



GCSE MARKING SCHEME

JANUARY 2016

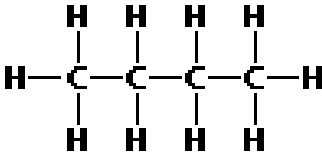
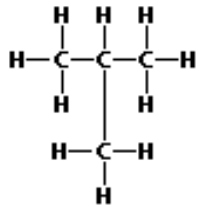
**SCIENCE – CHEMISTRY C2
4472/ 01/02**

INTRODUCTION

This marking scheme was used by WJEC for the January 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.

Question Number		Sub-section		Mark	Answer	Accept	Neutral answer	Do not accept
FT	HT							
1		(a)	(i)	1	A			
			(ii)	1	C			
			(iii)	1	B			
		(b)		1				
		(c)	(i)	1	boiling			
			(ii)	1	condensation			
			(iii)	1	fractions	fraction		
			(iv)	1	boiling point			

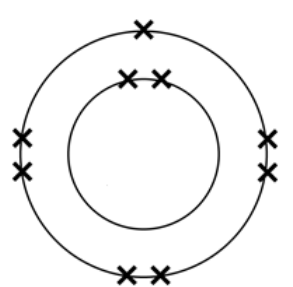
Question Number		Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
FT	HT								
2		(a)	(i)		1	protons and electrons – both needed			
			(ii)		1	electron			
			(iii)		1	5			
		(b)			2	84 (2) If answer incorrect or missing award (1) for evidence of correct interpretation of formula e.g. (1 x Na) + (1 x H) + (1 x C) + (3 x O) or 23 + 1 + 12 + 3(16)			

Question Number		Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
FT	HT	(a)	(i)						
3					3	all points plotted correctly (2) any three correct (1) straight line of best fit – ruler used (1)			
			(ii)		1	91.5 ± 0.5 consequential marking			
			(iii)		1	49 ± 0.5 consequential marking			
		(b)			2	water gets absorbed by the hydrogel (1) hydrogel expands / puffs up / swells (1)	water goes into the hydrogel / disappears	it increases	

Question Number		Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
FT	HT								
4		(a)	(i)		3	A oil (1) B water (1) C chlorine (1)	liquid paraffin H_2O Cl_2		paraffin chloride / Cl^-
			(ii)		1	yellow		orange	
		(b)			1	any of following for (1) <ul style="list-style-type: none"> • use small pieces of sodium / excess water • use tweezers / tongs • wear goggles / face shield / use safety screen 		use screen / wear gloves	glass screen
		(c)			2	correct formula for sodium oxide – Na_2O (1) <i>formula must be correct to award balancing mark</i> balancing ...4... and ...2... (1)	$Na^+_2 O^{2-}$		

Question Number								
FT	HT	Sub-section		Mark	Answer	Accept	Neutral answer	Do not accept
5		(a)		2	<p>dyes soluble in water (1)</p> <p>dyes have different solubilities and therefore travel at different speeds (up the paper) / different distances in the same time (1)</p> <p>both marks can be awarded for one statement e.g. the more soluble the dye the faster it travels / the further it travels in a given time</p>			
		(b)		2	<p>red (1)</p> <p>working shown including values of 6 and 8 taken from chromatogram (1)</p>			

Question Number		Sub-section		Mark	Answer	Accept	Neutral answer	Do not accept
FT	HT							
6		(a)		2	Austria (1) highest levels of Ca^{2+} and highest levels of Mg^{2+} (1)	'calcium' for Ca^{2+} 'magnesium' for Mg^{2+}		
		(b)		3	limescale / fur / calcium carbonate / magnesium carbonate (1) water pipe – causes blockages / stops water flowing / causes explosions (1) heating elements – prevents heat transfer / wastes energy / less efficient (1)	CaCO_3 / MgCO_3 costs more to heat water	costs more	scum / limestone

Question Number		Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
FT	HT								
7	1	(a)			5	$17 (1)$ $8 (1)$ $^{18}_8\text{O} (1)$	$17 (1)$ $8 (1)$		
		(b)			1	fluorine / F and oxygen / O either order		F_2 and O_2	
		(c)			1			2,7	

Question Number		Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
FT	HT								
8	2	(a)			2	A metallic / metal (1) C giant ionic / ionic (1)			
		(b)	(i)		2	A (1) free electrons / mobile electrons / delocalised electrons / sea of electrons (1)		electrons	
			(ii)		2	C (1) any of following for (1) <ul style="list-style-type: none"> contains more than one type of particle / ion has strong bonds between ions / strong ionic bonds If B given, award (1) for strong bonds between atoms		strong bonds	

