

GCSE

COMBINED SCIENCE: TRILOGY

Biology Paper 1 Higher Tier

Mark scheme Practice Paper Series – Set 1 SGC/S1/B/1H

Version 1.1

This mark scheme is an original resource written for sciencegcse.co.uk to accompany the Set 1 practice paper SGC/S1/B/1H. 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, Biology section 4.1–4.4. 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	something that increases the chance / likelihood / probability of a person developing a disease	allow a factor linked to an increased rate of a disease allow 'makes it more likely that you get a disease' do not accept something that causes a disease	1	AO1 4.2.2.6
01.2	$72 \div 2000 (\times 100)$	an answer of 3.6 scores 2 marks	1	AO2 4.2.2.6 MS 1c
	(percentage of smokers =) 3.6 (%)	an answer of 0.036 scores 1 mark	1	AO2 4.2.2.6 MS 1c
01.3	12 (times)	allow ECF from 01.2: answer to $01.2 \div 0.3$, correctly calculated	1	AO2 4.2.2.6 MS 1c
01.4	any two from: - other risk factors were not controlled, e.g. air pollution / genes / passive smoking - a link / correlation alone does not prove a cause	Allow other named, plausible confounding factors. Ignore unequal group sizes or individual exceptions alone. Do not accept smoking does not cause lung cancer.	2	AO3 4.2.2.6 WS 1.4
01.5	benign tumour: (abnormal cells) contained in one area or does not invade other tissues / does not spread	allow usually within a membrane allow the converse for malignant tumours	1	AO1 4.2.2.7
	malignant tumour: invades neighbouring tissues or spreads to other parts of the body (in the blood) or forms secondary tumours	'malignant tumours are cancerous' alone is insufficient do not accept benign tumours are harmless	1	AO1 4.2.2.7
Total			8	
02.1	by inhaling droplets from coughs and sneezes	if more than one box is ticked, no mark	1	AO1 4.3.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.2	any three from: - a small quantity of dead / inactive (measles) virus / pathogen is put into the body (by injection) (this) stimulates white blood cells to produce antibodies - if the (live) measles virus enters the body (later) the white blood cells respond quickly or produce (the correct) antibodies quickly (so) the virus is destroyed before the child becomes ill or the child does not develop measles	allow weakened for inactive allow memory cells for 'respond quickly' do not accept antibiotics for antibodies do not accept dead / inactive white blood cells ignore 'immune' without explanation	3	AO1 4.3.1.7
02.3	bar for 2014 drawn to 640	tolerance $\pm$ half a small square ($\pm$ 10 cases) each bar must be the same width as the 2010 bar, centred on the year label and not touching another bar	1	AO2 4.3.1.7 MS 4c
	bar for 2018 drawn to 260	if both heights are correct but the bars are drawn incorrectly (e.g. touching or different widths) allow 1 mark in total	1	AO2 4.3.1.7 MS 4c
02.4	as the percentage (of children) vaccinated decreases the number of (measles) cases increases	allow the converse allow negative / inverse correlation allow the fewer children vaccinated, the more cases there are do not accept 'they are linked' without the direction of the link	1	AO3 4.3.1.7 MS 2g
Total			7	
03.1	(glucose $\rightarrow$) lactic acid	allow lactate do not accept carbon dioxide / ethanol / water in the equation	1	AO1 4.4.2.1
03.2	30×1.2	an answer of 36 scores 2 marks	1	AO2 4.4.2.2 MS 1a
	(volume of air per minute =) 36 (dm ³)	allow 1 mark for $14 \times 0.5 = 7$ if the wrong column is used	1	AO2 4.4.2.2 MS 1a

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.3	any two from: • (so that) more oxygen is taken in / supplied to the muscles • for (more / faster) respiration to release more energy (for muscle contraction) • (so that) carbon dioxide is removed (from the blood) faster	allow the muscles need more energy for the second point ignore 'to get more air' do not accept respiration makes / produces energy do not accept 'to get more energy from the oxygen'	2	AO2 4.4.2.2
03.4	repeat the measurement (several times) and calculate a mean	allow count the breaths over a longer time (e.g. 5 minutes) and divide by the number of minutes allow repeat the measurement (on different days) ignore use a stopwatch / count more carefully	1	AO3 4.4.2.2 WS 2.6
Total			6	
04.1	any two from: • the DNA / genetic material is copied or two copies of each chromosome are made • the cell grows / gets bigger • the number of sub-cellular structures increases or more mitochondria / ribosomes are made	allow the chromosomes are copied / replicated do not accept the chromosomes are made / doubled in number without reference to copying ignore 'the cell prepares to divide'	2	AO1 4.1.2.2
04.2	any two from: • one set of chromosomes is pulled to each end of the cell • the nucleus divides • the cytoplasm and cell membrane divide to form two (genetically identical) cells	allow the chromosomes are separated / move to opposite ends allow the cell divides into two identical cells do not accept four cells / non-identical cells ignore references to meiosis	2	AO1 4.1.2.2
04.3	$(5 + 7) \div (38 + 42) \times 100$ or $12 \div 80 \times 100$	an answer of 15 scores 2 marks	1	AO2 4.1.2.2 MS 1c
	(percentage =) 15 (%)	an answer of 13.2 (area 1 only) or 16.7 (area 2 only) scores 1 mark	1	AO2 4.1.2.2 MS 1c
04.4	$28 \div 400$ (= 0.07 mm)	an answer of 7×10^{-5} (m) scores 3 marks	1	AO2 4.1.1.5 MS 1b, 2h
	0.07 mm = 0.000 07 m or $0.07 \div 1000$	an answer of 0.000 07 m (not in standard form) scores 2 marks an answer of 0.07 mm or 7×10^{-2} mm scores 1 mark	1	AO2 4.1.1.5 MS 1b, 2h

