



GCSE

Chemistry A

Unit **A172/01**: Modules C4, C5, C6 (Foundation Tier)

General Certificate of Secondary Education

Mark Scheme for June 2014

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This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by examiners. It does not indicate the details of the discussions which took place at an examiners' meeting before marking commenced.

All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the report on the examination.

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Annotations

Used in the detailed Mark Scheme:

Annotation	Meaning
/	alternative and acceptable answers for the same marking point
(1)	separates marking points
not/reject	answers which are not worthy of credit
ignore	statements which are irrelevant - applies to neutral answers
allow/accept	answers that can be accepted
(words)	words which are not essential to gain credit
words	underlined words must be present in answer to score a mark
ecf	error carried forward
AW/owtte	alternative wording
ORA	or reverse argument

Available in scoris to annotate scripts

	Blank Page – this annotation must be used on all blank pages within an answer booklet (structured or unstructured) and on each page of an additional object where there is no candidate response.
	indicate uncertainty or ambiguity
	benefit of doubt
	contradiction
	incorrect response
	error carried forward
	draw attention to particular part of candidate's response
	draw attention to particular part of candidate's response
	draw attention to particular part of candidate's response
	no benefit of doubt

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	reject
	correct response
	draw attention to particular part of candidate's response
	information omitted

Subject-specific Marking Instructions

- a. If a candidate alters his/her response, examiners should accept the alteration.
- b. Crossed out answers should be considered only if no other response has been made. When marking crossed out responses, accept correct answers which are clear and unambiguous.

E.g.

For a one mark question, where ticks in boxes 3 and 4 are required for the mark:

Put ticks (✓) in the two correct boxes.

<input type="checkbox"/>
<input type="checkbox"/>
<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>
<input type="checkbox"/>

This would be worth 1 mark.

Put ticks (✓) in the two correct boxes.

<input type="checkbox"/>
<input type="checkbox"/>
<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>
<input type="checkbox"/>

This would be worth 0 marks.

Put ticks (✓) in the two correct boxes.

<input checked="" type="checkbox"/>
<input type="checkbox"/>

This would be worth 1 mark.

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c. The list principle:

If a list of responses greater than the number requested is given, work through the list from the beginning. Award one mark for each correct response, ignore any neutral response, and deduct one mark for any incorrect response, e.g. one which has an error of science. If the number of incorrect responses is equal to or greater than the number of correct responses, no marks are awarded. A neutral response is correct but irrelevant to the question.

d. Marking method for tick boxes:

Always check the additional guidance.

If there is a set of boxes, some of which should be ticked and others left empty, then judge the entire set of boxes.

If there is at least one tick, ignore crosses. If there are no ticks, accept clear, unambiguous indications, e.g. shading or crosses.

Credit should be given for each box correctly ticked. If more boxes are ticked than there are correct answers, then deduct one mark for each additional tick. Candidates cannot score less than zero marks.

E.g. If a question requires candidates to identify a city in England, then in the boxes

Edinburgh	
Manchester	
Paris	
Southampton	

the second and fourth boxes should have ticks (or other clear indication of choice) and the first and third should be blank (or have indication of choice crossed out).

Edinburgh			✓			✓	✓	✓	✓	
Manchester	✓	x	✓	✓	✓				✓	
Paris				✓	✓		✓	✓	✓	
Southampton	✓	x		✓		✓	✓		✓	
Score:	2	2	1	1	1	1	0	0	0	NR

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Question		Answer	Mark	Guidance
1	a	NaCl; magnesium;	2	REJECT NaCl/NaCL/multiples e.g. Na ₂ Cl ₂ ALLOW NaCl ₁ ALLOW phonetic spelling
	b	P does follow pattern AND S does not ; One from: P (does follow pattern because it) is in group 5 and has 5 Cl in molecule; S (does not follow pattern because it) is in group 6 but only has 2 / S should have 6 chlorines / S should have 4 more; Pattern shows number of chlorines matches group number;	2	
	c	sodium + chlorine → sodium chloride	1	ALLOW sodium + hydrochloric acid → sodium chloride + hydrogen REJECT chloride for chlorine ACCEPT correctly balanced symbol equation IGNORE incorrect symbols if word equation present
			5	