Question Number		Sub-section		Mark	Answer	Accept	Neutral answer	Do not accept
FT	HT							
9	3	(a)		3	<p>polypropene (1)</p> $\left[\begin{array}{cc} \text{F} & \text{F} \\ & \\ -\text{C} & -\text{C}- \\ & \\ \text{F} & \text{F} \end{array} \right] \quad (1)$ $\begin{array}{ccc} \text{H} & & \text{H} \\ & \diagdown & / \\ & \text{C}=\text{C} & \\ & / & \diagdown \\ \text{H} & & \text{Cl} \end{array} \quad (1)$	structure without brackets	ignore 'n'	
		(b)		2	<p>links / bonds between chains prevent them from sliding over each other (1)</p> <p>any of following for (1)</p> <ul style="list-style-type: none"> • PEX heat resistant • doesn't soften / lose shape / melt 		high melting point	layers

Question Number			
FT	HT	Mark	Answer
10	4	6	<p>Indicative content Sedimentation: settling tank / settling process / large insoluble particles settle out Filtration: filter bed / layers of different sized particles / sand bed / top algae layer removes some bacteria / removes small insoluble particles Chlorination: kills bacteria</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)		2	substances A and B have the same solubility (1) 43 g/100 g water at 27 °C – unit required for both (1)			
	5		(ii)		2	33 (1) g / grams (1)			
		(b)			2	both mixtures contain 6 / same number of compounds (1) both contain compounds D and E (1)	both contain compounds with retention time 8 and 11	lines / peaks	

Question Number		Sub-section		Mark	Answer	Accept	Neutral answer	Do not accept	
FT	HT	(a)	(i)						
	6			2	K^+ K^+	$\begin{array}{c} x \cdot \\ x \cdot S x \\ x \cdot \end{array} 2-$	complete octet (1) correct charge on both ions (1)		
			(ii)	2	potassium (atoms) need to lose one electron and sulfur (atom) needs to gain two electrons (1) both atoms need a full outer electron shell to become stable (1) award (1) max if no direct reference to electrons in either statement				
		(b)		2	shared pair of electrons (1) each atom obtains a full outer electron shell (1) award (1) max if no direct reference to electrons in either statement				

Question Number		Sub-section		Mark	Answer	Accept	Neutral answer	Do not accept
FT	HT							
	7	(a)		3	A lithium chloride (1) B lithium oxide (1) C lithium hydroxide (1)	LiCl / Li ⁺ Cl ⁻ Li ₂ O / Li ₂ O ²⁻ LiOH / Li ⁺ OH ⁻		
		(b)		2	award (1) for correct formula FeF ₃ if formula correct award (1) for correct balancing $2\text{Fe} + 3\text{F}_2 \rightarrow 2\text{FeF}_3$			
		(c)		2	$\text{Ag}^+(\text{aq}) + \text{Cl}^-(\text{aq}) \rightarrow \text{AgCl}(\text{s})$ (2) award (1) for correct ions and product but missing/incorrect state symbols	equation with 2 of each species		
		(d)		3	Z is bromine (1) doesn't react with Cl ⁻ / doesn't react with halide ions above them in Group 7 (1) does react with I ⁻ / does react with halide ions below them in Group 7 (1)			

Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
	8	(a)			3	all points plotted correctly (2) any three correct (1) line of best fit through (0,0) (1)			
		(b)	(i)		1	0.4 dependent on line of best fit			
			(ii)		2	mass of oxygen value from part (b)(i) to be used both masses divided by appropriate A_r e.g. $0.4/16$ and $0.6/24$ (1) $0.025 : 0.025$ $1 : 1$ (1)			
		(c)			1	reduces effect of errors in any one experiment / anomalous result credit to be awarded for the idea of 'averaging'		more accurate / reliable	

Question Number			Mark	Answer
FT	HT			
	9	(a)	6	<p>Indicative content</p> <p>Structure</p> <ul style="list-style-type: none"> • giant molecule / layered structure • strong bonds within layers • weak bonds between layers • layers can slide over one another • delocalised electrons / free electrons / each atom forms three covalent bonds <p>Relate structure to correct property and uses</p> <ul style="list-style-type: none"> • free electrons electrical conductor electrodes • weak bond between layers soft & greasy pencils / lubricants • giant molecule / strong bond within layers high melting point brake shoes <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									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
	9	(b)			1	(electrical) conductor / (thermal) conductor / high melting point / high boiling point			