



GCSE MARKING SCHEME

SCIENCE - CHEMISTRY

SUMMER 2015

INTRODUCTION

The marking schemes which follow were those used by WJEC for the Summer 2015 examination in GCSE SCIENCE - CHEMISTRY. 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.

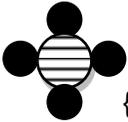
It is hoped that this information will be of assistance to centres but it is recognised at the same time that, without the benefit of participation in the examiners' conferences, teachers may have different views on certain matters of detail or interpretation.

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

	Page
C1	1
C2	17
C3	32

GCSE Mark Scheme - Chemistry 1

Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
1		(a)			3	A (1) D (1) C (1)			
		(b)			2	NH ₃ (1) Mg ²⁺ (1)	ammonia magnesium		

Question Number		Sub-section		Mark	Answer	Accept	Neutral answer	Do not accept
FT	HT							
2		(a)		1	calcium and chlorine - both needed		Ca and Cl	chloride
		(b)		1	sodium/magnesium/aluminium	Na/Mg/Al		
		(c)	(i)	1	nitrogen		N	
			(ii)	2	eg hydrogen  carbon  (1)			
					 (1) {atoms need to touch}			
		(d)		1	H_2CO_3	CO_3H_2		

Question Number		Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
3		(a)			3	A nitrogen (1) B oxygen (1) C argon (1)	N ₂ O ₂ Ar	N O	
		(b)	(i)		2	coke (1) slag (1)	carbon/C calcium silicate	coal impurities	
			(ii)		1	oxygen	O ₂	O	
			(iii)		1	2 + 3 - both needed (1)			

Question Number		Sub-section		Mark	Answer	Accept	Neutral answer	Do not accept
4		(a)		1	to use up / to neutralise / remove (all) the acid	to react with all the acid		to use it all up
		(b)		2	(filter) funnel (1) magnesium oxide (1)	MgO	filter solid	
		(c)		1	mark credited for process or how it is carried out i.e. evaporate or leave on window sill / in a warm place / leave for a length of time	heat / boil	leave it	
		(d)		1	magnesium sulfate + water	MgSO ₄ + H ₂ O		
		(e)		1	MgCl ₂			

Question Number		Sub-section		Mark	Answer	Accept	Neutral answer	Do not accept
FT	HT							
5		(a)		2	biodegradable (1) reduces land fill problems (1)		litter / recycled	
		(b)		2	starts to soften at 50°C (1) food would get 'covered' / contaminated with the plastic / plastic would melt on the food / container would lose its shape (1) or easy to cut with a knife (1) breaking the container (1)			

Question Number		Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
6		(a)			3	pH = 5 (1) weak acid / not very acidic (1) since grapes are eaten (1)	pH = 1 and acidic – 1 mark only safe to eat		
		(b)	(i)		3	all five points plotted correctly - 2 marks four points plotted correctly - 1 mark smooth curve - 1 mark	straight lines joining points (since biological data is used)		
			(ii)		1	4.4			
			(iii)		1	55 minutes - from graph ± 1	if line not extrapolated accept value in the range 52-60		

Question Number		Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
FT	HT								
7	1	(a)			3	B (1) m pt lower than room temperature/20°C (1) b pt higher than room temperature/20°C (1)	D m pt < 20 (1) A/C/E b pt > 20 (1)	m pt low / b pt high	
		(b)			3	E (1) good conductor of electricity (1) high m pt/b pt (1)	C high m pt/b pt (1) B good conductor (1)		
		(c)			1	malleable / ductile / high density / good conductor of heat / shiny / (generally) hard / sonorous / magnetic	rust / strong	good conductor / heavy / density	

Question Number		Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
8	2	(a)	(i)		1	C_8H_{18}		octane	
			(ii)		1	cracking			
		(b)	(i)		1	goes milky/cloudy/white because carbon dioxide is given off			
			(ii)	I	2	(colourless) liquid / water (1) forms when hydrogen burns (1)			
				II	2	no change (1) no carbon dioxide given off because no carbon present in fuel / hydrogen does not burn to give carbon dioxide (1)			