Question	Answers	Extra information	Mark	AO / Spec. Ref.
	(real length =) 7×10^{-5} (m)	allow 7.0×10^{-5} allow 1 mark for correctly writing an incorrect length in metres in standard form (ECF)	1	AO2 4.1.1.5 MS 1b, 2h
Total			9	
05.1	any two from: (the root hair gives the cell a) large surface area (for absorption) (contains) many mitochondria (to release energy for active transport) - thin cell wall / membrane or short diffusion distance	allow large surface area to volume ratio do not accept 'has a large surface' without reference to area ignore references to chloroplasts	2	AO1 4.1.1.3 4.1.3.3
05.2	$(48 - 12) \div 48 \times 100$ or $36 \div 48 \times 100$	an answer of 75 scores 2 marks	1	AO2 4.1.3.3 MS 1c
	(percentage decrease =) 75 (%)	an answer of 25 (the percentage remaining) scores 1 mark	1	AO2 4.1.3.3 MS 1c
05.3	nitrate ions are absorbed by active transport or the ions are moved against the concentration gradient	allow from a dilute solution to a more concentrated solution do not accept diffusion / osmosis for this mark	1	AO2 4.1.3.3
	(active transport) requires energy (from respiration)	allow uses energy released by respiration do not accept energy is made / produced / created	1	AO2 4.1.3.3
	without oxygen there is less (aerobic) respiration so less energy is released (for active transport)	allow respiration stops / cells respire anaerobically, releasing less energy	1	AO2 4.1.3.3 4.4.2.1
05.4	any one from: - anaerobic respiration (still) releases some energy - some oxygen remained (dissolved) in the solution / cells at first	allow some energy was already stored in the cells ignore 'the cells were still alive'	1	AO3 4.1.3.3
Total			8	
06.1	light intensity	if more than one box is ticked, no mark	1	AO2 4.4.1.2
06.2	carbon dioxide (concentration)	allow CO ₂ do not accept carbon dioxide and light	1	AO2 4.4.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.3	(at Y) the rate for A does not increase when the light intensity increases or the line (for A) is level / flat (so light is not limiting)	allow the rate has reached a maximum / plateau	1	AO3 4.4.1.2
	at the same light intensity, the rate is higher with more carbon dioxide or curve B is above curve A (so increasing carbon dioxide increases the rate)	allow the rate for B is 8 units but the rate for A is only 5 units do not accept temperature is limiting (temperature was constant)	1	AO3 4.4.1.2
06.4	$800 \times (20 \div 40)^2$ or $800 \times 20^2 \div 40^2$ or $800 \div 4$	an answer of 200 scores 2 marks allow $800 \times 20^2 = 320\,000$ and $320\,000 \div 40^2$ for the first mark	1	AO2 4.4.1.2 MS 3c
	(light intensity =) 200 (arbitrary units)	an answer of 400 (using $1 \div \text{distance}$) scores 0 marks an answer of 3200 (ratio inverted) scores 1 mark	1	AO2 4.4.1.2 MS 3c
06.5	increasing the carbon dioxide concentration / temperature increases the rate of photosynthesis (until another factor becomes limiting)	allow the rate stops increasing when another factor / light is limiting	1	AO2 4.4.1.2
	(so) the plants grow faster or the yield is bigger or the crop is ready sooner (so the farmer earns more money)	allow more glucose is made for growth	1	AO2 4.4.1.2
	the farmer should only add carbon dioxide / heating while the extra income is more than the (extra) cost or should stop increasing them when they no longer increase the rate	allow the cost of the gas / fuel must be less than the value of the extra crop allow too high a temperature would denature enzymes and reduce the rate	1	AO2 4.4.1.2
Total			9	
07.1	pulmonary vein	if more than one box is ticked, no mark	1	AO1 4.2.2.2
07.2	(in the wall of the) right atrium	allow upper right chamber do not accept right ventricle / left atrium	1	AO1 4.2.2.2
07.3	(an electrical device that) sends electrical impulses / signals to the heart (muscle)	allow stimulates the heart muscle to contract ignore where the device is placed	1	AO1 4.2.2.2
	(so that) the heart beats regularly or at the correct rate or to correct the irregular heartbeat	allow controls the heart rate do not accept makes the heart beat faster	1	AO1 4.2.2.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.4	less blood or less oxygen (and glucose) reaches (part of) the heart muscle	allow the heart muscle cells do not get enough oxygen	1	AO2 4.2.2.4
	(so) less (aerobic) respiration or less energy is released (in the muscle cells)	allow the cells respire anaerobically (producing lactic acid) do not accept energy is made / produced	1	AO2 4.2.2.4
	(so) the muscle cells cannot contract (properly) or the cells die or the person has a heart attack	allow the heart cannot pump blood properly	1	AO2 4.2.2.4
