



GCSE MARKING SCHEME

SCIENCE – CHEMISTRY (LEGACY)

JANUARY 2012

INTRODUCTION

The marking schemes which follow were those used by WJEC for the January 2012 examination in GCSE SCIENCE – CHEMISTRY (LEGACY). They were finalised after detailed discussion at examiners' conferences by all the examiners involved in the assessment. The conferences were held shortly after the papers were 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 conferences was to ensure that the marking schemes were 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' conferences, teachers may have different views on certain matters of detail or interpretation.

WJEC regrets that it cannot enter into any discussion or correspondence about these marking schemes.

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UNIT C1 (LEGACY)

January 2012 – Chemistry 1 - Foundation Tier only questions

Question Number		Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
FT	HT								
1		(a)	(i)		1	nickel / Ni			
			(ii)		1	iodine / I / I ₂			
		(b)			2	non-metal [1] low m.p./ low b.p./ low density Ref. to 'low' needed Any one for [1] <i>Ignore references to actual numerical values.</i>	converse statement		

Question Number		Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
FT	HT								
2		(a)	(i)		2	protons [1] and neutrons [1] <i>either order</i>			
			(ii)	I	1	20			
				II	1	2,8,8,2			
		(b)	(i)		1	1			
			(ii)		1	8			

Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
3		(a)			4	<p>● hydrogen / H [1]</p> <p>● carbon / C [1]</p> <p>○ oxygen / O [1]</p> <p>● nitrogen / N [1]</p>			H ₂ O ₂ N ₂
		(b)			1	compound			

Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
4		(a)			2	moving away from each other [1] year [1]			
		(b)	(i)		1	continental drift			
			(ii)		1	convection currents			
		(c)			1	similar / same fossils jig-saw fit of coastlines / coastlines fit together /	coastlines \equiv continents	similar shape of coastlines	ref. to 'countries'

Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
5		(a)			1	1 ppm / around 1ppm / about 1ppm			
		(b)	(i)		1	reduce tooth decay / reduce teeth extractions / reduce number of general anaesthetics any one for [1]			
			(ii)		1	increase bone cancer / stains teeth any one for [1]			
		(c)			1	medication without personal consent / mass medication any one for [1]			
		(d)			1	(chlorination) sterilises water / kills bacteria (chlorination) makes water safe to drink any one for [1] <i>Accept converse answer</i>		cleans water makes water healthy to drink	

Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
6					4	<p>Four discrete marking points:-</p> <ul style="list-style-type: none"> add excess copper carbonate to (dil. sulphuric) acid add copper carbonate to (dil. sulphuric) acid until no more dissolves add copper carbonate to (dil. sulphuric acid) until some remains add copper carbonate to (dil. sulphuric) acid until it is unreacted add copper carbonate to use up all the (dil. sulphuric) acid stir mixture swirl beaker mix the carbonate and acid together filter <i>to remove excess carbonate</i> – also gains first marking point if not already awarded filter mixture filter solution evaporate the solution to dryness evaporate completely leave to evaporate to dryness allow the solution to dry up completely leave until (blue) crystals are left behind heat until crystals appear <p style="text-align: right;">} <i>removal of water implied</i></p>		ref. to 'heat'	
								pour into funnel	
							ref. to 'salt' crystals	'heat'	

Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
7		(a)	(i)		1	800			
			(ii)		1	individual readings too different / erratic readings / readings (1,2 and 3) are very different	accept converse	readings are <i>different</i>	
		(b)			3	All points plotted correctly [2] if '800cm ³ ' point missing award [2] 4 points plotted correctly [1] Line of best fit (by eye) [1] Ruler must be used. <i>Line should go between 100 and 200cm³ points and through 400,600 and 800cm³.</i> <i>Consequential marking for line of best fit.</i>			
		(c)			1	increases (bigger the beaker) the longer the burning time / (bigger the beaker) the bigger the burning time			ref. to 'slower'

January 2012 – Chemistry 1 - Common questions

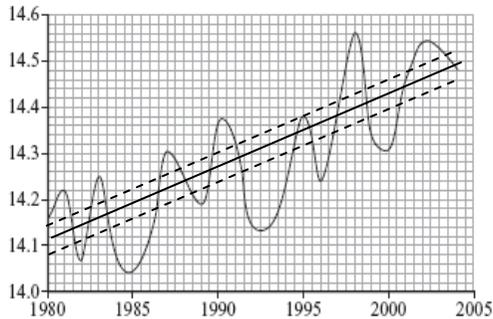
Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
8	1	(a)			1	C			
		(b)			1	E			
		(c)			1	D			
		(d)			1	B			

Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
9	2	(a)			1	fractional distillation		distillation	fractionating distillation
		(b)	(i)		1	bigger the number of (carbon) atoms the higher the b.p. / longer the (carbon) chain the higher the b.p.	higher \equiv bigger converse		the more hydrocarbons, the higher the boiling point
			(ii)		1	344			
			(iii)		1	170			
			(iv)		1	hydrogen / H and carbon / C both required for [1] <i>either order</i>			H ₂

Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
10	3	(a)	(i)		1	liquid paraffin / oil			paraffin
			(ii)		1	4:(1):2	8:2:4 2:½:(1)		4:0:2
		(b)	(i)		1	low density / lower density than water floats (on water)			ref. to 'bubbles', fizzes around
			(ii)		1	(strong) alkali / alkaline / pH above 7 pH between 8-14	pH value between 12 -14	weak alkali / pH value between 8-11 / forms sodium hydroxide	weak alkali
			(iii)		1	hydrogen / H ₂			H
			(iv)		1	lithium / Li			

January 2012 – Chemistry 1 – Higher Tier only questions

Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
	4	(a)	(i)	I	1	boron / B	^{11}B ^5_5B $^{11}_5\text{B}$		
				II	1	beryllium / Be	^9Be ^4_4Be ^9_4Be		
				III	1	francium / Fr	^{223}Fr $^{87}_{87}\text{Fr}$ $^{223}_{87}\text{Fr}$		
				IV	1	silicon / Si germanium / Ge tin / Sn lead / Pb any one for [1]	As above ignore ref. to atomic and / or mass numbers...which must be correct.		
			(ii)		1	electronic structure for calcium 2,8,8,2 shown diagrammatically			
		(b)	(i)		1	Al^{3+} O^{2-} both needed for [1]			ref. to subscript values
			(ii)		1	$\text{Ca}(\text{NO}_3)_2$	$\text{Ca}^{2+}(\text{NO}_3^-)_2$		

Question Number								
FT	HT	Sub-section		Mark	Answer	Accept	Neutral answer	Do not accept
	5	(a)	(i)	1	0.004			
			(ii)	1	<p>increase in burning (fossil) fuels / more coal power stations / more oil power stations / more gas power stations /</p> <p>deforestation</p>	burning more named fossil fuel e.g. petrol, wood, diesel, coal etc, more cars which release carbon dioxide	more industry / power stations / more cars	
		(b)	(i)	1	1987			
			(ii)	1	<p>tolerance between dotted lines - by eye</p>  <p>ruler must be used</p>			<p>line drawn from first point to last point</p> <p>line drawn from origin</p>
			(iii)	1	<p>flooding (due to sea-level rise) / flooding (due to polar ice melting) / sea-level rise cliff erosion</p>	coastal erosion		

Question Number		Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
FT	HT								
	6	(a)	(i)		1	boil / turn to a gas / vaporise		evaporate	ref. to melting
			(ii)		1	gas [1]			
			(iii)		1	any value above 114 [1]			
		(b)			3	reactants [1] Na; Br ₂ product [1] NaBr balancing [1] 2:1:2 <i>reactant and product must correct before balancing mark awarded</i>	Na ⁺ Br ⁻		
		(c)			2	A = (sodium) chloride , NaCl, Cl ⁻ B = (sodium) iodide , NaI , I ⁻ C = (sodium) bromide , NaBr , Br ⁻ all three [2] marks any one [1] mark		Cl I Br	chlorine iodine bromine

Question Number		Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
FT	HT								
	7	(a)	(i)		1	(nearly) 70% of people in favour / majority of people in favour / over 60% of people in favour			
			(ii)		1	(question) made reference to 'reduce tooth decay' / (question) made reference to 'positive aspect' (of fluoridation) only / gives advantage (of fluoridation)	converse		
			(iii)		1	different types of people / random types of people a lot of people surveyed	named type e.g. different ages / different class / men & women / different races / different areas		
		(b)			2	Ethical: mass medication / medication without consent / freedom of choice (removed) any one for [1] Medical: causes cancer / bone cancer discolours teeth / fluorosis poisonous / toxic brittle bones / IBS / thyroid problems any one for [1]	it is not right to force people to consume fluoride		

Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
	8	(a)			1	(continents) were once joined together			
		(b)			3	<p>Three marking points:</p> <ul style="list-style-type: none"> • close fit of coastlines / jig-saw fit of coastlines • similar rocks / similar rock types / similar rock patterns • similar fossils / similar fossil types 	coastlines ≡ continents ref. to South America and Africa similar ≡ same similar ≡ same	countries similar shape of coastlines	ref. to animals and/or plants
		(c)			1	(tectonic) plates were moving / convection currents (in mantle)		continents move continental drift plate tectonics	

Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
	9	(a)			2	$4(413) = 1652$ $2648 - 1652 = \mathbf{996}$ [1] $996/2 = \mathbf{498}$ [1] <i>accept consequential marking</i> <i>award [2] if correct answer given without any working</i>			
		(b)			2	$2(805) = 1610$ $3466 - 1610 = \mathbf{1856}$ [1] $1856/4 = \mathbf{464}$ [1] <i>accept consequential marking</i> <i>award [2] if correct answer given without any working</i>			
		(c)			1	$2648 - 3466 = \mathbf{-818}$ / more energy released in bond making than absorbed in bond breaking <i>award [1] if correct answer given without any working</i>		818 more energy released than absorbed heat given out	

UNIT C2 (LEGACY)

January 2012 Chemistry 2 Mark Scheme – Foundation Tier only questions

Q.1	Mark	Answer	Accept	Neutral answer	Do not accept
(a) (i)	1	C			
(ii)	1	B			
(iii)	1	A			
(b) (i)	1	5			
(ii)	1	7			
(c)	1	nucleus			

Q.2	Mark	Answer	Accept	Neutral answer	Do not accept
(a)	3	wellington boot ----- waterproof coffee cup ----- good heat insulator electric plug casing ----- does not conduct electricity tooth brush ----- strong, flexible and hard wearing all four correct = 3 marks two correct = 2 marks one correct = 1 mark			
(b)	1	PVC, PTFE, polystyrene, nylon, polyester, acrylic, etc			
(c)	1	lighter / does not corrode or rust / easier to mould	can be coloured	waterproof	

Q.3	Mark	Answer	Accept	Neutral answer	Do not accept
(a)	2	to make superelastic spectacle frames (1) in coffeepot thermostat (1)			
(b)	1	photochromic pigment			

Q.4	Mark	Answer	Accept	Neutral answer	Do not accept
(a)	1	B A C			
(b) (i)	1	magnesium sulphate + copper	MgSO ₄ + Cu		
(ii)	2	aluminium and copper oxide (1) copper and silver nitrate solution (1)			
(iii)	2	no reaction (1) silver is less reactive than magnesium/ magnesium is higher in the reactivity series (1)	silver low in the series	more slowly than Mg	
(c)	1	electrolysis		reduction	

Q.5	Mark	Answer	Accept	Neutral answer	Do not accept
(a) (i)	1	giant ionic			
(ii)	1	850			
(iii)	1	graphite		C	
(b) (i)	1	B			
(ii)	1	(simple) molecular			

Q.6	Mark	Answer	Accept	Neutral answer	Do not accept
(a)	2	C (1) most froth / lather formed (1)			
(b)	1	add sodium carbonate / distil / pass through ion-exchange resin	boil		
(c)	1	stronger teeth / stronger bones reduce heart illness better taste / good for making beer		<u>strong</u> teeth/bones	

Q.7	Mark	Answer	Accept	Neutral answer	Do not accept
(a)	3	6 points correct = 2 marks 5 points correct = 1 mark smooth curve going through all the points = 1 mark			
(b) (i)	1	40 ±1			
(ii)	1	47.5 ±1			

Common questions

Q.8/1	Mark	Answer	Accept	Neutral answer	Do not accept
(a)	4	6 (1) 12 (1) 16 (1) 40 Ar (1) 18			
(b)	2	correct answer = 98 (2) $M_r = 2 + 32 + (4 \times 16)$ (1)			

Q9/2	Mark	Answer	Accept	Neutral answer	Do not accept
(a)	1	C_5H_{12}			
(b)	1	B			
(c)	1	$ \begin{array}{cccc} & H & H & H & H \\ & & & & \\ H & - C & - C & - C & - C - H \\ & & & & \\ & H & H & H & H \end{array} $			

