

GCSE

COMBINED SCIENCE: TRILOGY

Biology Paper 2 Higher Tier

Mark scheme Practice Paper Series – Set 1 SGC/S1/B/2H

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/2H. 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 4.5–4.7. 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	meiosis	if more than one box is ticked, no mark	1	AO1 4.6.1.2
01.2	top row: Bb, bb bottom row: Bb, bb	all four correct = 2 marks two or three correct = 1 mark allow bB for Bb	2	AO2 4.6.1.4 MS 2c
01.3	0.5 or $\frac{1}{2}$ or 50% or 1 in 2	allow ECF from an incorrect Punnett square do not accept 1 : 1 (a ratio)	1	AO2 4.6.1.4 MS 2e
01.4	(the mouse has) two different alleles (for the gene)	allow one dominant allele and one recessive allele allow Bb	1	AO1 4.6.1.4
01.5	(sex chromosomes of a male) XY		1	AO1 4.6.1.6
	(probability of a boy) 0.5 or $\frac{1}{2}$ or 50% or 1 in 2	allow 1 : 1 if clearly used as a probability of a half	1	AO1 4.6.1.6 MS 2e
01.6	both parents are carriers / heterozygous or each parent has one (recessive) cystic fibrosis allele	allow each parent has one dominant and one recessive allele	1	AO2 4.6.1.5
	the child inherits a cystic fibrosis allele from each parent / two recessive alleles or the child is homozygous recessive	allow the child has no dominant allele	1	AO2 4.6.1.5
Total			9	
02.1	to avoid bias or so that the sample is representative (of the whole field)	allow so the results are valid do not accept to make it a fair test	1	AO1 4.7.2.1 WS 2.4 RP 7
02.2	$(3 + 5 + 4 + 2 + 6) \div 5$ or $20 \div 5$	an answer of 4 scores 2 marks	1	AO2 4.7.2.1 MS 2b RP 7
	(mean =) 4 (per quadrat)	allow 4.0	1	AO2 4.7.2.1 MS 2b RP 7
02.3	4×200	an answer of 800 scores 2 marks allow ECF from an incorrect mean in 02.2	1	AO2 4.7.2.1 MS 2b RP 7
	(estimated number =) 800		1	AO2 4.7.2.1 MS 2b RP 7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.4	any one from: - light intensity - temperature - moisture level / amount of water - soil pH / mineral content - wind intensity / direction	ignore 'weather'	1	AO2 4.7.1.2
02.5	any one from: - animals grazing / eating the plants (e.g. rabbits) - competition from other plants / grass - disease / pathogens	allow availability of food for the animals that eat dandelions	1	AO2 4.7.1.3
02.6	(producer) grass		1	AO1 4.7.2.1
	(the arrows show) the transfer of energy / biomass (from one organism to the next) or what eats what	allow the direction of energy flow	1	AO1 4.7.2.1
Total			9	
03.1	(endocrine system – message carried by) chemicals / hormones in the blood	allow hormones carried in the bloodstream / blood plasma	1	AO1 4.5.3.1
	(nervous system – speed) very fast / faster / rapid	allow quick	1	AO1 4.5.2.1 4.5.3.1
03.2	controls the (basal) metabolic rate or important for growth and development	allow controls the rate of chemical reactions in the body	1	AO1 4.5.3.6
03.3	(if the thyroxine level falls) the pituitary gland releases (more) TSH / thyroid stimulating hormone	Allow pituitary hormone for TSH if its stimulating role is clear.	1	AO1 4.5.3.6
	TSH stimulates the thyroid gland to release (more) thyroxine (so the level rises)		1	AO1 4.5.3.6
	(when the thyroxine level is back to normal / high) the release of TSH is inhibited , so less thyroxine is released	allow the high level of thyroxine switches off TSH production allow the level rises and falls around the normal level	1	AO1 4.5.3.6
03.4	any one from: - increases the heart rate - increases the breathing rate - diverts blood (flow) to the muscles - increases the blood glucose concentration	allow prepares the body for 'fight or flight' ignore makes you scared	1	AO1 4.5.3.6
Total			7	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	any two from: - the concentration for B rises much higher, to (about) 220 (mg per 100 cm³) compared with 140 for A - the concentration for A returns to the starting level (90) within about 2.5 hours, but for B it stays high / does not return to the starting level - the peak for B is later (1.5 hours compared with 1 hour) B starts at a higher concentration (100 compared with 90)	a comparison with data from Figure 2 is needed for each mark allow other correct comparisons using data	2	AO3 4.5.3.2 MS 4a
04.2	the pancreas (detects the high concentration and) releases insulin		1	AO1 4.5.3.2
