



Mark Scheme
(Results)

Summer 2019

Pearson Edexcel GCSE
In Combined Science (1SC0) Paper 1CH

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General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

Mark schemes have been developed so that the rubrics of each mark scheme reflects the characteristics of the skills within the AO being targeted and the requirements of the command word. So for example the command word 'Explain' requires an identification of a point and then reasoning/justification of the point.

Explain questions can be asked across all AOs. The distinction comes whether the identification is via a judgment made to reach a conclusion, or, making a point through application of knowledge to reason/justify the point made through application of understanding. It is the combination and linkage of the marking points that is needed to gain full marks.

When marking questions with a 'describe' or 'explain' command word, the detailed marking guidance below should be consulted to ensure consistency of marking.

Assessment Objective		Command Word	
Strand	Element	Describe	Explain
AO1		An answer that combines the marking points to provide a logical description	An explanation that links identification of a point with reasoning/justification(s) as required
AO2		An answer that combines the marking points to provide a logical description, showing application of knowledge and understanding	An explanation that links identification of a point (by applying knowledge) with reasoning/justification (application of understanding)
AO3	1a and 1b	An answer that combines points of interpretation/evaluation to provide a logical description	
AO3	2a and 2b		An explanation that combines identification via a judgment to reach a conclusion via justification/reasoning
AO3	3a	An answer that combines the marking points to provide a logical description of the plan/method/experiment	
AO3	3b		An explanation that combines identifying an improvement of the experimental procedure with a linked justification/reasoning

Question number	Answer	Additional guidance	Mark
1(a)(i)	any two from E, G and X	allow mark if all three given for E allow B / boron for G allow O / O ₂ / oxygen for X allow Ar / argon allow use of lower case letters reject answers with any other letters / element names	(1)

Question number	Answer	Additional guidance	Mark
1(a)(ii)	any two from A, E and G	allow mark if all three given for A allow Li / lithium for E allow B / boron for G allow O / O ₂ / oxygen allow use of lower case letters reject answers with any other letters / element names	(1)

Question number	Answer	Additional guidance	Mark
1(a)(iii)	A / J	allow mark if both given for A allow Li / lithium for J allow Na / sodium allow use of lower case letters reject answers with any other letters / element names reject answers with + or – charges	(1)

Question number	Answer	Additional guidance	Mark
1(b)(i)	An explanation linking: (atoms with) same (number of) protons (1) (atoms with) different (number of) neutrons (1)	ignore any mention of electrons reject answers in terms of elements (plural) but allow element (singular) if no other mark: allow same atomic number and different mass number (1)	(2)

Question number	Answer	Mark
1(b)(ii)	A 5 protons is the only correct answer B is not correct because there are 5 or 6 neutrons C is not correct because the atomic number is 5 D is not correct because there are 5 or 6 neutrons	(1)

Question number	Answer	Additional guidance	Mark
1(c)	2.8.8	allow 2,8,8 2/8/8 2 8 8 or other separator allow correct electron shell diagram	(1)

Question number	Answer	Additional guidance	Mark
1(d)	MP1 for dividing by atomic mass $\begin{array}{ccc} \text{A} & : & \text{G} \\ \underline{3.5} & : & \underline{4.0} \\ 7 & & 16 \end{array} \quad (1)$ MP2 for deriving ratio from MP1 $\begin{array}{ccc} 0.5 & : & 0.25 \\ \text{OR} & & \\ 2 & : & 1 \end{array} \quad (1)$ MP3 for ratio in MP2 to formula empirical formula A₂G (1)	A₂G with no relevant working (1) ONLY AG₂ (0) For MP2: If they go on to calculate a different ratio in addition to 0.5:0.25 or 2:1 do not award MP2 ecf on step 1: If inverted, $\begin{array}{ccc} \underline{7} & : & \underline{16} \\ 3.5 & & 4.0 \end{array} \quad (0)$ $= 2 : 4$ or $1 : 2 \quad (1)$ AG₂ (1) allow 1 in empirical formula allow Li for A and O for G do not penalise incorrect case in formula	(3)

(Total for Question 1 = 10 marks)

