OCR
Oxford Cambridge and RSA

Foundation

GCSE

Combined Science Biology A Gateway Science

J250/07: Paper 7 (Higher Tier)

General Certificate of Secondary Education

Mark Scheme for June 2023

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This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by examiners. It does not indicate the details of the discussions which took place at an examiners' meeting before marking commenced.

All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the report on the examination.

MARKING INSTRUCTIONS

PREPARATION FOR MARKING

RM ASSESSOR

1. Make sure that you have accessed and completed the relevant training packages for on-screen marking: *RM Assessor Online Training*; *OCR Essential Guide to Marking*.
2. Make sure that you have read and understood the mark scheme and the question paper for this unit. These are available in RM Assessor.
3. Log-in to RM Assessor and mark the **required number** of practice responses ("scripts") and the **required number** of standardisation responses.

MARKING

1. Mark strictly to the mark scheme.
2. Marks awarded must relate directly to the marking criteria.
3. The schedule of dates is very important. It is essential that you meet the RM Assessor 50% and 100% (traditional 50% Batch 1 and 100% Batch 2) deadlines. If you experience problems, you must contact your Team Leader (Supervisor) without delay.
4. If you are in any doubt about applying the mark scheme, consult your Team Leader by telephone, email or via the RM Assessor messaging system.

5. Work crossed out:

   a. where a candidate crosses out an answer and provides an alternative response, the crossed out response is not marked and gains no marks

   b. if a candidate crosses out an answer to a whole question and makes no second attempt, and if the inclusion of the answer does not cause a rubric infringement, the assessor should attempt to mark the crossed out answer and award marks appropriately.

6. Always check the pages (and additional objects if present) at the end of the response in case any answers have been continued there. If the candidate has continued an answer there, then add the annotation SEEN to confirm that the work has been seen.

7. There is a NR (No Response) option. Award NR (No Response)

   - if there is nothing written at all in the answer space
   - OR if there is a comment which does not in any way relate to the question (e.g. 'can't do', 'don't know')
   - OR if there is a mark (e.g. a dash, a question mark) which isn't an attempt at the question.

   Note: Award 0 marks – for an attempt that earns no credit (including copying out the question).

8. The RM Assessor **comments box** is used by your Team Leader to explain the marking of the practice responses. Please refer to these comments when checking your practice responses. **Do not use the comments box for any other reason.**

   If you have any questions or comments for your Team Leader, use the phone, the RM Assessor messaging system, or email.

9. Assistant Examiners will send a brief report on the performance of candidates to their Team Leader (Supervisor) via email by the end of the marking period. The report should contain notes on particular strengths displayed as well as common errors or weaknesses. Constructive criticism of the question paper/mark scheme is also appreciated.

10. For answers marked by levels of response:

Read through the whole answer from start to finish, using the Level descriptors to help you decide whether it is a strong or weak answer. The indicative scientific content in the Guidance column indicates the expected parameters for candidates' answers, but be prepared to recognise and credit unexpected approaches where they show relevance. Using a 'best-fit' approach based on the skills and science content evidenced within the answer, first decide which set of level descriptors, Level 1, Level 2 or Level 3, best describes the overall quality of the answer.

Once the level is located, award the higher or lower mark:

The higher mark should be awarded where the level descriptor has been evidenced and all aspects of the communication statement (in italics) have been met.

The lower mark should be awarded where the level descriptor has been evidenced but aspects of the communication statement (in italics) are missing.

In summary:

The skills and science content determines the level.

The communication statement determines the mark within a level.

Level of response question on this paper is **15(a)**.

11. Annotations available in RM Assessor

Annotation	Meaning
	Correct response
	Incorrect response
	Omission mark
	Benefit of doubt given
	Contradiction
	Rounding error
	Error in number of significant figures
	Error carried forward
	Level 1
	Level 2
	Level 3
	Benefit of doubt not given
	Noted but no credit given
	Ignore

12. Abbreviations, annotations and conventions used in the detailed Mark Scheme (to include abbreviations and subject-specific conventions).

Annotation	Meaning
/	alternative and acceptable answers for the same marking point
✓	Separates marking points
DO NOT ALLOW	Answers which are not worthy of credit
IGNORE	Statements which are irrelevant
ALLOW	Answers that can be accepted
( )	Words which are not essential to gain credit
__	Underlined words must be present in answer to score a mark
ECF	Error carried forward
AW	Alternative wording
ORA	Or reverse argument

13. **Subject-specific Marking Instructions**

INTRODUCTION

Your first task as an Examiner is to become thoroughly familiar with the material on which the examination depends. This material includes:

- the specification, especially the assessment objectives
- the question paper
- the mark scheme.

