

GCSE

COMBINED SCIENCE: TRILOGY

Chemistry Paper 1 Foundation Tier

Mark scheme Practice Paper Series – Set 1 SGC/S1/C/1F

Version 1.1

This mark scheme is an original resource written for sciencegcse.co.uk to accompany the Set 1 practice paper SGC/S1/C/1F. It is not an AQA mark scheme and has not been produced or endorsed by AQA. It follows the structure and conventions of AQA GCSE science mark schemes so that students and teachers can mark the practice paper in the same way that a real paper is marked.

Marking should be carried out using the Information to Examiners on the following pages. The paper has not been standardised, so raw marks should not be converted into grades using any published grade boundaries.

Specification references are to the AQA GCSE Combined Science: Trilogy (8464) specification, Chemistry section 5.1–5.5. AO = assessment objective; WS = working scientifically; MS = mathematical skills; RP = required practical.

Information to Examiners

1. General

The mark scheme for each question shows:

- the marks available for each part of the question
- the total marks available for the question
- the answer(s) expected, including alternative acceptable wording, in the **Answers** column
- guidance on which answers are and are not creditworthy in the **Extra information** column
- the assessment objective (AO) and specification reference for each marking point.

Award marks positively. Do not deduct marks for incorrect additional material unless it contradicts a correct answer (see 3.1). Marks are awarded for what the student has written, not for what they might have meant.

2. Emboldening and underlining

2.1 Where a list of acceptable answers is given and more than one mark is available, **any two from** (or similar) is used, followed by the acceptable answers.

2.2 A bold **and** indicates that both parts of the answer are needed to gain the mark.

2.3 Alternative answers acceptable for the same mark are separated by **or**. Different words that are acceptable within a marking point are separated by a forward slash (/).

2.4 Words in bold in the Answers column are the essential words that must be present, or their equivalent, for the mark to be awarded.

3. Marking points

3.1 Marking of lists

For a question asking for a fixed number of responses, consider the whole answer, including extra responses. Each incorrect or contradictory response cancels one correct response; ignore neutral additions. Numbered answer lines do not limit marking to the first responses. This rule does not apply to extended answers.

3.2 Marking procedure for calculations

Full marks can be awarded for a correct numerical answer without working, unless the question asks for working to be shown. If the answer is incorrect, marks may be awarded for the correct stages of working shown in the mark scheme. Anything shown in brackets in the Answers column (for example the unit) is not required for the mark.

3.3 Interpretation of 'it'

Answers using the word 'it' should be given credit only if it is clear that the 'it' refers to the correct subject.

3.4 Errors carried forward

Any error in the answer to a structured question causes the loss of the mark(s) for that part only. Later parts should be marked on the assumption that the incorrect answer was correct, where the mark scheme indicates that error carried forward (ECF) applies.

3.5 Phonetic spelling

Accept misspelled or phonetic scientific terms when the intended answer is clear, unless the spelling could be confused with a different technical term. This also applies when the question asks for the name of a process or structure.

3.6 Brackets

Words shown in brackets in the Answers column are not required to gain the mark but help to set the context.

3.7 Allow

Answers that are acceptable but which would not normally be expected are shown as **allow**.

3.8 Ignore

Statements shown as **ignore** are neither creditworthy nor penalised. Mark the rest of the answer normally.

3.9 Do not accept

Statements shown as **do not accept** are incorrect and, where they contradict or replace the expected answer, mean the mark is not awarded.

4. Level of response marking instructions

Extended-response questions (question 09.1 in this paper) are marked using a level of response mark scheme. The scheme has three levels, each covering two marks, plus a level descriptor and indicative content.

Step 1 – Determine a level. Read the whole answer and decide which level descriptor best fits it. Use a 'best-fit' approach: an answer does not need to meet every part of a descriptor to be placed in that level, and a weak part of the answer need not prevent it from reaching the higher level if the overall quality matches the descriptor.

Step 2 – Determine a mark within the level. Award the higher mark in the level if the answer meets the descriptor fully and the points made are well linked; award the lower mark if the answer only just meets the descriptor or contains minor errors or omissions.

The indicative content is not a checklist: students need not include every point to reach the top level, and other relevant, correct points should be credited. An answer that lists points without linking them into a coherent answer should be placed in a lower level than one that develops and connects them.

