storage of liquefied gas in thick steel containers **5-6 marks** The candidate constructs an articulate, integrated account correctly linking relevant points, such as those in the indicative content, which shows sequential reasoning. The answer fully addresses the question with no irrelevant inclusions or significant omissions. The candidate uses appropriate scientific terminology and accurate spelling, punctuation and grammar. **3-4 marks** The candidate constructs an account correctly linking some relevant points, such as those in the indicative content, showing some reasoning. The answer addresses the question with some omissions. The candidate uses mainly appropriate scientific terminology and some accurate spelling, punctuation and grammar. **1-2 marks** The candidate makes some relevant points, such as those in the indicative content, showing limited reasoning. The answer addresses the question with significant omissions. The candidate uses limited scientific terminology and inaccuracies in spelling, punctuation and grammar. **0 marks** The candidate does not make any attempt or give a relevant answer worthy of credit.