You should ensure that you have copies of these materials.

You should ensure also that you are familiar with the administrative procedures related to the marking process. These are set out in the OCR booklet **Instructions for Examiners**. If you are examining for the first time, please read carefully **Appendix 5 Introduction to Script Marking: Notes for New Examiners**.

Please ask for help or guidance whenever you need it. Your first point of contact is your Team Leader.

The breakdown of Assessment Objectives for GCSE (9-1) in Combined Science A:

	Assessment Objective
AO1	**Demonstrate knowledge and understanding of scientific ideas and scientific techniques and procedures.**
AO1.1	Demonstrate knowledge and understanding of scientific ideas.
AO1.2	Demonstrate knowledge and understanding of scientific techniques and procedures.
AO2	**Apply knowledge and understanding of scientific ideas and scientific enquiry, techniques and procedures.**
AO2.1	Apply knowledge and understanding of scientific ideas.
AO2.2	Apply knowledge and understanding of scientific enquiry, techniques and procedures.
AO3	**Analyse information and ideas to interpret and evaluate, make judgements and draw conclusions and develop and improve experimental procedures.**
AO3.1	Analyse information and ideas to interpret and evaluate.
AO3.1a	Analyse information and ideas to interpret.
AO3.1b	Analyse information and ideas to evaluate.
AO3.2	Analyse information and ideas to make judgements and draw conclusions.
AO3.2a	Analyse information and ideas to make judgements.
AO3.2b	Analyse information and ideas to draw conclusions.
AO3.3	Analyse information and ideas to develop and improve experimental procedures.
AO3.3a	Analyse information and ideas to develop experimental procedures.
AO3.3b	Analyse information and ideas to improve experimental procedures.

For answers to Section A if an answer box is blank ALLOW correct indication of answer e.g. circled or underlined.

Question	Answer	Marks	AO element	Guidance
1	D	1	2.1	
2	A	1	2.1	
3	B	1	1.1	
4	C	1	1.1	
5	D	1	2.2	**ALLOW** 0.5 (m)
6	A	1	1.2	
7	B	1	2.2	
8	C	1	1.1	
9	B	1	1.1	
10	D	1	1.1	

Question			Answer	Marks	AO element	Guidance
11	(a)	(i)	Idea that sugar is used up ✓	1	2.2	**ALLOW** sugar concentration decreases over time / sugar is broken down (into ethanol) / sugar is a reactant / sugar is needed for respiration / so there is still some sugar to react / concentration will change **ALLOW** to make the sugar (solution)/it the same each time **ALLOW** glucose for sugar **IGNORE** sugar could have evaporated / sugar could have dissolved / to remove the ethanol being made / so the yeast reacts the same each time / all the yeast has been used up **IGNORE** (just) fair test / it is a control variable / no contamination from previous test
		(ii)	Number of alginate beads ✓	1	2.2	More than one box ticked = 0 marks **ALLOW** any indication of correct mark e.g. circling or crossing but ticking takes precedence
		(iii)	Carbon dioxide ✓	1	1.2	**ALLOW** CO_2 **IGNORE** incorrect formula e.g., CO^2 / CO2 /Co_2 **DO NOT ALLOW** other gasses / ethanol

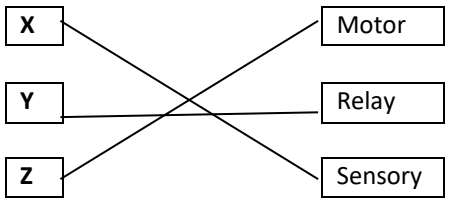
	(b)	**(i)**	Anomaly / outlier ✓	**1**	**3.1b**	**ALLOW** phonetic spellings of anomaly/anomalous **ALLOW** idea that it does not fit the pattern e.g., too high / not 1 or 2 / higher than (result for) 45°C **IGNORE** just 'it was 6' / not accurate / bung was not on correctly / unreliable compared to trials 2 and 3 / it was wrong / it was a mistake / temperature was higher than rest of trials
		(ii)	Suitable scale on Y axis ✓ Y axis labelled with units (mean) volume of gas (collected) cm^3 ✓ Plotting is accurate ✓	**3**	**3 x 2.2**	**place ticks and crosses on right hand side of grid** minimum 1 small square = 1 cm^3 **ALLOW** + or - half square plots are: 15, 6 25,15 35, 24 45, 2 55, 1 **IGNORE** plot (0.0)
		(iii)	Suitable curve of best fit through most points ✓	**1**	**2.2**	**ALLOW** curve of best fit for their plotting / reasonable curve through most points **IGNORE** any extrapolation of line