Question number	Answer	Additional guidance	Mark
2(a)(i)	(squeaky) pop / gas burns / water forms	allow explosion / bang / flame / fire / energy released ignore reaction occurs / ignites / set alight ignore references to splints (glowing or lit)	(1)

Question number	Answer		Mark
2(a)(ii)	A description to include <i>volumes going up:</i> (oxygen/ hydrogen/ gas) increase (with time) / volume (directly) proportional to time (1) <i>quantitative comparing hydrogen and oxygen:</i> (volume of) hydrogen double (volume of) oxygen / ORA / 2:1 ratio (1)	allow hydrogen goes up by 4 (cm³) each time / by 2 cm³ per minute / equivalent for oxygen for MP1 explicit reference needed to a ratio and not just quoting 2 figures allow amount in place of volume throughout allow twice as much hydrogen produced as oxygen (1) allow rate of hydrogen production double that of oxygen (2)	(2)

Question number	Answer	Mark
2(b)	C lead and bromine is the only correct answer A is incorrect because lead is produced at the cathode B is incorrect because lead and bromine are produced D is incorrect because bromine is produced at the anode	(1)

Question number	Answer	Additional guidance	Mark
2(c)	An explanation linking: (calcium) nitrate {is soluble/ dissolves}/ (calcium) carbonate {is insoluble/ does not dissolve} (1) - so ions {free to move in solution / not free in solid} (1)	calcium nitrate dissolves so ions can move (2) or reverse argument for calcium carbonate	(2)

Question number	Answer	Additional guidance	Mark
2(d)	$\text{Zn}^{2+} + 2\text{e}^{(-)} \rightarrow \text{Zn} \quad (2)$	if not fully correct, allow 1 for $\text{Zn}^{2+} + (\text{any number}) \text{e}^{(-)} \rightarrow (\text{anything})$ allow ZN, zn allow multiples reverse reaction scores (0) ignore state symbols $\text{Zn}^{2+} \rightarrow \text{Zn} - 2\text{e}^{(-)} \quad (0)$	(2)

(Total for Question 2 = 8 marks)

Question number	Answer	Additional guidance	Mark
3(a)(i)	14(.2) with or without working scores 3 1kg = 1000g (1) $\frac{142}{1000}$ (1) x 100% = 14(.2) (1)	If the percentage of non nickel compounds is calculated to give 85.8%/86% score 2 $\frac{142}{1000}$ or 0.142 will score MP1 and MP2 $\frac{142}{1} \times 100 = 14200$ scores (1)	(3)

Question number	Answer	Additional guidance	Mark
3(a)(ii)	decontaminates ground / conserves {nickel / nickel ores / ores} / allows use of low-grade ore / specified environmental reason: e.g. less noise due to mining / carbon neutral / less carbon dioxide	Ignore any reference to cost/ better for environment etc. / time / energy	(1) XP

Question number	Answer	Additional guidance	Mark
3(b)(i)	$2\text{NiS} + 3\text{O}_2 \rightarrow 2\text{NiO} + 2\text{SO}_2$ (2) all four formulae (1) balancing correct formulae only (1)	allow = for $\rightarrow$ allow multiples if wrong subscript or misuse of capital/small letter e.g. O2, O², niO, NIS, allow MP1 but cannot score MP2 if more than 4 formulae, can score MP1 but not MP2 ignore state symbols	(2)

Question number	Answer	Mark
3(b)(ii)	B the metal produced by electrolysis is very pure is the only correct answer A is incorrect because this is a disadvantage C is incorrect because electrolysis is expensive D is incorrect because heating with carbon can be used	(1)

Question number	Answer	Additional guidance	Mark
3(c)	A description including • (simple/fractional) distillation (1) • heat/ boil (1) • nickel tetracarbonyl {{boils/evaporates} off first / is obtained from top of column/ vapour is condensed by condenser} ORA (1)	allow 'raise temp. to 50°C' etc. (temp >42 and <90) allow lower boiling point liquid for nickel tetracarbonyl	(3)

(Total for question 3 = 10 marks)

