

COMPONENT 2 – Concepts in Chemistry**FOUNDATION TIER****MARK SCHEME****GENERAL INSTRUCTIONS**Recording of marks

Examiners must mark in red ink.

One tick must equate to one mark (apart from the questions where a level of response mark scheme is applied).

Question totals should be written in the box at the end of the question.

Question totals should be entered onto the grid on the front cover and these should be added to give the script total for each candidate.

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.

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

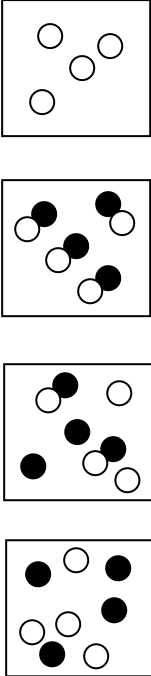
Extended response question

A level of response mark scheme is used. Before applying the mark scheme please read through the whole answer from start to finish. Firstly, decide which level descriptor matches best with the candidate's response: remember that you should be considering the overall quality of the response. Then decide which mark to award within the level. Award the higher mark in the level if there is a good match with both the content statements and the communication statements.

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

Question		Marking details		Marks Available					
				AO1	AO2	AO3	Total	Maths	Prac
1	(a)		 <p> mixture of elements a reaction not yet complete pure compound pure element </p> <p>All correct for (2) Two correct for (1)</p>	2			2		
	(b)	(i)	Distillation	1			1		1
		(ii)	Boiling (1) Condensing (1)	2			2		2

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Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
1	(c)	(i)		Purple and yellow – both needed			1	1		1
		(ii)		<p>Distance (cm)</p> <p>solvent front</p> <p>start point</p> <p>purple green yellow brown blue</p> <p>Food colouring</p>			1	1		1
		(iii)		0.4×10 (1) 4 (1)	1	1		2		2
				Question 1 total	6	1	2	9	0	7

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
2	(a)			Disposing of the jacket	1			1		
	(b)			Advantage: cotton less energy used / less fuel used with cotton (1) Disadvantage: fertiliser used for cotton/ more emissions (of carbon dioxide /sulfur dioxide) / more water used (1)			2	2		
				Question 2 total	1	0	2	3	0	0

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
3	(a)	(i)		Millions of years	1			1		
		(ii)		Hydrocarbons	1			1		
	(b)	(i)		Sum of other fractions = 38 (1) Answer = 4 (1)	2			2		
		(ii)		21x100/42 (1) Answer = 50 (1)	1	1		2	2	
				Question 3 total	5	1	0	6	2	0

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
4	(a)			Battery acid (1)	2			2		
				Pure water (1)						
	(b)			A Copper(II) carbonate (1) accept copper carbonate			3	3		3
			B Copper(II) oxide (1) accept copper oxide							
			C Sodium hydroxide (1)							
	(c)	(i)		1		1		1		1
				(ii)	25			1	1	
		(iii)		Any of the following for (1) Measures continuously Measures more precisely Data can be plotted in real time Stores data			1	1		1
				Question 4 total	2	1	5	8	0	6

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
5	(a)	(i)		2, 8, 8		1		1		
		(ii)		D		1		1		
		(iii)		B and D – both needed (1) Must be correct in order to award second mark Same number of electrons in outer shell (1)		1		2		
	(b)	(i)		$(2 \times 23) + 12 + (3 \times 16)$ (1) Answer = 106 (1)		2		2	2	
		(ii)		$\left(\frac{46}{106}\right) \times 100$ (1) Answer = 45 (1) [%] accept 45.3 / 45.28		2		2	2	
				Question 5 total	1	7	0	8	4	0

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Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
6	(a)	(i)	I	intercept = 0 (1)		1		1	1	1
			II	Workings = $0.41/0.15 = 0.2 \text{ [s}^{-1}\text{]}$ to 1 dp The mark is for a suitable triangulation ratio that gives 0.2 to 1dp		1		1	1	
			III	rate = $0.2 \times \text{concentration}$ Allow ecf		1		1	1	1
		(ii)	I	time = $1/0.052$ (substitution) = 19 [s]	1	1		2	2	2
			II	Any of the following for (1) Reaction time in seeing change and stopping stopwatch Not always clear when cross has vanished concentrations/ temperatures may not be exactly correct Do not just accept: experimental error in measurements			1	1		1
	(b)			Any of the following for (1) Watch stops at precisely the same point in the reaction each time Measures accurately as there is no delay in stopping watch Data can be plotted in real time Credit other sensible advantages			1	1		1
				Question 6 total	1	4	2	7	5	6