		(iv)	Increase in (kinetic) energy (as temperature increases) / **ORA** ✓ More (frequent) collisions (as temperature increases) / **ORA** ✓	**2**	**2 x 3.2b**	**answers must be comparative** **ALLOW** increased movement / faster movement (of particles) / (particles) gain (kinetic) energy **ALLOW** at 35 (°C) there is more (kinetic) energy / at 15 (°C) there is less (kinetic) energy **IGNORE** working faster / work best / just 'high energy' / optimum temperature / reacts faster **ALLOW** at 35 (°C) there are more collisions / at 15 (°C) there are less collisions **ALLOW** more enzyme substrate complexes form **IGNORE** speeding up collisions **IGNORE** references to denature above 35 (°C) **DO NOT ALLOW** enzyme denatures at lower temperatures
		(v)	Idea of increasing range / more temperatures ✓ **BUT** Idea of using a range between 35 – 45 (°C) ✓e	**2**	**2 x 3.3b**	**ALLOW** go up in smaller intervals e.g., go up in 5 (°C) (intervals) / use smaller increments / start at 10 (°C) and go up in 10s **IGNORE** use all the values in the range / use accurate temperatures **ALLOW for 2 marks** use (range) temperatures between 35 – 45 (°C) / use smaller increment e.g. 35,36,37 etc (°C) / more temperatures closer to 40 (°C)

Question			Answer	Marks	AO element	Guidance
12	(a)	(i)	Large surface area ✓ Increases (rate) of uptake ✓	2	2 x 1.1	**ALLOW** maximum surface area / high surface area **IGNORE** to volume ratio **IGNORE** thin walls / incorrect name of cell Q **ALLOW** quicker uptake / more uptake / maximum uptake **ALLOW AW** for uptake e.g. diffusion / osmosis / absorption **IGNORE** just 'efficient'
		(ii)	**Any three from:** Moves by osmosis ✓ Moves from high(er) water potential to low(er) water potential ✓ Cell Q has a higher water potential than <u>cortex</u> cells / **ORA** ✓ <u>Cortex</u> cells have a higher water potential than xylem / **ORA** ✓	3	3 x 1.1	 **IGNORE** through a membrane / by diffusion **DO NOT ALLOW** active transport **ALLOW** (water moves because) Q has a higher water potential (than the xylem) / **ORA** **IGNORE** references to concentration/concentration gradients **ALLOW** moves from high(er) water potential in Q to low(er) water potential in <u>cortex</u> cells = 2 marks moves from high(er) water potential in <u>cortex</u> cells to low(er) water potential in xylem = 2 marks

Question			Answer	Marks	AO element	Guidance
						water moves from a high(er) water potential to a low(er) water potential from Q to <u>cortex</u> cells to xylem = 3 mark
	(b)	**(i)**	**Any two from:** Air moves (evaporated) water away from leaf ✓ Increases diffusion through stomata/out of leaf ✓ Due to increased water potential gradient (between leaf and air) ✓	**2**	**2 x 3.2b**	**ALLOW** water is blown away from leaf / less water around the leaf / lowers humidity around the leaf / increases (rate of) water loss / increases (rate of) water uptake **IGNORE** dries out leaf / fan produces heat **ALLOW** increases (rate of) evaporation (of water) / increases transpiration **ALLOW** increased concentration gradient (between leaf and air) / steep(er) concentration gradient (between the leaf and air) **IGNORE** references to photosynthesis
		(ii)	**First check the answer on answer line** **If answer = 26 (cm^3) award 2 marks** 32 – [0.2 x 30] ✓ 26 (cm^3) ✓	**2**	**2 x 2.1**	**ALLOW** 'just' 6 for one mark
		(iii)	Idea of using a fan with variable speeds / changes the distance of the fan from the plant ✓	**1**	**3.3a**	**ALLOW** use fans with different power/settings / turn the fan up / use more (than one) fan / control the fan speed **IGNORE** have fan on rotation / use an oscillating fan