Question Number		Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
9	3	(a)	(i)		1	Na_2SO_4			
			(ii)		1	ammonium fluoride ammonium sulfate magnesium fluoride magnesium sulfate - any two for one mark	NH_4F $(\text{NH}_4)_2\text{SO}_4$ MgF_2 MgSO_4		
		(b)			2	B (1) contains the most fluoride (1)		lot of fluoride	fluorine

Question Number		Mark	Answer
FT	HT		
10	4	6	<p>Indicative content Many fossil fuels contain impurities including sulfur. The sulfur produces sulfur dioxide during combustion which can eventually produce sulfuric acid resulting in acid rain. Lakes can then become acidic damaging aquatic life. Forests and vegetation gets damaged. Limestone buildings are badly affected. Acid rain also attack metal structures such as bridges.</p> <p>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.</p> <p>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.</p> <p>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.</p> <p>0 marks: The candidate does not make any attempt or give a relevant answer worthy of credit.</p>

Question Number		Sub-section		Mark	Answer	Accept	Neutral answer	Do not accept
FT	HT							
	5	(a)		1	sulfuric	H ₂ SO ₄		
		(b)		2	any 2 of 3 points for (1) each bubbles / fizzing / effervescence (1) blue solution / colour change (1) temperature increases (1)			
		(c)		2	filter (1) evaporate water / evaporate some of solution / evaporate overnight / evaporate in warm place (1)	leave for length of time in warm place		
		(d)		1	copper(II) chloride + water	CuCl ₂ + H ₂ O		

Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
	6	(a)			2	remains of sea / marine organisms / small sea animals / small plants (1) from millions of years ago / under the effect of heat/pressure / no oxygen (1)			
		(b)	(i)		1	evaporated / vaporised	boiled		
			(ii)		1	different boiling points			
		(c)			2	nitrogen (1) it has the lowest boiling point (1) do not award second mark if incorrect gas named			

Question Number		Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
FT	HT								
	7	(a)	(i)		2	volume of oxygen = $50.0 - 40.5 = 9.5$ (1) percentage of oxygen = $\frac{9.5}{50} \times 100 = 19$ (1) [correct answer only - 2 marks]			
			(ii)		1	not all the oxygen used up / too little copper in the tube / reaction incomplete / air not passed over enough times		leaks / apparatus not fully cooled	
			(iii)		2	remains the same / no change (1) carbon dioxide not used up / produced / does not react with Cu (1)	percentage increases because the volume of air decreases (2)		
		(b)			1	$2 \rightarrow 2 \quad 4$			

Question Number		Sub-section		Mark	Answer	Accept	Neutral answer	Do not accept
FT	HT							
	8	(a)		3	Ba(OH) ₂ (1) Fe ³⁺ (1) HPO ₄ ²⁻ (1)			
		(b)		2	sodium loses an electron (1) bromine gains an electron (1)	electrons transferred (1)		

Question Number		Sub-section		Mark	Answer	Accept	Neutral answer	Do not accept
FT	HT	(a)	(i)	1	cryolite			
	9		(ii)	1	2 4			
		(b)	(i)	2	Pb^{2+} (1) + 2e (1)			
			(ii)	3	<p>any 3 of 4 points for (1) each</p> <p>bromide ions are negative (1)</p> <p>bromide ions attracted to the anode/+ve electrode (1)</p> <p>loss of electrons (1)</p> <p>two bromide ions / bromine atoms form a bromine molecule (1)</p> <p>award credit for above points in suitable equations</p> <p>max (2) if reference to 'bromine ions' or 'bromide atoms'</p>			award 0 if bromide ions are described as positive ions