Question				Marking details		Marks available						
						AO1	AO2	AO3	Total	Maths	Prac	
7	(a)	(i)		365* – 100 (1) Answer = 265 (1)	*Accept value between 360 – 365 Use value from first line to award mark		2		2	1		
		(ii)		energy of the reactants < energy of products ✓		1			1			
	(b)			Lower energy reaction profile drawn with: same start/end point (1) lower activation energy (1)				2	2			
	(c)	(i)		941+(3x436) selection and working =2249			1		1	1		
		(ii)		391x3x2 selection and working =2346			1		1	1		
		(iii)		-97 / Allow 97 Allow ecf (1) Exothermic reaction because more energy is given out (in forming bonds) than is required (in breaking bonds) (1)			1		2			
				Question 7 total			4	5	0	9	3	0

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Question			Marking details			Marks available																	
						AO1	AO2	AO3	Total	Maths	Prac												
8	(a)		<table border="1"> <thead> <tr> <th>Particle</th> <th>Mass</th> <th>Charge</th> </tr> </thead> <tbody> <tr> <td>proton</td> <td>1</td> <td>positive (+)</td> </tr> <tr> <td>neutron</td> <td>1</td> <td>neutral (0)</td> </tr> <tr> <td>electron</td> <td>negligible</td> <td>negative (-)</td> </tr> </tbody> </table> <p>Each correct answer (1)</p>	Particle	Mass	Charge	proton	1	positive (+)	neutron	1	neutral (0)	electron	negligible	negative (-)								
	Particle	Mass	Charge																				
proton	1	positive (+)																					
neutron	1	neutral (0)																					
electron	negligible	negative (-)																					
	(b)		<p>...19...</p> <p style="text-align: center;">X</p> <p>...9...</p> <p>Both correct for 1 mark</p>																				

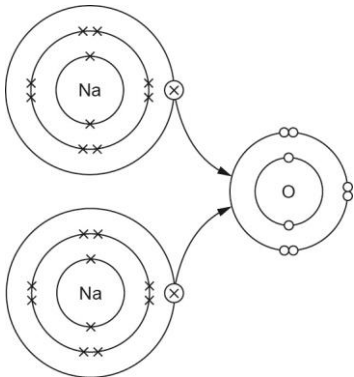
Question			Marking details	Marks available					
				AO1	AO2	AO3	Total	Maths	Prac
(c)	(i)		FeCl ₃		1		1		
	(ii)		Chlorine is toxic / poisonous Do not accept: harmful/dangerous	1			1		1
	(iii)		Fluorine (1) Reactivity decreases down the group (1)	1		1	2		
	(iv)		2Na + Cl ₂ → 2NaCl		1		1		
(d)			Suggest suitable test (add each metal to water / burn each metal in air) (1) Correct observations for given test i.e. Adding water - sodium does not burn but potassium burns (1) with lilac flame (1), or Burn each metal in air - potassium burns with lilac flame (1), sodium with yellow (1)	2	1		3		2
			Question 8 total	6	4	1	11	0	3

