

GCSE

COMBINED SCIENCE: TRILOGY

Physics Paper 1 Foundation Tier

Mark scheme Practice Paper Series – Set 1 SGC/S1/P/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/P/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, Physics section 6.1–6.4. 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 09.2 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	(the battery is a store of) chemical (energy)		1	AO1 6.1.1.1
	(the) gravitational potential (energy store of the load increases)	words must be used in the correct sentences	1	AO1 6.1.1.1
01.2	joule (J)	if more than one box is ticked, no mark	1	AO1 6.1.1.1
01.3	(E_p =) $2.0 \times 9.8 \times 1.5$	an answer of 29.4 scores 2 marks allow 29 (J)	1	AO2 6.1.1.2 MS 3c
	(E_p =) 29.4 (J)	an answer of 3.0 (mass $\times$ height only) scores 0 marks	1	AO2 6.1.1.2 MS 3c
01.4	(efficiency =) $30 \div 120$	an answer of 0.25 or 25% scores 2 marks	1	AO2 6.1.2.2 MS 3c
	(efficiency =) 0.25 or 25%	allow $\frac{1}{4}$ an inverted ratio ($120 \div 30 = 4$) alone scores 0 marks	1	AO2 6.1.2.2 MS 3c
01.5	any one from: - heating (of the motor) / thermal energy transferred to the surroundings - friction (between moving parts) - sound	allow the motor / wires get hot ignore 'lost' without a reason	1	AO1 6.1.2.1
Total			8	
02.1	first symbol $\rightarrow$ lamp second symbol $\rightarrow$ switch third symbol $\rightarrow$ resistor	all three lines correct = 2 marks two lines correct = 1 mark if more than one line is drawn from a symbol, that symbol scores 0	2	AO1 6.2.1.1
02.2	(Q =) 0.20×60	an answer of 12 scores 2 marks	1	AO2 6.2.1.2 MS 3c
	(Q =) 12 (C)	an answer of 0.0033 ($0.20 \div 60$) or 300 ($60 \div 0.20$) scores 0 marks	1	AO2 6.2.1.2 MS 3c
02.3	(R =) $3.0 \div 0.20$	an answer of 15 scores 2 marks	1	AO2 6.2.1.3 MS 3b MS 3c
	(R =) 15 (Ω)	an answer of 0.6 (3.0×0.20) scores 0 marks	1	AO2 6.2.1.3 MS 3b MS 3c