	(insulin causes) glucose to move from the blood into the cells (of the liver and muscles)	allow glucose is taken up by the cells	1	AO1 4.5.3.2
	(excess) glucose is converted to glycogen (for storage in the liver and muscles)	do not accept glucagon	1	AO1 4.5.3.2
04.3	the pancreas releases glucagon	do not accept glycogen	1	AO1 4.5.3.2
	(glucagon causes) glycogen (in the liver) to be converted to glucose , which is released into the blood	allow glycogen is broken down to glucose	1	AO1 4.5.3.2
04.4	$(140 - 90) \div 90 \times 100 = 55.6$ (%)	allow 55 to 56 (%) an answer of 35.7 ($50 \div 140$) or 50 (the increase not divided by the starting value) scores 0 marks	1	AO2 4.5.3.2 MS 1c MS 4a
Total			8	
05.1	LH / luteinising hormone	allow the hormone with the peak on day 14	1	AO2 4.5.3.3
05.2	(FSH) causes an egg to mature in the ovary / in a follicle	allow stimulates the development of an egg	1	AO1 4.5.3.3
	(FSH) stimulates the ovaries to produce oestrogen		1	AO1 4.5.3.3
05.3	oestrogen inhibits the release of FSH (from the pituitary gland)	allow a high level of oestrogen stops FSH being released	1	AO1 4.5.3.3
	progesterone inhibits the release of FSH (and LH)	allow progesterone stops FSH being released so no more eggs mature	1	AO1 4.5.3.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.4	the mother is given FSH and LH to stimulate the maturation of several eggs	allow fertility drugs containing FSH and LH	1	AO1 4.5.3.5
	the eggs are collected from the mother and fertilised by sperm (from the father) in the laboratory , and the embryos that develop are inserted into the mother's uterus	both the fertilisation in the laboratory and the insertion of embryos are needed for the mark allow one or two embryos are inserted	1	AO1 4.5.3.5
	any one disadvantage from: - it is emotionally and/or physically stressful - the success rate is not high / it often does not work - it can lead to multiple births, which are a risk to the babies and the mother - it is expensive	ignore ethical objections without a reason	1	AO3 4.5.3.5
Total			8	
06.1	the gene (for the required characteristic, e.g. insect resistance) is cut out of the chromosome / DNA (of another organism) using enzymes	allow the gene is isolated using enzymes	1	AO1 4.6.2.4
	the gene is inserted into a vector – a (bacterial) plasmid or a virus	allow the gene is transferred to a plasmid	1	AO1 4.6.2.4
	the vector is used to insert the gene into the cells of the crop plant at an early stage of development , so the plant develops with the characteristic	allow the gene is inserted into plant cells / an embryo which grows into a plant with the new gene	1	AO1 4.6.2.4
06.2	any one from: - increased yield / bigger crops - resistance to herbicides / weedkillers - resistance to disease - improved nutritional value (e.g. golden rice with vitamin A) - able to grow in dry / poor conditions	do not accept resistance to insects (given in the question)	1	AO1 4.6.2.4
06.3	any two from: - possible effects on populations of wild flowers and insects (e.g. genes spreading to wild plants / harm to insects that are not pests) - the effects of eating GM crops on human health have not been fully explored - economic concerns, e.g. the cost of the seeds / companies controlling the seed supply	allow reduced biodiversity ignore 'it is unnatural' without a reason	2	AO1 4.6.2.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.4	inbreeding can lead to reduced variation / a smaller gene pool, so the population is less able to adapt to change or some breeds are prone to disease / inherited defects	allow it takes many generations / a long time	1	AO1 4.6.2.3
Total			7	
07.1	there is variation in fur colour (in the mice) or a mutation produced the (allele for) dark fur		1	AO2 4.6.2.2
	on the dark rock the dark mice are camouflaged / less likely to be seen and eaten by owls (whereas the pale mice are seen and eaten)	allow the pale mice are more easily hunted on the dark rock	1	AO2 4.6.2.2
	(so) the dark mice are more likely to survive and reproduce	allow the dark mice are more likely to breed	1	AO2 4.6.2.2
	(and) pass on the allele(s) for dark fur to their offspring, so over many generations the proportion of dark mice increases	allow the gene for dark fur is passed on do not accept the mice changed colour to match the rock / chose to become dark	1	AO2 4.6.2.2