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1	proton: relative charge +1	allow +	1	AO1 5.1.1.4
	neutron: relative mass 1		1	AO1 5.1.1.5
	electron: relative charge -1	allow -	1	AO1 5.1.1.4
01.2	13		1	AO2 5.1.1.5
01.3	14	allow ECF from an incorrect number of protons in 01.2 (27 – their answer)	1	AO2 5.1.1.5 MS 1a
01.4	2,8,3	allow 2.8.3 or a correct diagram showing 2, 8 and 3 electrons in three shells	1	AO1 5.1.1.7
01.5	in the nucleus	if more than one box is ticked, no mark	1	AO1 5.1.1.5
01.6	1×10^{-10} (m)	allow 0.000 000 000 1 (m) allow 0.1×10^{-9} (m)	1	AO2 5.1.1.5 MS 1b
Total			8	
02.1	the sodium fizzes and moves around on the surface	if more than one box is ticked, no mark	1	AO1 5.1.2.5
02.2	(sodium + water →) sodium hydroxide	the two products may be given in either order	1	AO1 5.1.2.5
	(+) hydrogen	do not accept hydrogen oxide / oxygen	1	AO1 5.1.2.5
02.3	potassium		1	AO1 5.1.2.5
02.4	(going down the group) the outer electron is further from the nucleus or the atoms have more (electron) shells	allow the outer electron is more shielded (from the nucleus)	1	AO1 5.1.2.5
	(so) the outer electron is less strongly attracted (to the nucleus) and is lost more easily	allow less energy is needed to remove the outer electron do not accept the atoms have more electrons to lose	1	AO1 5.1.2.5
02.5	purple / blue	allow dark blue / violet	1	AO2 5.1.2.5 5.4.2.4
	because sodium hydroxide is an alkali or the solution is alkaline or the pH is above 7 / is 13–14	allow the solution contains hydroxide ions	1	AO2 5.1.2.5 5.4.2.4
Total			8	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	one shared pair of electrons (one dot and one cross) drawn in the overlap		1	AO1 5.2.1.4
	six non-bonding electrons (three pairs) shown on each chlorine atom and no other electrons	each Cl contributes 7 electrons; each has 8 after sharing allow consistent dots/crosses	1	AO1 5.2.1.4
03.2	covalent	if more than one box is ticked, no mark	1	AO1 5.2.1.1
03.3	chlorine consists of (small / simple) molecules	allow Cl ₂ is a small molecule	1	AO1 5.2.2.4
	(the forces) between the molecules are weak so little energy is needed to overcome them	allow weak intermolecular forces do not accept breaking covalent bonds do not accept weak bonds between atoms	1	AO1 5.2.2.4
03.4	(the sodium atom) loses one electron (from its outer shell)	do not accept gains an electron / shares electrons	1	AO1 5.2.1.2
03.5	(in the solid) the ions are in fixed positions / cannot move	allow the ions are held in a lattice	1	AO1 5.2.2.3
	(when molten) the ions are free to move (and carry the charge)	do not accept electrons are free to move	1	AO1 5.2.2.3
Total			8	
04.1	40 + 12 + (3 × 16) or 40 + 12 + 48	an answer of 100 scores 2 marks	1	AO2 5.3.1.2 MS 1a
	(M _r =) 100	an answer of 68 (only one oxygen counted) scores 1 mark	1	AO2 5.3.1.2 MS 1a
04.2	atoms are not created or destroyed or the (same) atoms are rearranged (into new substances)	allow the number of each type of atom is the same before and after the reaction	1	AO1 5.3.1.1
04.3	carbon dioxide is a gas which escapes (into the air)	allow a gas is given off / lost from the open crucible	1	AO2 5.3.1.3
04.4	(10.0 – 5.6) ÷ 10.0 × 100 or 4.4 ÷ 10.0 × 100	an answer of 44 scores 2 marks	1	AO2 5.3.1.3 MS 1c
	(percentage decrease =) 44 (%)	an answer of 56 (percentage remaining) scores 1 mark	1	AO2 5.3.1.3 MS 1c