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.4	(the current) decreases	allow it gets smaller / lower do not accept it stops	1	AO1 6.2.1.3
02.5	in parallel with the cell	if more than one box is ticked, no mark	1	AO1 6.2.1.3
Total			8	
03.1	A		1	AO2 6.2.1.4 RP 16
03.2	the current is directly proportional to the potential difference	allow as the potential difference doubles, the current doubles allow the graph is a straight line through the origin do not accept 'as pd increases current increases' on its own	1	AO1 6.2.1.4
03.3	0.30 (A)	allow 0.29 to 0.31 (A)	1	AO2 6.2.1.4 MS 4a
03.4	($R =$) $4.0 \div 0.30$	an answer of 13.3 or 13 scores 2 marks allow ECF from an incorrect answer to 03.3	1	AO2 6.2.1.3 MS 3c
	($R =$) 13.3 (Ω)	allow 13 (Ω) allow 12.9 to 13.8 (Ω) from a value read within the tolerance for 03.3	1	AO2 6.2.1.3 MS 3c
03.5	(as the current increases) the temperature of the filament increases / the filament gets hotter	allow the lamp / wire gets hotter	1	AO1 6.2.1.4
	(so) the ions / atoms in the filament vibrate more , making it harder for the electrons to flow through or the electrons collide more (often) with the ions	allow (so) the resistance increases with temperature do not accept the electrons move faster	1	AO1 6.2.1.4
03.6	to change / vary the potential difference across (or the current through) the component	allow to change the current in the circuit allow to give a range of readings do not accept to control the current without reference to changing it	1	AO1 6.2.1.4 RP 16
Total			8	
04.1	50 Hz	if more than one box is ticked, no mark	1	AO1 6.2.3.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.2	the current keeps changing direction	if more than one box is ticked, no mark	1	AO1 6.2.3.1
04.3	$(P =) 230 \times 10$	an answer of 2300 scores 2 marks	1	AO2 6.2.4.1 MS 3c
	$(P =) \mathbf{2300}$ (W)	allow 2.3 kW an answer of 23 ($230 \div 10$) scores 0 marks	1	AO2 6.2.4.1 MS 3c
04.4	$(E =) 2300 \times 180$	an answer of 414 000 scores 2 marks allow ECF from an incorrect answer to 04.3	1	AO2 6.2.4.2 MS 3c
	$(E =) \mathbf{414\ 000}$ (J)	allow 4.14×10^5 (J) or 414 kJ	1	AO2 6.2.4.2 MS 3c
04.5	(increasing the potential difference) decreases the current (in the cables)	allow a smaller current is needed to transmit the same power	1	AO1 6.2.4.3
	(so) less energy is wasted / less energy is transferred to the surroundings by heating (of the cables)	allow the transmission is more efficient allow less energy is lost as heat	1	AO1 6.2.4.3
Total			8	
05.1	20 (cm ³)	allow 80 – 60	1	AO2 6.3.1.1 MS 4a RP 17
05.2	$(\rho =) 54 \div 20$	an answer of 2.7 scores 2 marks allow ECF from an incorrect answer to 05.1	1	AO2 6.3.1.1 MS 3c
	$(\rho =) \mathbf{2.7}$ (g/cm ³)	an answer of 0.37 ($20 \div 54$) scores 0 marks	1	AO2 6.3.1.1 MS 3c
05.3	aluminium	allow ECF: the metal in Table 1 whose density matches their answer to 05.2	1	AO2 6.3.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.4	any one from: - read the scale at eye level (to avoid parallax error) - use a measuring cylinder with smaller divisions / a narrower measuring cylinder - make sure the object is completely under the water and/or that no air bubbles are trapped on it - repeat the measurement and calculate a mean	allow read from the bottom of the meniscus ignore use a more accurate measuring cylinder without further detail	1	AO3 6.3.1.1 RP 17 WS 2.2
05.5	(the particles are) close together / touching and in a regular arrangement / pattern	allow in fixed positions / in rows	1	AO1 6.3.1.1 6.3.1.2
	(the particles) vibrate about fixed positions	do not accept the particles do not move do not accept the particles move around / slide past each other	1	AO1 6.3.1.1 6.3.1.2
Total			7	
06.1	B		1	AO2 6.3.1.2 6.3.2.3
06.2	100 (°C)		1	AO2 6.3.1.2 MS 4a
06.3	the energy is used to break / weaken the bonds (forces) between the particles or to change the state (from solid to liquid)	allow the energy increases the (potential) internal energy of the particles	1	AO1 6.3.2.3 6.3.2.1
	(so) the energy does not increase the kinetic energy of the particles / does not make the particles move faster (so the temperature stays the same)	allow the energy is not used to heat the substance	1	AO1 6.3.2.3 6.3.2.1
06.4	($\Delta E =$) $0.50 \times 4200 \times 40$ or $0.50 \times 4200 \times (60 - 20)$	an answer of 84 000 scores 2 marks an answer of 126 000 (60 °C used as the temperature change) or 42 000 (20 °C used) scores 1 mark	1	AO2 6.3.2.2 MS 3c
	($\Delta E =$) 84 000 (J)	allow 8.4×10^4 (J) or 84 kJ	1	AO2 6.3.2.2 MS 3c
06.5	($E =$) $0.50 \times 2\,260\,000$	an answer of 1 130 000 scores 2 marks	1	AO2 6.3.2.3 MS 3c