Question number	Answer	Additional guidance	Mark
4(a)	A description including DECOMPOSITION • heat the (hydrated) {crystals / solid} (1) • (solid) goes white/ steam is observed / water produced (1) REVERSE REACTION • add water / water rejoins / water reacts with anhydrous solid (1) • (solid) goes blue (again) / heat is released (1)	ignore anything to do with Le Chatelier etc.. ignore 'closed system' MP4 independent of MP3	(4)

Question number	Answer	Additional guidance	Mark
4(b)	An explanation to include • less purple / lighter/ paler / fades (1) • because less iodine (1)	Ignore equilibrium shifts right, forward reaction favoured reject 'goes colourless' for MP1 reject ALL iodine reacts to give HI for MP2 (credit some iodine reacts / some iodine is used up) ignore 'more HI' ignore forwards reaction is favoured	(2)

Question number	Answer	Additional guidance	Mark
4(c)	$1.8... \times 10^{24}$ with or without working scores 2 $3 \times 6.02 \times 10^{23}$ (1) $= 1.8 \times 10^{24}$ (1)	allow 18×10^{23} 1.81×10^{24} 1.806×10^{24} or any other form of correct answer to 2-4 sig figs allow $2 \times 6.02 \times 10^{23} = 1.2 \times 10^{24}$ (1)	(2)

(Total for question 4 = 8 marks)

Question number	Answer	Additional guidance	Mark
5(a)	Any two from: • {(red-)brown / orange / pink} solid formed (1) • (some) {grey/silver} solid remains (1) • (blue solution) becomes colourless (1)	ignore substance names – descriptions are required allow {grey/silver} solid disappears / reduces / dissolves Answers that include fizzing/ effervescence/ bubbles in addition to correct response have max score of 1.	(2)

Question number	Answer	Additional guidance	Mark
5(b)	An explanation linking • zinc oxidised (1) • because (zinc) lose electrons/ half equation (1) • copper (ions) reduced (1) • because copper (ions) gained electrons/ half equation (1)	ignore copper sulfate is reduced ignore copper sulfate gains electrons marks are independent e.g zinc is reduced because it loses electrons = 1 zinc is oxidised because it gains electrons = 1	(4)

		If no other mark scored allow one mark for oxidation is the loss of electrons and reduction is the gain of electrons	
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Question number	Answer	Additional guidance	Mark
5(c)	0.005/ 5×10^{-3} mol with or without working scores 3 Mr = $63.5 + 32 + 4 \times 16$ (1) (=159.5) AND EITHER mass of copper sulfate = $50/1000 \times 15.95$ (1) (= 0.7975 g) moles = $0.7975/159.5$ (1) (= 0.005 mol) OR conc = $15.95/159.5$ (1) (=0.1 mol dm⁻³) moles = $50/1000 \times 0.1$ (= 0.005 mol)	2 marks for (MUST show working): 5 0.1 ecf in all stages	(3) EXP

Question number	Answer	Additional guidance	Mark
5(d)	2.8g with or without working scores 2 0.043×65 (1) (=2.795) = 2.8 g (1)	allow 1 mark for a different calculation using 65 and 0.043 , correctly evaluated, with working, rounded to 1 decimal place	(2) EXP

(Total for question 5 = 11 marks)

Question number	Answer	Additional Guidance	Mark
6(a)(i)	use <u>pH meter</u> / <u>pH probe</u> (1)	allow <u>pH paper</u> / <u>Universal indicator</u> reject other named indicators / 'just 'indicator'	(1)

Question number	Answer	Mark
6(a)(ii)	D ten times higher A is incorrect because a pH difference in 1 reflects a 10 fold difference in $[H^+]$ B is incorrect because a pH difference in 1 reflects a 10 fold difference in $[H^+]$ C is incorrect because a lower pH means a higher $[H^+]$	(1)

Question number	Answer	Additional guidance	Mark
6(b)(i)	ACID use measuring cylinder / pipette / burette (1) BASE balance / scales / weigh out amount (1)	must name apparatus ignore weigh the liquid allow use portion of known mass / use measured amount in g / specific mass given [from 0.1 to 10g] allow weight for mass	(2)

Question number	Answer	Additional guidance	Mark
6(b)(ii)	START colourless END pink / magenta	ignore clear	(1)