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Question			Answer	Mark	Guidance
2	a	i	box 2; box 4;	2	
		ii	Fast/vigorous reaction; fizz/make a gas/bubbles/make hydrogen; make an alkali/form hydroxide; heat given off/steam formed/boil/exothermic; metal moves around on surface/floats;	any 2	IGNORE melt/dissolve/flame
	b		<p>elements</p> <div style="display: flex; justify-content: space-around;"> <div style="border: 1px solid black; padding: 5px; width: 150px;">calcium, strontium, barium</div> <div style="border: 1px solid black; padding: 5px; width: 150px;">non-metals found combined in molecules in the air</div> </div> <div style="display: flex; justify-content: space-around; margin-top: 10px;"> <div style="border: 1px solid black; padding: 5px; width: 150px;">chlorine, bromine, iodine</div> <div style="border: 1px solid black; padding: 5px; width: 150px;">non-metals that all react quickly with gp1 metals</div> </div> <div style="display: flex; justify-content: space-around; margin-top: 10px;"> <div style="border: 1px solid black; padding: 5px; width: 150px;">carbon, nitrogen and oxygen</div> <div style="border: 1px solid black; padding: 5px; width: 150px;">metals with high melting points and good electrical conductivity</div> </div>	2	all correct (2) 1 or 2 correct (1)
	c	i	<p>check (original) data / check RAMs; AW</p> <p>check/repeat/work out calculation or mean; AW</p> <p>peer review / discuss / decide if they agree/disagree; AW</p> <p>test predictions / see if his ideas work for other elements; AW</p>	any 2	<p>Ignore 'evaluate ideas' in the Q</p> <p>Allow repeating experiment idea for checking data.</p> <p>Allow attempt to check calculation using numbers in Q</p> <p>Allow 1 mark for idea of checking unqualified</p>

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Question			Answer	Mark	Guidance
	c	ii	<p>average mass = 130 /130.25 / difference between RAM of silver and copper is 44.5 / difference between RAM of silver and gold is 89; (1)</p> <p>which is different to 108 / different to (RAM of) silver / mean is too high / RAM of silver not in the middle idea / differences in RAM not equal idea; (1)</p>	2	<p>Answer must refer to silver or 108 for second mark</p> <p>Allow second mark ecf on incorrect calculation</p> <p>Allow 'it is 22/22.25 too high' for (2)</p>
				10	

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Question	Answer	Marks	Guidance
3	<p>[Level 3] Links trends in number of shells to atomic radius, including a comparative prediction for rubidium and caesium. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks)</p> <p>[Level 2] Describes trends in the data, linking electrons to atomic radius and makes a prediction about caesium and/or rubidium. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks)</p> <p>[Level 1] Describes a trend in the data without making it clear that the pattern is ‘down the group’ or makes a prediction about caesium and/or rubidium. Quality of written communication impedes communication of the science at this level. (1 – 2 marks)</p> <p>[Level 0] Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)</p>	6	<p>This question is targeted at grades up to C</p> <p>Indicative scientific points may include: Describes the trends in the data</p> <ul style="list-style-type: none"> • atomic radius increases down the group • number of electrons increases down the group • number of electron shells increases down the group <p>Allow answers that imply ‘down the group’.</p> <p>Links</p> <ul style="list-style-type: none"> • More shells gives a bigger radius • More electrons gives a bigger radius <p>Prediction</p> <ul style="list-style-type: none"> • caesium and/or rubidium will have more shells • caesium and/or rubidium will have a larger atomic radius • caesium and/or rubidium will have more electrons • caesium and/or rubidium will have 1e in outer shell • caesium and/or rubidium will have more 16/8 more electrons than potassium • suggests possible electron arrangements based on the data e.g. Rb is 2.8.8.8.1 <p>Comparative prediction</p> <ul style="list-style-type: none"> • rubidium will have fewer shells than caesium • caesium will be the biggest atom. • Caesium would have 8 more electrons than rubidium <p>Use the L1, L2, L3 annotations in Scoris; do not use ticks.</p>
	Total	6	

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Question		Answer	Mark	Guidance
4	ai	C	1	
	ii	B	1	
	iii	A and C	1	ALLOW C and A
	iv	A	1	
	b	strength melting point electrical conductivity malleability	2	All correct = 2 3 or 2 correct = 1
			6	