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.5	$40 \div 100 \times 100$	an answer of 40 scores 2 marks allow ECF from an incorrect M_r in 04.1	1	AO2 5.3.1.2 MS 1c
	(percentage of calcium =) 40 (%)		1	AO2 5.3.1.2 MS 1c
04.6	$200 \text{ cm}^3 = 0.2 \text{ dm}^3$ or $8.0 \div 0.2$	an answer of 40 scores 2 marks	1	AO2 5.3.2.5 MS 1c
	(concentration =) 40 (g/dm ³)	an answer of 0.04 (g/cm ³) scores 1 mark	1	AO2 5.3.2.5 MS 1c
Total			10	
05.1	magnesium, zinc, iron, copper (most to least reactive)	all four in the correct order = 2 marks magnesium most reactive and copper least reactive with the middle two reversed = 1 mark	2	AO2 5.4.1.2
05.2	aluminium	if more than one box is ticked, no mark	1	AO1 5.4.1.3
05.3	(zinc oxide + carbon →) zinc	the two products may be given in either order	1	AO1 5.4.1.3
	(+) carbon dioxide	allow carbon monoxide	1	AO1 5.4.1.3
05.4	reduction is the loss of oxygen	do not accept gain of electrons unless the loss of oxygen is also given	1	AO1 5.4.1.1
	zinc oxide loses (its) oxygen or the oxygen is removed from the zinc oxide (by the carbon) to leave zinc	allow the carbon takes the oxygen from the zinc oxide	1	AO2 5.4.1.1
Total			7	
06.1	neutralisation	if more than one box is ticked, no mark	1	AO1 5.4.2.2
06.2	water	allow H ₂ O	1	AO1 5.4.2.2
06.3	to make sure all the acid has reacted / is used up	allow so that no acid is left in the solution do not accept to make the reaction faster	1	AO2 5.4.2.3
06.4	filter (the mixture) / filtration	allow use filter paper and a funnel	1	AO1 5.4.2.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.5	gently evaporate some water, then cool the solution to form crystals	allow use a water bath / evaporating basin do not accept heat to dryness	1	AO1 5.4.2.3 RP 8
	filter off the crystals and dry them with filter paper or in a warm place	allow drying between sheets of filter paper	1	AO1 5.4.2.3 RP 8
06.6	any pH value less than 7	e.g. pH 0, 1, 2, 3, 4, 5 or 6	1	AO1 5.4.2.4
Total			7	
07.1	(so that) the ions are free to move (to the electrodes)	allow the ions can carry the charge do not accept so the electrons can move	1	AO1 5.4.3.2
07.2	(at the negative electrode) lead (is formed)		1	AO1 5.4.3.2
	(at the positive electrode) bromine (is formed)	words must be used in the correct sentences	1	AO1 5.4.3.2
07.3	any one from: (graphite) conducts electricity (graphite) is inert / unreactive or does not react with the products (graphite) has a high melting point (so it does not melt in the molten lead bromide)	ignore 'cheap'	1	AO1 5.4.3.1
07.4	aluminium is more reactive than carbon (so carbon cannot remove the oxygen from aluminium oxide)	allow aluminium is above carbon in the reactivity series	1	AO1 5.4.3.3
07.5	(cryolite) lowers the melting point (of the aluminium oxide) or so less energy is needed to melt the aluminium oxide	allow the mixture melts at a lower temperature	1	AO1 5.4.3.3
07.6	a large amount of energy / electricity is needed (to melt the aluminium oxide / for the electrolysis)	allow the positive electrodes (carbon) burn away and have to be replaced	1	AO1 5.4.3.3
Total			7	
08.1	exothermic	if more than one box is ticked, no mark	1	AO1 5.5.1.1
08.2	13 (°C)	must be written in Table 3 or clearly given as the mean for zinc	1	AO2 5.5.1.1 MS 2b

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.3	bar for zinc drawn to 13 °C	tolerance $\pm$ half a small square (± 1 °C) allow ECF from an incorrect mean in 08.2	1	AO2 5.5.1.1 MS 4c
	bar for iron drawn to 5 °C	bars must be the same width as the magnesium bar and centred on the labels; if the heights are correct but the bars touch each other, allow 1 mark in total	1	AO2 5.5.1.1 MS 4c
08.4	magnesium	the reason mark can only be awarded if magnesium is chosen	1	AO3 5.5.1.1
	(because it gives) the largest temperature rise or releases the most energy	allow it is the most exothermic do not accept it reacts the fastest	1	AO3 5.5.1.1
08.5	copper does not react with (hydrochloric) acid or copper is less reactive than hydrogen or copper is unreactive	allow copper is below hydrogen in the reactivity series	1	AO2 5.4.2.1
08.6	$32 \div 5 = 6.4$ (times)	allow 6	1	AO2 5.5.1.1 MS 1c
08.7	A		1	AO1 5.5.1.2
Total			9	

Question	Answers		Extra information	Mark	AO / Spec. Ref.
09.1	Level 3 (5–6 marks)	A clear, detailed explanation that describes the structure and bonding of both diamond and graphite and uses them to explain the differences in hardness and electrical conductivity and the high melting points. The points made are linked together logically.		6	AO1 / AO2 5.2.3.1 5.2.3.2
	Level 2 (3–4 marks)	A description of the structure and bonding of diamond and/or graphite that explains some of the properties in Table 4 . Some links between structure and property may be missing or incomplete.			
	Level 1 (1–2 marks)	Simple statements about diamond or graphite, for example that they contain covalent bonds or that graphite has layers, with little or no explanation of the properties.			
	0 marks	No relevant content.			
	Indicative content Both substances - giant (covalent) structures / lattices of carbon atoms - the carbon atoms are joined by strong covalent bonds - many strong covalent bonds must be broken to melt them, which needs a lot of energy, so both have very high melting points Diamond - each carbon atom is bonded to four other carbon atoms - the atoms form a rigid three-dimensional structure, so diamond is very hard - there are no free (delocalised) electrons / all the outer electrons are used in bonds, so diamond does not conduct electricity Graphite - each carbon atom is bonded to three other carbon atoms, forming layers of hexagonal rings - there are no covalent bonds between the layers / only weak forces between the layers, so the layers can slide over each other, which makes graphite soft and slippery - one electron from each carbon atom is delocalised / free to move (between the layers), so graphite conducts electricity Credit other correct, relevant points. Do not credit statements that graphite has weak covalent bonds, or that diamond has intermolecular forces.				
Total				6	
TOTAL FOR PAPER				70	