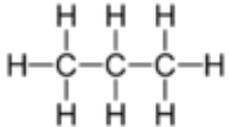
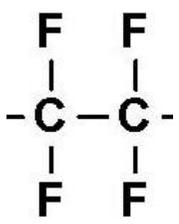
Question Number		Mark	Answer
FT	HT		
	10	6	<p>Indicative content Temperature very high. Coke is oxidized to carbon monoxide. ($2C + O_2 \rightarrow 2CO$) Carbon monoxide reduced the iron ore to iron. ($3CO + Fe_2O_3 \rightarrow 2Fe + 3CO_2$) Molten iron flows to the bottom of the furnace. Limestone is decomposed by heat to calcium oxide and carbon dioxide. The calcium oxide reacts with the impurities (sand/silica) to form slag which flows to the bottom of the furnace and floats on the molten iron.</p> <p>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.</p> <p>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.</p> <p>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.</p> <p>0 marks: The candidate does not make any attempt or give a relevant answer worthy of credit.</p>

GCSE Mark Scheme – Chemistry 2

Question Number		Sub-section		Mark	Answer	Accept	Neutral answer	Do not accept
1		(a)		2	metallic → malleable and ductile / high melting point simple molecular → gas or liquid at room temperature giant covalent → high melting point all 3 for (2) any 1 for (1)			
		(b)		3	thermochromic pigment (1) shape memory polymer (1) hydrogel (1)			

Question Number		Sub-section		Mark	Answer	Accept	Neutral answer	Do not accept
2		(a)		1	electron		e	
		(b)		2	proton (1) neutron (1)		p n	
		(c)	(i)	1	14			
			(ii)	1	2,8,4			

Question Number		Sub-section		Mark	Answer	Accept	Neutral answer	Do not accept
FT	HT							
3		(a)	(i)	1	the higher the temperature the shorter the reaction time	higher temp, faster reaction		
			(ii)	2	<p>surface area (1)</p> <p>the greater the surface area the shorter the reaction time / faster reaction (1)</p> <p>or</p> <p>particle size (1)</p> <p>the smaller the particle size the shorter the reaction time / faster reaction (1)</p> <p>both marks could be credited for one statement e.g. smaller particles react faster</p>	<p>'form' of calcium carbonate</p> <p>'powder takes less time than chips'</p>		molecules become smaller
			(iii)	2	<p>volume of acid (1)</p> <p>concentration of acid (1)</p> <p>mass/weight of calcium carbonate (1)</p> <p>max (2)</p>	'amount of' once only	pH type of acid	
		(b)		2	<p>mass decreases (1)</p> <p>gas / carbon dioxide lost from container / released (1)</p>	gets lighter	gas produced	incorrect gas named

Question Number		Sub-section		Mark	Answer	Accept	Neutral answer	Do not accept
4		(a)		3	 (1) C_6H_{14} (1) methane (1)			
		(b)	(i)	1	ethene	C_2H_4		polyethene
			(ii)	1	monomers		unsaturated	
		(c)	(i)	1	polytetrafluoroethene	PTFE		
			(ii)	1			ignore brackets	

Question Number		Sub-section		Mark	Answer	Accept	Neutral answer	Do not accept
FT	HT							
5		(a)		3	all points plotted correctly (2) 4 points plotted correctly (1) smooth curve through points (1)	½ square tolerance		
		(b)		1	the higher the temperature the higher the solubility	it increases with more heat	faster	higher solubility, higher temperature
		(c)		3	crystals form (1) any reference to crystals/solid/powder allows access to second mark even though first mark may not have been awarded as solubility is lower at lower temperature (1) both marks may be awarded based on a quantitative response	solid forms		it solidifies / potassium chlorate forms

Question Number		Sub-section		Mark	Answer	Accept	Neutral answer	Do not accept
FT	HT							
6		(a)		2	3 molecules of CO ₂ (1) must get first mark to be awarded second 5 molecules of O ₂ (1)			
		(b)	(i)	2	identification of all bonds made e.g. 4 x O–H (1) 1852 (1) award (2) for correct answer only (cao)	max (1) if subtraction done		
			(ii)	2	485 kJ calculated (1) allow error carried forward (ecf) from (i) more energy given out than taken in (1)		negative value	