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Question	Answer	Marks	Guidance
5	<p>[Level 3] Processes data about supply or demand and links data about both to a problem. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks)</p> <p>[Level 2] Identifies a problem and uses data about both supply and demand OR identifies a problem linked to processed data about supply or demand. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks)</p> <p>[Level 1] Identifies a problem and uses data about supply or demand. Quality of written communication impedes communication of the science at this level. (1 – 2 marks)</p> <p>[Level 0] Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)</p>	6	<p>This question is targeted at grades up to C</p> <p>Indicative scientific points may include:</p> <p>Problems</p> <ul style="list-style-type: none"> • idea that copper supplies will run out in the future/are finite/limited • Supply cannot meet demand <p>Data about supply and demand</p> <p>Demand</p> <ul style="list-style-type: none"> • demand for copper is rising • Quotes value(s) from demand graph <p>Supply</p> <ul style="list-style-type: none"> • Recycling/scrap can only supply 50% of demand • Quotes value(s) from supply table • only four countries have (large) copper supplies. <p>Processed data</p> <ul style="list-style-type: none"> • between 2010 and 2030 copper demand is expected to double. • Demand for copper is rising faster (over time) • Attempts to estimate number of years' supply. • uses values from the supply table to compare to the annual demand. • Total supply from 4 countries is 289 million tonnes • discusses a shortfall between demand and supply using data from both the table and the graph <p>Use the L1, L2, L3 annotations in Scoris; do not use ticks.</p>
	Total	6	

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Question			Answer	Mark	Guidance
6	a		Box 1	1	
	b	i	blue precipitate; which does not dissolve in excess NaOH;	2	ALLOW blue solid Must be clear that excess NaOH has been used Mark independently
		ii	(add dilute acid and then) barium chloride / barium nitrate; white precipitate forms;	2	REJECT use of sulphuric acid ALLOW white solid IGNORE cloudy/milky Mark independently
	c	i	electrolysis	1	ALLOW phonetic spelling
		ii	Box 1; Box 3;	2	
				8	

Question	Answer	Marks	Guidance
7 a	<p>[Level 3] Describes a workable method to make crystals which is mostly in the correct sequence. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks)</p> <p>[Level 2] Describes a method to make crystals with some in the correct sequence. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks)</p> <p>[Level 1] Gives some basic ideas about how to use the apparatus to make crystals. Quality of written communication impedes communication of the science at this level. (1 – 2 marks)</p> <p>[Level 0] Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)</p>	6	<p>This question is targeted at grades up to E</p> <p>Indicative scientific points may include:</p> <p>basic ideas</p> <ul style="list-style-type: none"> • acid in beaker • add carbonate to acid • stir • filter • heat / boil <p>possible additional details</p> <ul style="list-style-type: none"> • measure acid in measuring cylinder • add excess zinc carbonate • add more carbonate when fizzing stops / when reaction stops / when no more dissolves • filter off unreacted carbonate • heat to evaporate water • evaporate only some of the water • cool to crystallise /leave to crystallise • dry crystals in oven <p>idea of sequence</p> <ul style="list-style-type: none"> • measuring • mixing • filtering • evaporation • drying <p>Ignore numbers on diagram unless linked to descriptions in text.</p> <p>Use the L1, L2, L3 annotations in Scoris; do not use ticks.</p>

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Question			Answer	Mark	Guidance
	b	i	3.2 (1)	1	
		ii	80 % (or ecf for bi x25)with or without working scores (2)	2	Allow 1 mark for answer to (b)(i) divided by 4
	c	 zinc carbonate → carbon dioxide (1) zinc → hydrogen (1)	2	
				11	

Question			Answer	Mark	Guidance
8	a		A → fastest B → slowed down C → stopped	2	all 3 correct = 2 any 2 correct = 1 1 correct = 0
	b		zinc chloride	1	Allow ZnCl ₂ Ignore incorrect formula if name is correct. Allow zinc chloride and hydrogen(1) Do not allow if other incorrect additional products are named.
	c		Repeat (same) experiment; add copper/catalyst; look for a faster reaction/higher rate;	3	Allow 'do it again' Allow shorter time
	d		reactants; energy change of reaction;	2	
				8	

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