07.2	many early forms of life were soft-bodied , so they left few traces / fossils behind	allow soft body parts decay and do not form fossils	1	AO1 4.6.3.2
	(and) the traces that were left have (mostly) been destroyed by geological activity (e.g. earthquakes / volcanoes / movement of rocks)	allow rocks containing early fossils have been changed or destroyed	1	AO1 4.6.3.2
07.3	archaea, bacteria, eukaryota	all three correct = 2 marks two correct = 1 mark allow (true) bacteria / eukaryotes / eukarya	2	AO1 4.6.4
Total			8	
08.1	as the distance from the tree increases, the light intensity increases and the number of daisy plants increases	allow more daisies grow where the light intensity is higher	1	AO3 4.7.1.2 MS 2g
	the increase in the number of daisies levels off / is small beyond 6 m (14 to 15 per m ²) or the largest increase is between 2 m and 6 m (3 to 14 per m ²)	data from Table 4 must be quoted for this mark	1	AO3 4.7.1.2 MS 2g
08.2	(with more light) the daisies can photosynthesise more , so they make more glucose / grow more / produce more seeds	allow daisies need light for photosynthesis	1	AO2 4.7.1.2 4.7.1.3
	close to the tree the daisies are shaded by the tree or the daisies compete with the tree for light (and water / mineral ions)	allow the tree blocks the light	1	AO2 4.7.1.2 4.7.1.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.3	(microorganisms / decomposers) break down / decay dead organisms and waste (materials)	allow they digest the dead leaves	1	AO1 4.7.2.2
	(the microorganisms) respire , releasing carbon dioxide into the atmosphere (and returning mineral ions to the soil)	allow carbon is returned to the air as carbon dioxide	1	AO1 4.7.2.2
08.4	peat is a (large) store of carbon / peat contains partly decayed plant material that has not released its carbon	allow peat forms because decay is very slow in bogs	1	AO1 4.7.3.3
	when the peat is removed / dried / burned, it decays (microorganisms respire) or is combusted, releasing carbon dioxide	allow the carbon stored in the peat is released as carbon dioxide	1	AO1 4.7.3.3
Total			8	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.1	Level 3 (5–6 marks)	A clear, logically ordered plan that uses a transect line from the edge of the stream into the field with the quadrat placed at regular intervals, counts the buttercups in each quadrat, measures the soil moisture at each position, controls the relevant variables, includes repeats or means, and says how the results will be presented or analysed.	6	AO2 4.7.2.1 WS 2.2, 2.3 RP 7
	Level 2 (3–4 marks)	A plan with most of the main steps, but with some detail missing, for example no regular intervals, no repeats, or the soil moisture not measured at each position.		
	Level 1 (1–2 marks)	Simple statements, for example use the tape measure and count the buttercups, with little detail of how the investigation would be carried out.		
	0 marks	No relevant content.		
	Indicative content - lay the tape measure (the transect line) from the edge of the stream straight out into the field, at right angles to the stream (e.g. for 20 m) - place the quadrat at regular intervals along the tape (e.g. every 2 m), with the same corner of the quadrat against the tape each time count the number of buttercup plants in each quadrat (using a rule for plants on the edge of the quadrat) - measure the soil moisture with the soil moisture meter at each quadrat position, pushing the probe into the soil to the same depth each time repeat with two or more transects at different places along the stream (or on other days) and calculate the mean number of buttercups at each distance - convert the counts to the number of buttercups per m² (multiply by 4 for a 0.25 m² quadrat) - record the results in a table and plot graphs of the number of buttercups against distance and soil moisture against distance (or the number of buttercups against soil moisture) - control variables: the same size of quadrat, the same field, the same day / weather for the moisture readings (rain would change the soil moisture) - look for a correlation between the soil moisture and the number of buttercups Credit other correct, relevant points. Do not credit random placing of the quadrats for this investigation (the aim is to see how the number changes with distance), or counting the buttercups without a quadrat.			
Total			6	
TOTAL FOR PAPER			70	