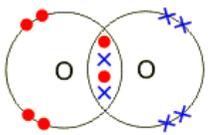
Question Number		Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
FT	HT								
7	1	(a)	(i)		2	E (1) two shells occupied / containing electrons (1)	Ne		
			(ii)		2	B and E (1) both have full outer shells of electrons (1)	Ar and Ne 8 electrons in outer shell		
			(iii)		1		2		
		(b)			2	electronic structure is 2,8,7 therefore 17 electrons / atomic number is 17 (1) number of electrons is equal to number of protons (1) both marks may be credited for one statement e.g. total number of electrons is equal to number of protons / contains 17 electrons therefore nucleus contains 17 protons (2)		any reference to adding number of electrons in each shell	

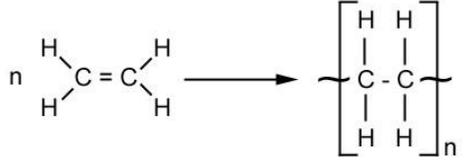
Question Number		Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
FT	HT								
8	2	(a)			2	pH6 – should be pH 11-12 (or alkaline) (1) burns with an orange flame – should be lilac flame (1)	8-14 / above 7 lithium with implication that reaction should be more rapid (but less rapid than reaction of sodium)		7 or above
		(b)			4	flame test (1) yellow flame (1) (add) silver nitrate (solution) (1) white precipitate (1) must have correct test for observation mark to be awarded	orange flame		

Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
9	3	(a)			2	AlCl ₃ (1) formula must be correct to get balancing mark 2,3,2 (1)			
		(b)	(i)		2	102 (2) if incorrect allow (1) for (27 x 2) + (16 x 3) no ecf within part (i)			
			(ii)		1	47 ecf possible from part (i)	47.1		

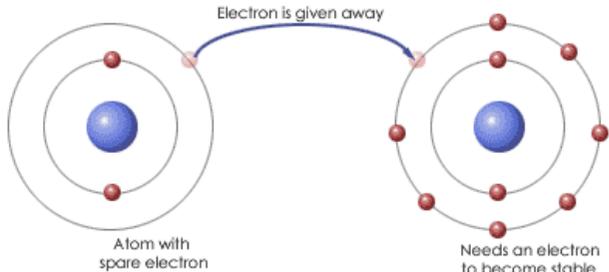
Question Number		Mark	Answer
FT	HT		
10	4	6	<p>Indicative content: how it is carried out – spot of each ink on pencil line and dip end of paper in water, leave for water to rise up paper what happens – water dissolves ink and carries the components different distances according to their solubilities, appear as spots/streaks on paper / as chromatogram results – if inks contain the same pigments, the pattern of spots would be identical; different pattern if inks contain different pigments</p> <p>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.</p> <p>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.</p> <p>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.</p> <p>0 marks: The candidate does not make any attempt or give a relevant answer worthy of credit.</p>

Question Number		Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
FT	HT	(a)	(i)		1	84 – no tolerance			
	5		(ii)		2	32 (2) ecf possible from part (i) if incorrect award (1) for 16 or 200 – 168			
		(b)			3	both increase with temperature (1) R R - must have this for full marks any 2 of the following for (1) each KNO ₃ non-linear increase/curve and KBr linear increase/straight line (1) solubilities the same at 50°C (1) below 50°C solubility of KNO ₃ is lower than KBr or above 50°C solubility of KNO ₃ is higher than KBr (1) solubility of KNO ₃ increases more than solubility of KBr (1)			

Question Number								
FT	HT	Sub-section		Mark	Answer	Accept	Neutral answer	Do not accept
	6	(a)		3	<p>many strong bonds in all directions in diamond (1)</p> <p>lots of energy needed to separate atoms / break bonds (1)</p> <p>weak bonds between molecules therefore less energy needed to separate them (1)</p>	hydrogen is simple molecular but diamond is giant covalent for (1) if no other credit awarded		
		(b)		2	<p>thermal/electrical conductivity (1)</p> <p>free moving / delocalised electrons between layers (1)</p> <p>or</p> <p>slippery / soft (1)</p> <p>layers able to move over each other / weak bonds / forces between layers (1)</p> <p>must have property for explanation mark to be awarded</p>			brittle
		(c)		2	<p>two shared pairs of electrons (1)</p> <p>outer shells of both atoms complete (1)</p>  <p>must have double bond to be awarded second mark</p>			