Total			7	
08.1	any three from: (many alveoli give a) large surface area (for diffusion) (alveolar) walls are thin / one cell thick so there is a short diffusion distance / path - good blood supply / many capillaries (so oxygen is carried away quickly) which maintains the concentration gradient ventilation / breathing brings in fresh air which maintains the concentration gradient	allow moist surface (so gases dissolve) 'thin walls' alone is insufficient for the second point unless linked to diffusion distance or to gases passing through easily do not accept thin cell membranes	3	AO1 4.1.3.1 4.2.2.2
08.2	(the concentration of lactic acid) increases during exercise / for the first 10 minutes	allow rises from 1.0 to 9.0 (mmol/dm ³)	1	AO3 4.4.2.2 MS 2c
	(then) decreases after exercise stops / during rest but is still above the starting value at 30 minutes	allow falls from 9.0 to 1.5 (mmol/dm ³) for the second mark 'goes up then down' with no reference to exercise, rest or data scores 1 mark in total	1	AO3 4.4.2.2 MS 2c
08.3	(during exercise) anaerobic respiration produced lactic acid (which built up in the muscles / blood) or the student had an oxygen debt	allow not enough oxygen was supplied during exercise	1	AO1 4.4.2.2 (HT)
	extra oxygen is needed (after exercise) to react with / break down / remove the lactic acid	allow to repay the oxygen debt do not accept to remove carbon dioxide alone	1	AO1 4.4.2.2 (HT)
	lactic acid is transported (in the blood) to the liver where it is converted (back) into glucose	both liver and glucose required do not accept lactic acid is converted to glucose in the muscles	1	AO1 4.4.2.2 (HT)
Total			8	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.1	(layers of) fatty material / fatty deposits build up inside the coronary arteries	allow cholesterol for fatty material allow plaque do not accept fat builds up in the heart / around the arteries	1	AO1 4.2.2.4
	(so) the arteries become narrower or blood flow (to the heart muscle) is reduced, so less oxygen (and glucose) reaches the heart muscle	allow the coronary arteries become blocked allow less oxygen for respiration in the heart muscle	1	AO1 4.2.2.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.2	Level 3 (5–6 marks)	A detailed, balanced evaluation of both treatments that uses data from Table 7 and links it to how each treatment works. The answer considers both of the patient’s problems (high blood cholesterol and a narrowed artery) and reaches a conclusion that is justified by the arguments made.	6	AO3 4.2.2.4 WS 1.4
	Level 2 (3–4 marks)	An evaluation that gives advantages and disadvantages of both treatments, with some use of data from Table 7 or some scientific explanation. A conclusion is given but it may be one-sided or only partly justified.		
	Level 1 (1–2 marks)	Simple statements about one or both treatments, mostly taken directly from Table 7 , with little or no evaluation or conclusion.		
	0 marks	No relevant content.		
	Indicative content Statins • lower blood cholesterol, which slows the build-up of fatty material in all of the coronary arteries (treats the cause) • reduce the risk of a heart attack by 30% over 5 years • no operation, so no risk of infection or blood clots from surgery • cheap (£100 per year, so £2000 over 20 years) • take several months to work, so the narrowed artery is not treated quickly • side effects such as muscle pain; must be taken every day for life; patients may forget Stents • keep the narrowed artery open, so blood flow / oxygen supply to the heart muscle is restored immediately • larger reduction in the risk of a heart attack (45%) • one payment of £5000 – more expensive than many years of statins • risk of infection or blood clot after the operation; the artery may narrow again • only treats the one narrowed artery; does not lower cholesterol, so other arteries may become narrowed Conclusion (any justified conclusion, for example) • a stent to open the narrowed artery straight away and statins to lower cholesterol and protect the other arteries • statins alone if the patient wants to avoid the risks of an operation, accepting a slower and smaller reduction in risk • a stent alone because the reduction in risk is larger and immediate, accepting the higher cost and the operation risks Credit other correct, relevant points. Data quoted from Table 7 must be used to support a point, not simply copied. Do not credit statements that statins remove the fatty material already present, or that a stent lowers cholesterol.			
Total			8	
TOTAL FOR PAPER			70	