

Higher

GCSE

Combined Science Biology A Gateway Science

J250/07: Paper 7 (Higher Tier)

General Certificate of Secondary Education

Mark Scheme for June 2022

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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.

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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 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 posted on the RM Cambridge Assessment Support Portal <http://www.rm.com/support/ca>
3. Log-in to RM Assessor and mark the **required number** of practice responses (“scripts”) and the **number of required** standardisation responses.

YOU MUST MARK 10 PRACTICE AND 10 STANDARDISATION RESPONSES BEFORE YOU CAN BE APPROVED TO MARK LIVE SCRIPTS.

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 40% 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 or the RM Assessor messaging system, or by email.

5. Crossed Out Responses

Where a candidate has crossed out a response and provided a clear alternative then the crossed out response is not marked. Where no alternative response has been provided, examiners may give candidates the benefit of the doubt and mark the crossed out response where legible.

Rubric Error Responses – Optional Questions

Where candidates have a choice of question across a whole paper or a whole section and have provided more answers than required, then all responses are marked and the highest mark allowable within the rubric is given. Enter a mark for each question answered into RM assessor, which will select the highest mark from those awarded. *(The underlying assumption is that the candidate has penalised themselves by attempting more questions than necessary in the time allowed.)*

Multiple Choice Question Responses

When a multiple choice question has only a single, correct response and a candidate provides two responses (even if one of these responses is correct), then no mark should be awarded (as it is not possible to determine which was the first response selected by the candidate). *When a question requires candidates to select more than one option/multiple options, then local marking arrangements need to ensure consistency of approach.*

Contradictory Responses

When a candidate provides contradictory responses, then no mark should be awarded, even if one of the answers is correct.

Short Answer Questions (requiring only a list by way of a response, usually worth only **one mark per response**)

Where candidates are required to provide a set number of short answer responses then only the set number of responses should be marked. The response space should be marked from left to right on each line and then line by line until the required number of responses have been considered. The remaining responses should not then be marked. Examiners will have to apply judgement as to whether a 'second response' on a line is a development of the 'first response', rather than a separate, discrete response. *(The underlying assumption is that the candidate is attempting to hedge their bets and therefore getting undue benefit rather than engaging with the question and giving the most relevant/correct responses.)*

Short Answer Questions (requiring a more developed response, worth **two or more marks**)

If the candidates are required to provide a description of, say, three items or factors and four items or factors are provided, then mark on a similar basis – that is downwards (as it is unlikely in this situation that a candidate will provide more than one response in each section of the response space.)

Longer Answer Questions (requiring a developed response)

Where candidates have provided two (or more) responses to a medium or high tariff question which only required a single (developed) response and not crossed out the first response, then only the first response should be marked. Examiners will need to apply professional judgement as to whether the second (or a subsequent) response is a 'new start' or simply a poorly expressed continuation of the first response.

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 a tick to confirm that the work has been seen.
7. Award No Response (NR) if:
 - there is nothing written in the answer space

Award Zero '0' if:

- anything is written in the answer space and is not worthy of credit (this includes text and symbols).

Team Leaders must confirm the correct use of the NR button with their markers before live marking commences and should check this when reviewing scripts.

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 e-mail.
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: Not applicable in F501
 - a. **To determine the level** – start at the highest level and work down until you reach the level that matches the answer
 - b. **To determine the mark within the level**, consider the following

Descriptor	Award mark
On the borderline of this level and the one below	At bottom of level
Just enough achievement on balance for this level	Above bottom and either below middle or at middle of level (depending on number of marks available)
Meets the criteria but with some slight inconsistency	Above middle and either below top of level or at middle of level (depending on number of marks available)
Consistently meets the criteria for this level	At top of level

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 **13c(i)**

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	C✓	1	1.1	
2	C✓	1	2.1	
3	A✓	1	1.2	
4	C✓	1	1.1	
5	D✓	1	1.1	
6	C✓	1	1.1	
7	D✓	1	1.1	
8	D✓	1	2.1	
9	D✓	1	2.1	
10	C✓	1	2.2	