Question Number		Sub-section		Mark	Answer	Accept	Neutral answer	Do not accept
FT	HT	(a)	(i)	2	$C_2H_4 + Br_2$ (1) $C_2H_4Br_2$ (1)			
	7		(ii)	1	orange solution turns colourless			ethene goes colourless
		(b)	(i)	3	 <p>(3) for correct equation</p> <p>otherwise double bond breaks in ethene (1) large number of molecules join together (1) to form a long chain polymer (1)</p>			
			(ii)	2	speeds up the rate of the reaction (1) reduces energy required (for collision to be successful) (1)	reduces activation energy		
		(c)		4	A = thermoplastic / thermosoftening plastic B = thermoset both needed for (1) weak or no bonds between chains in A (1) bonds formed between chains in B (1) allowing chains of A to move over each other / chains of B cannot move over each other (1)	crosslinks		award (2) max for explanation if any reference to layers

Question Number		Sub-section		Mark	Answer	Accept	Neutral answer	Do not accept
FT	HT							
	8	(a)		3	$M_r(\text{NaHCO}_3) = 84$ and $M_r(\text{Na}_2\text{CO}_3) = 106$ (1) 2 : 1 ratio (1) $126 \rightarrow 79.5\text{g}$ (1) award (3) for cao			
		(b)		2	$70/79.5$ (1) 88.05 (1) ecf possible from part (a)			

Question Number		Mark	Answer
FT	HT		
	9	6	<p>Indicative content:</p> <p>diagram showing bonding in lithium chloride with no ambiguity</p>  <p>to form Li^+ and Cl^- (outer electrons only need be shown)</p> <p>description of bonding in words i.e. lithium atom loses an electron to become a positive ion, chlorine atom gains an electron to become a negative chloride ion, strong force of attraction between oppositely charged ions; high melting point due to strong bonds between the ions; conducts electricity when molten or in solution as charged ions are free to move; does not conduct when solid as ions are immobile</p> <p>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.</p> <p>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.</p> <p>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.</p> <p>0 marks: The candidate does not make any attempt or give a relevant answer worthy of credit.</p>

GCSE Mark Scheme - Chemistry 3

Question Number		Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
1		(a)			3	three factors – air/oxygen, fuel and heat all three for (2) any two for (1) remove any one to put out fire (1)			
		(b)			2	Method 1: removes air/oxygen (1) Method 2: removes fuel (1)			

Question Number		Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
FT	HT	(a)	(i)						
2					2	$ \begin{array}{c} \text{H} \\ \\ \text{H}-\text{C}-\text{H} \\ \\ \text{H} \end{array} $ (1) C_2H_6 (1)			
			(ii)		1	C_8H_{18}			
		(b)	(i)		1	ethanol		alcohol	
			(ii)		1	C			
			(iii)		1	wine / beer / alcoholic drinks fuels / biofuels solvents antibacterial gels perfumes / aftershaves any one for (1)		alcohol / drinking / drinks / medicine / cleaning	

Question Number		Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
FT	HT								
3		(a)	(i)		2	number of nitrogen atoms 2 number of hydrogen atoms 6 both needed for (1) equal / same number (of these atoms) on right hand side (1)			
			(ii)		1	gas / gaseous			
		(b)	(i)	I	1	cooling			
				II	1	recycling			
			(ii)		2	iron (1) speeds up reaction (1)			