Q.10/3	Mark	Answer	Accept	Neutral answer	Do not accept
(a) (i)	1	nitrogen and oxygen (1) both needed for the mark		N and O	
(ii)	1	sulphuric acid	H ₂ SO ₄		
(b) (i)	1	nitrogen	N ₂		N
(ii)	1	ammonia + nitric acid	NH ₃ + HNO ₃		
(c) (i)	1	increase growth / faster growth / bigger plants / healthy plants / improves soil / cheaper food / increase profit / releases land for other purposes			better plants/cheaper
(ii)	1	reduces the amount of fish		decrease in living organisms	

Higher Tier only questions

Q.4	Mark	Answer	Accept	Neutral answer	Do not accept
(a)	1	does not corrode		light/cost/malleable	
(b)	1	changes colour when exposed to sunlight / light			
(c)	1	has the ability to absorb a lot of liquids		absorbs water	
(d)	1	has the ability to regain its (original) shape when heated			

Q.5	Mark	Answer	Accept	Neutral answer	Do not accept
(a) (i)	1	carbon			
(ii)	1	<div style="display: flex; align-items: center; gap: 10px;"> <div style="border: 1px solid black; padding: 2px 5px;">3</div> → <div style="border: 1px solid black; padding: 2px 5px;">2</div> <div style="border: 1px solid black; padding: 2px 5px;">3</div> </div>			
(b)	1	iron + aluminium oxide			
(c)	3	<ul style="list-style-type: none"> • place iron in the copper sulphate (solution) • the iron in copper sulphate experiment gives a (black/brown) solid / changes colour • (reaction has taken place therefore) iron more reactive than copper 			

Q.6	Mark	Answer	Accept	Neutral answer	Do not accept
(a)	1	water that does not lather well / easily with soap water that contains calcium / magnesium ions / compounds	forms scum with soap	long <u>time</u> to lather	
(b) (i)	1	use the same amount of soap (solution) for both samples			
(ii)	1	A – requires more soap in experiment 2	A – less lather per cm ³ of soap (solution) /		
(iii)	1	volume of soap (solution) required to produce lather is less / the same for samples A and B – the ion exchange unit removes the hardness / softens the water / removes Ca ²⁺ /replaces Ca ²⁺ with Na ⁺	doubling volume of soap (solution) only produces small increase in lather (height) in experiment 1		

Q.7	Mark	Answer	Accept	Neutral answer	Do not accept
(a)	3	<p>diagrammatic representation showing clearly one Ca atom losing 2 outer electrons (1) two Cl atoms gaining one electron each (1) Ca^{2+} and Cl^- (both needed) (1)</p> <p>there must be no ambiguity e.g. electrons cannot be on atoms and ions at the same time</p>			
(b) (i)	2	<p>shared pair of electrons between the N atom and the three H atoms (1) full octet around the N (1)</p>			
(ii)	1	covalent			

Q.8	Mark	Answer	Accept	Neutral answer	Do not accept
(a)	2	$\begin{array}{c} \text{H} & \text{H} \\ & \\ \text{H}-\text{C}- & \text{C}-\text{H} \\ & \\ \text{H} & \text{H} \end{array} \quad (1) \quad \begin{array}{c} \text{H} & & \text{H} \\ & \diagdown & / \\ & \text{C}=\text{C} & \\ & / & \diagdown \\ \text{H} & & \text{H} \end{array} \quad (1)$			
(b) (i)	1	cracking			
(ii)	1	saturated – polythene has no double bonds / only contains single bonds		cannot add more hydrogen atoms contains single bonds	
(c) (i)	2	$\left(\begin{array}{c} \text{H} & \text{H} \\ & \\ -\text{C}- & \text{C}- \\ & \\ \text{H} & \text{Cl} \end{array} \right)_n$			
(ii)	1	thermoplastic	thermosoftening plastics		

Q.9	Mark	Answer	Accept	Neutral answer	Do not accept
(a)	3	<p>63.5 tonnes of Cu would come from 79.5 tonnes of CuO (1)</p> <p>63.5 x 2 (127) tonnes of Cu would come from 2 x 79.5 tonnes of CuO (1)</p> <p>answer = 159 tonnes of CuO (1)</p> <p>[3 marks for correct answer]</p>			
(b)	2	<p>percentage yield = $\frac{101.6 \times 100}{127}$ (1)</p> <p>= 80 (1)</p> <p>[2 marks for correct answer]</p>			$\frac{63.5}{79.5} \times 100 = 79.9\%$

Q.10	Mark	Answer	Accept	Neutral answer	Do not accept
	3	(warm) with sodium hydroxide (1) damp (red) litmus (1) goes blue (1)	damp universal indicator paper goes blue / purple		



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