GCE AS MARKING SCHEME

SUMMER 2019

AS (NEW)
CHEMISTRY - UNIT 1
2410U10-1

INTRODUCTION

This marking scheme was used by WJEC for the 2019 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.

UNIT 1: THE LANGUAGE OF CHEMISTRY, STRUCTURE OF MATTER AND SIMPLE REACTIONS

MARK SCHEME

GENERAL INSTRUCTIONS

Extended response questions

A level of response mark scheme is applied. The complete response should be read in order to establish the most appropriate band. Award the higher mark if there is a good match with content and communication criteria. Award the lower mark if either content or communication barely meets the criteria.

Marking rules

All work should be seen to have been marked.

Marking schemes will indicate when explicit working is deemed to be a necessary part of a correct answer.

Crossed out responses not replaced should be marked.

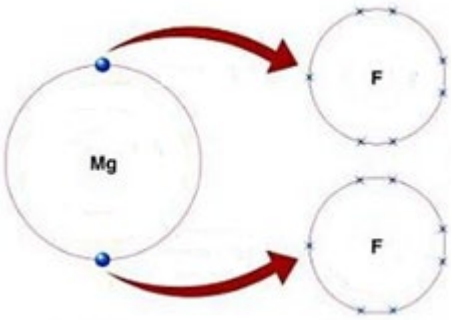
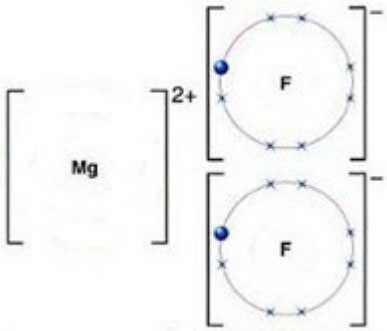
Marking abbreviations

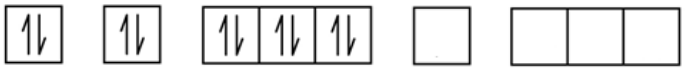
The following may be used in marking schemes or in the marking of scripts to indicate reasons for the marks awarded.

cao = correct answer only
ecf = error carried forward
bod = benefit of doubt

Credit should be awarded for correct and relevant alternative responses which are not recorded in the mark scheme.

Section A

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
1				 electron transfer (1)  ion formation (1)		2		2		
2				decreases tooth decay / strengthens tooth enamel	1			1		
3				$\frac{1}{12}$ th mass of one atom of carbon-12	1			1		

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
4					1			1		
5				award (1) for any of following +5 5 +V V		1		1		
6				$Mg_3(PO_4)_2$		1		1		
7				2.41×10^{24}		1		1	1	
8				n(Ti) = 0.200 mol $n(O_2)$ = 0.150 mol (1) **both** needed Ti_2O_3 (1) do not accept Ti_4O_6 award (1) only for Ti_4O_3		2		2	2	
				Section A total	**3**	**7**	**0**	**10**	**3**	**0**

Section B

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
9	*(a)*	(i)		**C** (1) contains two shells not three / less shielding of outer electron (1) of the elements with two shells it contains greatest nuclear charge / most protons (1)	2		1	3		
		(ii)		**G** (1) nucleus is most positively charged / has most protons (so greatest attraction to last electron) (1)	1		1	2		
		(iii)		**D**, **E**, **G** award (2) for all three correct award (1) for two correct / two correct and one incorrect answer award (1) for all three correct and one incorrect answer award (0) if more than one incorrect answer	1	1		2		
		(iv)		**D**, (**E**), **G**	1			1		
	(b)	(i)		(gaseous magnesium) atoms bombarded by electrons	1			1		
		(ii)		deflected through a magnetic field	1			1		

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
	(c)	(i)		^{28}Al		1		1		
		(ii)		21 hours		1		1	1	
	(d)			bonding consists of (a regular array of) metal ions surrounded by a 'sea' of delocalised / valence electrons (1) (electrostatic) attraction between ions and electrons (1) (when a force is applied) the layers of metal ions slide over each other forming a new shape (1) credit possible for appropriate diagram(s)	3			3		
	(e)			6.17×10^{-4}		1		1	1	
				Question 9 total	**10**	**4**	**2**	**16**	**2**	**0**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
10	*(a)*			electron promoted to a higher energy level (1) falls back down to a lower energy level (1)	2			2		
	(b)	(i)		each series corresponds to electrons falling to different energy levels	1			1		
		(ii)		energy difference between the shells decreases / energy levels get closer together	1			1		
	(c)	(i)		ionisation of the atom / point at which electron leaves the atom	1			1		
		(ii)		$\Delta E = hf$ and $f = c/\lambda$ (1) $\frac{6.63 \times 10^{-34} \times 3.00 \times 10^{8}}{92.1 \times 10^{-9}}$ (1) 2.18×10^{-18} J (1) 1312 kJ mol^{-1} (1)	1	3		4	4	