Question Number		Sub-section		Mark	Answer	Accept	Neutral answer	Do not accept
FT	HT							
4		(a)		3	limestone / chalk / marble (1) CaO (1) calcium hydroxide (1)			
		(b)	(i)	1	brick-red	red		
			(ii)	2	carbon dioxide / CO ₂ (1) must have correct gas to award test mark turns limewater milky (1)			
			(iii)	2	1.9/2.0 (1) 95 (1) award (2) for correct answer only (cao)			
		(c)		2	landscaping during /after quarry to remove visual pollution restrict quarry size to reduce visual pollution trains instead of lorries blast at agreed times spray lorry wheels with water to reduce dust remove endangered species to safe site any two for (1) each	other sensible	reference to economic benefits	
		(d)		2	local jobs money into local economy limestone for building / named buildings e.g. houses, walls, etc. local industries / named industry e.g. for making cement/iron building better local road system any two for (1) each	other sensible		

Question Number		Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
FT	HT								
5		(a)	(i)		1	ammonia	NH ₃		
			(ii)		1	copper(II) hydroxide	copper hydroxide Cu(OH) ₂		
			(iii)		1	Fe(OH) ₂			
		(b)	(i)		1	sulfuric acid is stronger / more acidic (than ethanoic acid) ethanoic acid is weaker / less acidic (than sulfuric acid)	sulfuric acid is strong and ethanoic acid is weak	pH of sulfuric acid is 1 and pH of ethanoic acid is 3	
			(ii)	I	1	reaction with sulfuric acid would be faster more reactive / more bubbles / gets hotter with sulfuric acid	converse answers		
				II	1	(gas) pops with lighted splint			

Question Number		Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
FT	HT	(a)	(i)						
6	1		(i)		3	SO ₂ O ₂ (1) SO ₃ (1) formulae must be correct to get balancing mark 2, 1, 2 (1)			
			(ii)		2	30 (2) if incorrect answer credit (1) for two correct readings from graph i.e. 86 and 56			
			(iii)		2	H ₂ SO ₄ (1) [no mark for SO ₃] H ₂ S ₂ O ₇ (1)			
		(b)			3	black mass forms / black solid forms / sugar turns black (1) steam / water vapour / hissing (1) smell (1) any two for (1) each carbon (1)		temperature rise / water formed / bubbles / fizzing	

Question Number		Sub-section		Mark	Answer	Accept	Neutral answer	Do not accept
FT	HT							
7	2	(a)		2	100 × 4.2 × 30 (1) 12600 (1) award (2) for cao			
		(b)		1	same height between flame and can same can/same wick/ same spirit burner same stirring (or not) not using a lid for all alcohols changing the water each time / using cold water each time any one for (1)		same room temperature / conditions	
		(c)		3	theoretical values greater (than experimental values) (1) both values increase down alcohol group (1) loss of heat to the surroundings / can (1)	rank order the same		
		(d)		2	two linked points required e.g. biofuels have a lower energy output than traditional fuels (1) and therefore require greater quantities to be consumed (in order to produce the same amount of energy) (1) credit sensible alternatives uses land that would otherwise be used to grow food crops (1) leading to food shortage/price increase (1) growth requires large amounts of water (1) which is therefore not available for other uses (1)			

Question Number		Mark	Answer
FT	HT		
8	3	6	<p>Indicative content</p> <p>Benefits e.g. increase crop yield, more food, healthier plants, improves quality of soil, cheaper food and releases land for other purposes.</p> <p>Problems e.g. increased soil acidity (which needs neutralising using lime), pollutes water supplies/ nitrates in drinking water (possible health problems), overgrowth of plants in canals (which requires unblocking) and ‘eutrophication’ or full description – (algae over growth, bloom formation, sunlight blocked, plants die, bacteria removes oxygen during decomposition, water de-oxygenated and water becomes lifeless)</p> <p>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.</p> <p>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.</p> <p>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.</p> <p>0 marks The candidate does not make any attempt or give a relevant answer worthy of credit.</p>

Question Number		Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
FT	HT								
	4				6	<p>three different methods needed award max (2) for each method</p> <p>use water (1) remove heat (1)</p> <p>'beat' (1) remove air/oxygen (1)</p> <p>bulldoze/back burn / backfire / making a firebreak (1) remove fuel (1)</p> <p>method must be correct for second mark to be awarded</p>			CO ₂ extinguisher / fire blanket as a method of removing oxygen in this context