Question			Answer	Marks	AO element	Guidance
						IGNORE turn fan on and off

Question			Answer	Marks	AO element	Guidance
13	(a)	(i)	 ✓	1	2.1	All correct for one mark
		(ii)	**Any two from:** Receptor <u>detects</u> stimulus/pressure/sharp object ✓ (Electrical) <u>impulses</u> sent to spinal cord ✓ Spinal cord coordinates response by stimulating effector/muscle ✓	2	2 x 1.1	**note** <u>impulses</u> need to be only seen once **ALLOW** receptor <u>detects</u> the change (in environment) / receptor <u>detects</u> pain **ALLOW** (electrical) <u>impulses</u> sent to relay neurone/CNS **IGNORE** impulses sent along sensory neurone / impulses skip the CNS **DO NOT ALLOW** impulses sent to brain **DO NOT ALLOW** impulses sent from motor neurone to spinal cord/relay neurone/CNS **ALLOW** (electrical) <u>impulses</u> sent from spinal cord/relay neurone along motor neurone to effector/muscle **ALLOW** CNS coordinates response by stimulating effector/muscle

	(b)		**Any three from:** Both increase/stimulates metabolism ✓ Both increase respiration / increase ATP production ✓ Both increase heart rate / breathing rate ✓ (Only) adrenaline - diverts blood away from digestive system / diverts blood to muscle / dilates pupils / increases blood sugar ✓ - (prepares for) 'fight or flight' ✓ (Only) thyroxine linked to TRH levels ✓	**3**	**3 x 1.1**	**IGNORE** site of production mark the whole answer and **ALLOW** for the 'both' idea, same function linked to adrenaline and thyroxin e.g., adrenaline increases heart rate **and** thyroxin increases heart rate = 1 mark **ALLOW** controls metabolism **IGNORE** just 'provides energy' **IGNORE** slows digestion **IGNORE** secreted when scared / prepares body for danger **ALLOW** (only) thyroxine involved in control of growth / protein synthesis / (indirectly) linked to TSH production **IGNORE** references to temperature control
	(c)		Idea of glucose in body will have fallen ✓ Insulin no longer released ✓	**2**	**2 x 3.1a**	**ALLOW** glucose is converted to glycogen **ALLOW** glucose/sugar used up (in respiration) / insulin lowers the (blood) glucose/sugar levels / (blood) glucose/sugar levels returned to normal **IGNORE** insulin regulates glucose level / glucose is wearing off / glucose has dissolved **DO NOT ALLOW** glucose is broken down by insulin **ALLOW** insulin no longer produced **IGNORE** insulin levels are falling / insulin no longer needed

						IGNORE references to diabetes

Question			Answer	Marks	AO element	Guidance
14	**(a)**	**(i)**	Change concentration (of solution x) ✓	**1**	**2.2**	**ALLOW** increase concentration (of solution x) / decrease concentration (of solution x) / use more dilute solution / change the amount of chemical in the same volume of solution **IGNORE** (just) 'change the amount of chemical in the solution' / change the availability of the chemical / it increases the concentration of carbon dioxide
		(ii)	Volume of gas ✓	**1**	**2.2**	**ALLOW** volume of oxygen **IGNORE** number of bubbles / amount of gas **DO NOT ALLOW** incorrect name of gas e.g., volume of carbon dioxide gas
	(b)		Rate of photosynthesis increases and then levels off (as carbon dioxide concentration increases) ✓ (Levels off as) another factor limits the rate ✓	**2**	**2 x 2.1**	**IGNORE** positive correlation **ALLOW (**levels off as) carbon dioxide no longer the limiting factor **ALLOW** examples of another limiting factor e.g., (levels off) as light intensity/temperature needs to be increased **ALLOW** marks on annotated diagram but answer line take precedence