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
	(d)	(i)		$n(Al) = 4.85 \times 10^{-3}$ (1) $n(H_2) = 7.28 \times 10^{-3}$ (1) volume H_2 = 178 cm^3 (1)		3		3	2	
		(ii)		$V = \frac{1 \times 178 \times 323}{298 \times 1.6}$ (1) $V = 121\ cm^3$ (1) if 200 cm^3 used award (2) for V = 135 cm^3 Credit alternative method using pV = nRT $V = \frac{7.28 \times 10^{-3} \times 8.31 \times 323}{161600}$ (1) $V = 121\ cm^3$ (1)		2		2	2	
				Question 10 total	**6**	**8**	**0**	**14**	**8**	**0**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
11	*(a)*			no more effervescence		1		1		1
	(b)			award (1) each for any two improvements and (1) each for linked explanations use larger beaker / conical flask (1) prevents acid spray from escaping (1) rinse beaker and add washings to flask (1) ensures no acid left in beaker (1) use more acid / less chalk (1) gives larger titres therefore smaller percentage error (1) crush the chalk / heat the solution / stir the solution (1) speeds up the reaction (1)			4	4		4
	(c)			$n(NaOH) = 1.64 \times 10^{-3}$ mol (1) excess $n(HCl) = 1.64 \times 10^{-3}$ mol $n(HCl)$ reacted $= 0.05 - 1.64 \times 10^{-3} = 0.0484$ mol (1) $n(CaCO_3) = 0.0242$ mol mass $CaCO_3 = 2.42$ g (1) percentage $CaCO_3 = 95.3$ % (1)		4		4	3	4
	(d)			not valid as first titre should be disregarded / is rough value			1	1		1

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
	(e)			value of titre would increase (1) fewer moles HCl react with limestone therefore more moles NaOH needed to react with excess (1)			2	2		2
				Question 11 total	**0**	**5**	**7**	**12**	**3**	**12**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
12	*(a)*	(i)		can't be magnesium since gives colour in flame test (1) can't be (strontium) or barium since compound A / the hydroxide is not soluble enough (1)			2	2		2
		(ii)		calcium carbonate accept $CaCO_3$		1		1		1
		(iii)		n(acid) = 3.92×10^{-3} n(compound **C**) = 1.96×10^{-3} (1) M_r(compound **C**) = 56.1 A_r(O) is 16 therefore A_r of metal must be 40.1 (1)			2	2	2	2
	(b)			number of protons = 50 / relative masses of isotopes are 120 and 122 (1) $A_r = \frac{(120 \times 57.9) + (122 \times 42.1)}{100}$ (1) A_r = 120.8 (1) **must** be given to 4 sig figs		3		3	1	

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
	(c)			**Indicative content** • addition of acid to form soluble salt • excess acid to ensure maximum amount of magnesium salt • addition of soluble carbonate • excess to ensure all magnesium ions precipitated • filter and dry precipitate • appropriate equations		4	2	6		6
				5-6 marks Full description of two stages; good attempt at two equations *The candidate constructs a relevant, coherent and logically structured method including all key elements of the indicative content. A sustained and substantiated line of reasoning is evident and scientific conventions and vocabulary are used accurately throughout.* **3-4 marks** Full description of one stage; attempt at one equation *The candidate constructs a coherent account including most of the key elements of the indicative content. Some reasoning is evident in the linking of key points and use of scientific conventions and vocabulary are generally sound.* **1-2 marks** Gives reactants or partial description of one stage *The candidate attempts to link at least two relevant points from the indicative content. Coherence is limited by omission and/or inclusion of irrelevant material. There is some evidence of appropriate use of scientific conventions and vocabulary.* **0 marks** *The candidate does not make any attempt or give an answer worthy of credit.*						
				Question 12 total	**0**	**8**	**6**	**14**	**3**	**11**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
13	*(a)*	(i)		(in a reversible reaction) the rate of forward reaction is equal to the rate of backward reaction	1			1		
		(ii)		NaOH reacts with the H^+ / concentration of H^+ decreases (1) equilibrium shifts to right and concentration of Cl_2 decreases / concentration of HClO increases (1)			2	2		
	(b)	(i)	I	mass water = 1.62 g (1) $n(CaCl_2) = 0.0150$ mol $n(H_2O) = 0.0899$ mol (1) $x = 6$ (1) award (1) only for correct answer with **no working**		3		3	2	3
			II	heat to constant mass	1			1		1
		(ii)		award (1) for either of following iodide ion larger than chloride ion so less attraction to sodium ion less difference in electronegativity so NaI not as ionic as NaCl	1			1		

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
	(c)	(i)		permanent dipoles between molecules in ICl but Cl_2 has only temporary dipoles / van der Waals forces between molecules (1) permanent dipoles stronger than temporary dipoles / van der Waals forces (1) **or** ICl larger molecule than Cl_2 so more electrons (1) more van der Waals forces between molecules (1)	2			2		
		(ii)		octahedral	1			1		
		(iii)		$[ClF_2]^+$ has 2 bond pairs and 2 lone pairs (1) $[ClF_2]^-$ has 2 bond pairs and 3 lone pairs (1) student is correct - different numbers of electron pairs will give rise to different shapes (1)			3	3		
				Question 13 total	**6**	**3**	**5**	**14**	**2**	**4**

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SUMMARY OF MARKS ALLOCATED TO ASSESSMENT OBJECTIVES

Question	AO1	AO2	AO3	Total	Maths	Prac
Section A	3	7	0	10	3	0
9	10	4	2	16	2	0
10	6	8	0	14	8	0
11	0	5	7	12	3	12
12	0	8	6	14	3	11
13	6	3	5	14	2	4
Totals	25	35	20	80	21	27