Question	Answers	Extra information	Mark	AO / Spec. Ref.
	(E =) 1 130 000 (J)	allow 1.13×10^6 (J) or 1130 kJ an answer of 4 520 000 (2 260 000 $\div$ 0.50) scores 0 marks	1	AO2 6.3.2.3 MS 3c
Total			8	
07.1	(a small central) nucleus		1	AO1 6.4.1.1
	(which contains protons and) neutrons	words must be used in the correct order	1	AO1 6.4.1.1
07.2	(number of protons =) 11		1	AO2 6.4.1.2
	(number of neutrons =) 12	allow ECF: 23 – their number of protons	1	AO2 6.4.1.2
07.3	(an atom of sodium-22) has one fewer neutron or has 11 neutrons (instead of 12)	allow it has a different number of neutrons allow it has a smaller mass number / mass do not accept a different number of protons or electrons	1	AO2 6.4.1.2
07.4	X	the reason mark can only be awarded if X is chosen	1	AO2 6.4.2.1
	(because) it is stopped by (a sheet of) paper or it is the least penetrating (type of radiation)	allow it travels the shortest distance / is absorbed most easily	1	AO2 6.4.2.1
07.5	an electron from the nucleus	if more than one box is ticked, no mark	1	AO1 6.4.2.1
Total			8	
08.1	the time taken for the count rate (or activity) to halve / fall to half its initial value or the time taken for the number of (radioactive) nuclei in a sample to halve	allow the time for half of the (unstable) nuclei to decay do not accept the time for the source to half decay / for half the source to disappear	1	AO1 6.4.2.3
08.2	(half-life =) 4 (days)	allow 3.8 to 4.2 (days)	1	AO2 6.4.2.3 MS 4a
	correct construction lines shown on Figure 6 , e.g. from 400 counts per second to the curve and down to the time axis	allow lines showing any correct halving, e.g. from 200 to 100 counts per second	1	AO2 6.4.2.3 MS 4a
08.3	$\frac{1}{4}$	if more than one box is ticked, no mark	1	AO2 6.4.2.3 MS 1c

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.4	(gloves) stop the radioactive material getting onto the skin / hands or reduce the risk of contamination	allow gloves stop the worker touching the source	1	AO2 6.4.2.4
	(tongs) increase the distance between the source and the worker, so less radiation reaches the worker or reduce irradiation	allow tongs keep the source further from the body ignore tongs stop the worker touching the source without reference to distance or irradiation	1	AO2 6.4.2.4
08.5	(mass number =) 237		1	AO2 6.4.2.2
	(atomic number =) 93	numbers must be in the correct positions (mass number above the atomic number)	1	AO2 6.4.2.2
Total			8	
09.1	wind	if more than one box is ticked, no mark	1	AO1 6.1.3

Question	Answers		Extra information	Mark	AO / Spec. Ref.
09.2	Level 3 (5–6 marks)	A detailed comparison that gives advantages and disadvantages of both wind turbines and a gas-fired power station, uses the information in Table 2, and links the points into a well-organised answer.		6	AO3 6.1.3
	Level 2 (3–4 marks)	Some advantages and disadvantages of one or both methods, with some comparison between them. The answer may be unbalanced or lack detail.			
	Level 1 (1–2 marks)	Simple statements about wind turbines or about a gas-fired power station, with little or no comparison.			
	0 marks	No relevant content.			
	Indicative content Wind turbines • wind is a renewable resource – it will not run out • no fuel is needed, so there are no fuel costs and no fuel to transport • no carbon dioxide (or other pollutants) is produced while generating electricity, so no contribution to global warming / climate change • the output depends on the wind speed, so it is unreliable / cannot be controlled to match demand – a backup supply is needed • many turbines are needed over a large area of land; some people think they spoil the view; they can be noisy • expensive to build / install (but cheap to run) Gas-fired power station • the output can be changed quickly to match demand, so it is reliable / can supply electricity at any time • a large amount of electricity can be generated from one site / takes up little land • natural gas is a non-renewable (fossil) fuel, so it will run out • the gas has to be bought (and transported), so there are fuel costs • burning the gas produces carbon dioxide, which contributes to global warming / climate change (and may produce other pollutants) Example comparison: wind turbines are better for the environment and have no fuel costs, but a gas-fired power station (or another backup) is still needed to supply electricity when there is little wind. Credit other correct, relevant points. Do not credit statements that wind turbines produce no pollution at all (their manufacture does), or that gas is renewable.				
Total				7	
TOTAL FOR PAPER				70	