Question			Answer	Marks	AO element	Guidance
15*	(a)	(ii)	Please refer to the marking instructions on page 4 of this mark scheme for guidance on how to mark this question. **Level 3 (5–6 marks)** Demonstrate detailed knowledge of the structure of red blood cells related to their function including ideas about haemoglobin **AND** Explains in detail why sickle cell reduces oxygen transport and causes fatigue including ideas about respiration *There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.* **Level 2 (3–4 marks)** Demonstrate detailed knowledge of the structure of red blood cells related to their function including ideas about haemoglobin **AND** Attempts to explain why sickle cell reduces oxygen transport **or** causes fatigue **OR** Explains in detail why sickle cell reduces oxygen transport and causes fatigue including ideas about respiration *There is a line of reasoning presented with some structure. The information presented is relevant and supported by some evidence.*	**6**	**2 x 1.1** **2 x 2.1** **2 x 3.2a**	**AO1.1 Demonstrates knowledge and understanding of scientific ideas about structure of red blood cells** • Red blood cells transport oxygen • Idea that haemoglobin combines with oxygen / haemoglobin is needed for oxygen transport • Idea that shape of non-sickle red blood cell allows it to flow through capillaries **ALLOW** reference to reduced surface area/volume in sickle cells **IGNORE** reference to lack of nucleus **AO2.1 Apply knowledge and understanding of respiration to explain why individual is fatigued** • Body cells/muscles receive less oxygen • There is less oxygen which is needed for (aerobic) respiration / idea of using more anaerobic respiration • (Less oxygen) so less energy released/ATP produced from (aerobic) respiration **ALLOW** idea of individual may be short of breath / need to breath harder to take in sufficient oxygen **IGNORE** Less glucose so less energy released from (aerobic) respiration **AO3.2a Analyse information and ideas to make judgements – efficiency of cell to transport oxygen** • Less oxygen binds with haemoglobin • Less oxygen transported (by blood cells) • (Cells may clump together) blocking blood vessels

Question			Answer	Marks	AO element	Guidance
			Level 1 (1–2 marks) Demonstrate some knowledge of the structure of red blood cells related to their function **OR** Attempts to explain why sickle cell causes fatigue **OR** Attempts to explain why sickle reduces oxygen transport *There is an attempt at a logical structure with a line of reasoning. The information is in the most part relevant***.** **0 marks** *No response or no response worthy of credit.*			• Sickle cells do not live as long so less red blood cells in blood

	(b)		**First check the answer on answer line** **If answer = 1.5x10^3 (µm) award 3 marks** [12 ÷ 8] x 1000 or [1.2 ÷ 8] x10000 ✓ 1500 ✓ = 1.5 x 10^3 (µm) ✓	**3**	**1.2** **2 x 2.2**	**ALLOW** measurements of 12mm or 11mm or 1.2cm or 1.1cm **ALLOW** 1.5x10^n/1.375 x10^n anywhere in answer for minimum one mark **ALLOW** 1375 from 11mm or 1.1cm **ALLOW** 1.375 x10^3 from 11mm or 1.1cm **ALLOW** evidence of correct conversion of their answer to standard form from an attempted calculation using magnification **and** image size **ALLOW ECF** from incorrect measurement – maximum 2 marks e.g. from 13mm 1.625 x10^3 **ALLOW** power of 10 error for maximum 2 marks e.g., 1.5 x 10^4 = 2 marks from 13mm 1.625 x10^6 = 1 mark
	(c)		Large lumen to reduce resistance to blood flow ✓ Valves to prevent backflow ✓	**2**	**2 x 1.1**	**ALLOW** large lumen allows more blood to flow / large lumen allows high levels of blood flow / large lumen allows less restricted blood flow / large lumen allows faster blood flow **IGNORE** references to walls and blood pressure

Question			Answer	Marks	AO element	Guidance
16	(a)		(Cell) differentiation ✓	1	1.1	**ALLOW** phonetic spellings
	(b)	(i)	Idea of peer review / **AW** ✓	1	1.2	**ALLOW** to let others find flaws / to let others suggest improvements / to compare the results with other scientists / to show the progress of their experiments / share results / so other scientists can build on the ideas/research **ALLOW** to communicate their results to a range of audiences / so other scientist know about it / so people can learn about it / so people can read about it **IGNORE** for ethical reasons
		(ii)	260 ✓	1	2.1	**ALLOW** a range of reading from +/- ½ small square i.e. any number in the range 220 to 300 inclusive
		(iii)	Less ethical issues involved with iPs cells / **ORA** ✓ Less chance of rejection with iPs cells / **ORA** ✓	2	2 x 2.1	**ALLOW** idea of embryos not being harmed in iPs **IGNORE** easier to extract/find / more reliable / more effective / more research / religion

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