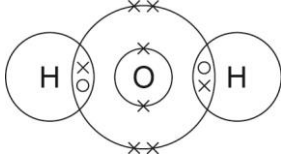
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Question	Marking details	Marks available					
		AO1	AO2	AO3	Total	Maths	Prac
9	<p>Indicative content: Silicon has some typical properties of a metal i.e. high melting point & boiling point, shiny, electrical conductor. However, silicon also has properties typical of a non-metal i.e. low density & brittle. Interprets density of silicon - closer to the non-metal phosphorus than the metal iron. Silicon shows properties of both metals & non-metals and is therefore difficult to classify. Lies between metal aluminium and non-metal sulfur in periodic table and shows properties of both.</p> <p>AO allocations AO1 - Properties metals / non-metals AO3 - Classification of silicon in light of interpreting information in table</p> <p>5-6 marks: Correctly groups each property of silicon as typical of metal or non-metal. Comments on density information of iron & phosphorus to substantiate that silicon's density is typical of non-metal. Comments on positioning between metal and non-metal in periodic table. Formulates a response to the observations made. <i>There is a sustained line of reasoning which is coherent, relevant, substantiated and logically structured. The information included in the response is relevant to the argument.</i></p> <p>3-4 marks: Correctly groups most properties of silicon as typical of metals or non-metal. Recognises this causes a difficulty in classifying silicon. <i>There is a line of reasoning which is partially coherent, largely relevant, supported by some evidence and with some structure. Mainly relevant information is included in the response but there may be some minor errors or the inclusion of some information not relevant to the argument.</i></p> <p>1-2 marks: Correctly recognises that at least one property of silicon is typical of a metal and at least one property typical of a non-metal. <i>There is a basic line of reasoning which is not coherent, largely irrelevant, supported by limited evidence and with very little structure. There may be significant errors or the inclusion of information not relevant to the argument.</i></p> <p>0 marks: <i>No attempt made or no response worthy of credit.</i></p>	3		3	6		
	Question 9 total	3	0	3	6	0	0

Question			Marking details	Marks available					
				AO1	AO2	AO3	Total	Maths	Prac
10	(a)	(i)	3.0 identified as anomalous result			1	1		1
		(ii)	Any of following points for (1) Not enough magnesium added Too much solution used Reading taken too quickly after addition / without stirring			1	1		1
	(b)	(i)	Both scales correct (1) All 5 points plotted correctly (1) Smooth curve drawn (1)		3		3	3	
		(ii)	0.8 g because no additional temperature increase when a greater mass added			1	1		1
	(c)	(i)	Iron is more reactive than copper (1) Displacement reaction occurs / iron displaces the copper (1)	1					2
		(ii)	Reactants – copper(II) sulfate and iron (1) Products – iron(II) sulfate and copper (1) Accept iron sulfate		2		2		
	(d)		$\text{Cu} + 2\text{AgNO}_3 \rightarrow \text{Cu}(\text{NO}_3)_2 + 2\text{Ag}$ (2) If equation not correct award (1) for AgNO_3 and Ag included on appropriate sides		2		2		
Question 10 total				1	8	3	12	3	5

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Question			Marking details	Marks available					
				AO1	AO2	AO3	Total	Maths	Prac
11	(a)	(i)	 <p>Movement of electrons as shown</p>		1		1		
		(ii)	<div style="border: 1px solid black; padding: 2px; display: inline-block;">$[2:8]^+$</div> <p>Electron configuration of sodium ions with + charge (1) Accept if this is shown only once</p> <div style="border: 1px solid black; padding: 2px; display: inline-block;">$[2:8]^{2-}$</div> <p>Electron configuration of oxide ion with 2– charge (1)</p>						
		(iii)	<p>Sodium and oxide ions have opposite charges (1)</p> <p>Strong attraction holds them together (1)</p>	2			2		
		(iv)	B		1		1		

Question			Marking details	Marks available					
				AO1	AO2	AO3	Total	Maths	Prac
	(b)		 <p>Correct diagram as shown (2)</p> <p>Award (1) if hydrogen and oxygen atom included and correct representation of one bonding pair between them [hydrogen's only electrons]</p>		2		2		
	(c)		<p>Strong bonds between all atoms in diamond (1)</p> <p>Weak forces between hydrogen molecules (1)</p> <p>Requires lots of heat/energy to break the bonds in diamond but only small amount to overcome forces in hydrogen (1)</p>	3			3		
			Question 11 total	5	6	0	11	0	0

COMPONENT 2 – Concepts in Chemistry**FOUNDATION TIER****SUMMARY OF MARKS ALLOCATED TO ASSESSMENT OBJECTIVES**

Question	AO1	AO2	AO3	TOTAL MARK	MATHS	PRAC
1	6	1	2	9	0	7
2	1	0	2	3	0	0
3	5	1	0	6	2	0
4	2	1	5	8	0	6
5	1	7	0	8	4	0
6	1	4	2	7	5	6
7	4	5	0	9	3	0
8	6	4	1	11	0	3
9	3	0	3	6	0	0
10	1	8	3	12	3	5
11	5	6	0	11	0	0
TOTAL	35	37	18	90	17	27