Question Number		Sub-section		Mark	Answer	Accept	Neutral answer	Do not accept
FT	HT	(a)	(i)	1	C_8H_{18}			
	5		(ii)	2	$\begin{array}{c} \text{CH}_3 \\ \\ \text{CH}_3-\text{CH}_2-\text{CH}-\text{CH}_3 \end{array} \quad (1)$ $\begin{array}{c} \text{CH}_3 \\ \\ \text{CH}_3-\text{C}-\text{CH}_3 \\ \\ \text{CH}_3 \end{array} \quad (1)$			
		(b)	(i)	1	C_nH_{2n}			
			(ii)	1	$\begin{array}{c} \text{H} \quad \text{H} \quad \text{H} \\ \quad \quad \\ \text{H}-\text{C}=\text{C}-\text{C}-\text{H} \\ \\ \text{H} \end{array}$			
		(c)		1	<p>B</p> <p>contains C=C peak</p> <p>both needed for (1)</p>			

Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
	6	(a)	(i)		1	1000 atmospheres 100°C both needed for (1)			
			(ii)		2	low rate/ slow reaction (1) (iron) catalyst (1)	decreased rate		incorrectly named catalyst e.g. V ₂ O ₅
			(iii)		1	cost of container/more expensive to build/thicker container walls/ cost of getting to high pressure		'cost'	
		(b)	(i)		1	exothermic			
			(ii)		1	4 → 4			
			(iii)		2	CuCO ₃ + 2HNO ₃ → Cu(NO ₃) ₂ + H ₂ O + CO ₂ formulae correct (1) balancing (1) formulae must be correct for balancing mark to be awarded			

Question Number		Sub-section		Mark	Answer	Accept	Neutral answer	Do not accept
FT	HT							
	7	(a)		4	<p>A sodium iodide B ammonium carbonate C calcium chloride D iron(II) carbonate</p> <p>mark positive and negative ions independently</p> <p>8 ions correct = 4 marks 6/7 ions correct = 3 marks 4/5 ions correct = 2 marks 2/3 ions correct = 1 mark</p>	<p>NaI $(\text{NH}_4)_2\text{CO}_3$ CaCl_2 FeCO_3</p> <p>no credit for either ion if incorrect formula given instead of name – ignore formulae if names also given</p>		
		(b)		1	<p>barium chloride (solution forms a) white precipitate</p> <p>test and result needed</p>	barium nitrate / $\text{Ba}^{2+}(\text{aq})$		

Question Number		Sub-section		Mark	Answer	Accept	Neutral answer	Do not accept
FT	HT							
	8	(a)		2	moles = conc × vol/1000 $= \frac{0.1 \times 17.5}{1000} \quad (1)$ $= 0.00175 \quad (1)$ award (2) for cao			
		(b)		1	176			
		(c)		2	ecf possible from parts (a) and (b) mass = moles × M _r = 0.00175 × 176 (1) 0.308 g / 308 mg (correct unit required) therefore statement incorrect (1)	alternative method using given 300 mg mass		

Question Number		Mark	Answer
FT	HT		
	9	6	<p>Indicative content appropriate apparatus required, measured amount of alkali (or acid) in conical flask, add indicator <i>e.g. phenolphthalein</i>, add acid (alkali), drop-wise near end point/colour change, record volume of acid (alkali) added, repeat without indicator adding recorded volume of acid (alkali), boil off some of the water, leave solution to evaporate, dry crystals obtained</p> <p><i>Credit awarded for sequenced labelled diagrams as part of the response.</i></p> <p>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.</p> <p>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.</p> <p>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.</p> <p>0 marks The candidate does not make any attempt or give a relevant answer worthy of credit.</p>



WJEC
245 Western Avenue
Cardiff CF5 2YX
Tel No 029 2026 5000
Fax 029 2057 5994
E-mail: exams@wjec.co.uk
website: www.wjec.co.uk