Question number	Answer	Additional guidance	Mark
6(b)(iii)	An explanation linking • {hydrogen ions/ H^+} {reacted / neutralised} (1) • {concentration falls/ fewer} H^+ / {concentration rises/ more} OH^- (1)	allow $\text{H}^+ + \text{OH}^- \rightarrow \text{H}_2\text{O}$ for MP1	(2)

Question number	Indicative content	Mark
6(c)	Answers will be credited according to candidate's deployment of knowledge and understanding of the material in relation to the qualities and skills outlines in the generic mark scheme. The indicative content below is not prescriptive and candidates are not required to include all the material which is indicated as relevant. Additional content included in the response must be scientific and relevant. AO3 (6 marks) • A is copper oxide • copper oxide is black • copper oxide reacts with sulfuric acid to make {copper sulfate / blue solution} but no gas • B is magnesium • magnesium is silver coloured • magnesium reacts/ bubbles with water • magnesium reacts with sulfuric acid to give hydrogen / equation • C is sodium hydroxide • sodium hydroxide is white • sodium hydroxide solution is colourless • sodium hydroxide reacts with sulfuric acid to form a colourless solution / equation • sodium hydroxide solution is alkaline • sodium hydroxide has hydroxide ions • D is copper carbonate • copper carbonate is green • carbonates are insoluble • copper carbonate reacts with sulfuric acid to form copper sulfate and {gas / carbon dioxide} • copper carbonate reacts with sulfuric acid to form carbon dioxide / equation • copper sulfate (solution) is blue	(6)

(Total for question 6 = 13 marks)

Level	Mark	Descriptor
	0	No rewardable material.
Level 1	1-2	- Deconstructs scientific information but understanding and connections are flawed. An unbalanced or incomplete argument that provides limited synthesis of understanding. - Judgements are supported by limited evidence. (AO3)
Level 2	3-4	- Deconstructs scientific information and provides some logical connections between scientific concepts. An imbalanced argument that synthesises mostly relevant understanding, but not entirely coherently. - Judgements are supported by evidence occasionally. (AO3)
Level 3	5-6	- Deconstructs scientific information and provide logical connections between scientific concepts throughout. A balanced, well-developed argument that synthesises relevant understanding coherently. - Judgements are supported by evidence throughout. (AO3)

Marker Guidance

Level	Mark	Descriptor	Additional Guidance
	0	No rewardable material.	Read whole answer and ignore all incorrect material/ discard any contradictory material then: No solids are correctly identified/ One solid is identified but no reason is given
Level 1	1–2	<u>Additional Guidance</u> Three solids are correctly identified but only one or none have valid reasoning (2) Two solids are correctly identified and one has valid reasoning (2) Two solids are correctly identified but neither has valid reasoning (1) One solid is correctly identified with a valid reason (1)	<u>Possible candidate response</u> A is copper oxide. D is copper carbonate because carbonates fizz with acid. – 2 correctly identified, one has a sufficient reason (2)
Level 2	3–4	<u>Additional Guidance</u> All four solids are correctly identified but only one or none have valid reasoning -No solid has valid reasoning (3) -One solid has valid reasoning (4) Three solids are correctly identified and at least two have valid reasoning -Three have valid reasoning (4) -Two have valid reasoning (3) Two solids are correctly identified and both have valid reasoning (3)	<u>Possible candidate response</u> A is copper oxide because it has pH 7, B is magnesium because metals are silver coloured, C is sodium hydroxide because it reacts with acid, D is copper carbonate because it has pH 7. – 4 correctly identified, only 1 has a sufficient reason (4)
Level 3	5–6	<u>Additional Guidance</u> All four solids are correctly identified and at least two have valid reasoning. -Two or three solids have valid reasoning (5) -All four have valid reasoning (6)	<u>Possible candidate response</u> A is copper oxide because it is the only black solid. B is magnesium because metals are silver coloured. C is sodium hydroxide because it dissolves to form an alkaline solution. D is copper carbonate because it forms copper sulfate which is blue in the reaction with acid <u>and fizzes</u>. 4 correctly identified, 4 with sufficient reasons (6)

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