Question			Answer	Marks	AO element	Guidance
11	(a)	(i)	red blood (cell) ✓	1	1 x 2.1	ALLOW erythrocyte ALLOW just rbc
		(ii)	<p>Any three from:</p> <p><u>veins</u> transport blood (to heart) from gaseous exchange system/lungs ✓</p> <p><u>arteries</u> transport (blood away from heart) to gaseous exchange system/lungs ✓</p> <p>left side/left atrium (of the heart) receives blood from gaseous exchange system/lungs ✓</p> <p>right side/right ventricle (of the heart) pumps blood to gaseous exchange system/lungs ✓</p> <p>oxygen enters blood in gaseous exchange system/lung/alveoli or carbon dioxide leaves blood in gaseous exchange system/ lungs/alveoli ✓</p> <p>circulatory system/(blood) vessels transports oxygen to/around the body ✓</p>	3	3 x 1.1	<p>IGNORE references to features of gas exchange surface e.g. thin walls / large surface area</p> <p>ALLOW heart/ventricles pumps blood to gaseous exchange system/lung</p> <p>ALLOW blood becomes oxygenated in gaseous exchange system/lung/alveoli ALLOW deoxygenated blood enters lungs and oxygenated blood leaves lungs</p> <p>IGNORE references to just 'gas exchange' IGNORE just oxygen enters body / carbon dioxide leaves body</p> <p>ALLOW heart pumps oxygenated blood around body IGNORE heart pumps oxygenated blood and deoxygenated blood around body ALLOW cells/tissues/organs/named tissues and organs e.g. muscles for body IGNORE references to blood cells / plasma / valves / double circulatory system</p>

	(b)	(sieve plates) have holes in / less cytoplasm ✓ to allow the (easier) transport of sugar / for translocation ✓	2	2 x 1.1	ALLOW perforations/gaps for holes IGNORE partially permeable / permeable ALLOW sucrose for sugar ALLOW sugars pass through IGNORE food/nutrients/cell sap for sugar IGNORE to 'allow things to pass through' IGNORE references to direction of movement DO NOT ALLOW glucose / minerals DO NOT ALLOW sugar moves by osmosis OR alternatively: has companion cells = 1 mark companion cells to provide energy = 2 marks IGNORE 'energy' if no mention of companion cells
	(c)	(i) potometer ✓	1	1 x 1.2	ALLOW transpirometer
		(ii) idea that air will stop the plant taking up water ✓	1	1 x 2.2	ALLOW can form air locks / stops the flow of water / blocks the xylem / less water taken up by plant / reduced rate of uptake IGNORE it will not work / lets bubbles in / loss of pressure

		<p>(iii) FIRST CHECK THE ANSWER ON ANSWER LINE If answer = 0.013 (mm/s) award 3 marks</p> <p>600 ✓ 8/600 ✓ = 0.013 ✓</p>	3	3 x 2.2	<p>ALLOW for 2 marks</p> <p>0.01/0.013333 / 0.013</p> <p>ALLOW ecf where no unit conversion is made e.g. 8÷10 or 0.8 = 1 mark 0.80 = 2 marks</p> <p>if answer incorrect then ALLOW evidence of correct rounding to 2SF for 1 mark</p>
		<p>(iv) increase circled</p> <p>and</p> <p>idea that increases air movement/evaporation/diffusion ✓</p>	1	1 x 3.2a	<p>ALLOW increased stated on answer line if no answer circled</p> <p>ALLOW idea that water (vapour) is moved (away from leaf) / more water lost from stomata ALLOW because it decreases humidity ALLOW transpiration (rate) increases IGNORE just 'more wind' IGNORE dries out the leaves / more space for water IGNORE reference to photosynthesis</p>

Question			Answer	Marks	AO element	Guidance
12	(a)	(i)	mitochondria ✓	1	1 x 1.1	if answer line blank then ALLOW answer on diagram ALLOW mitochondrion ALLOW phonetic spelling
		(ii)	Any two from: by active transport ✓ using energy/ATP ✓ against a concentration gradient ✓	2	2 x 2.1	ALLOW uses carrier proteins IGNORE transpiration DO NOT ALLOW osmosis / diffusion / translocation IGNORE moves from a lower concentration (to a higher concentration) / moves from low to high concentration IGNORE water potential / references to cell membranes DO NOT ALLOW minerals move into the soil
	(b)		needed to make lipids/fats/oils ✓	1	1 x 1.1	ALLOW to make triglycerides ALLOW lipids/fats/oils are broken down into glycerol (and fatty acids) ALLOW lipids/fats/oils contain glycerol IGNORE references to energy, respiration, and photosynthesis
	(c)	(i)	FIRST CHECK THE ANSWER IN TABLE 12.1 (or in working space) If answer = 12 award 2 marks $\frac{25 \times 48}{100}$ or $\frac{48}{4}$ = 12 ✓	2	2 x 2.2	ALLOW 1200 anywhere in answer for one mark

Question	Answer	Marks	AO element	Guidance
(ii)	water moves out of the cell ✓ idea of higher water potential inside cell / lower <u>salt</u> concentration inside cell / ORA ✓	2	2 x 2.1	<p>ALLOW water moves into the (salt) solution / water moves out of the onion (cells)</p> <p>ALLOW higher <u>water</u> concentration inside cell / ORA</p> <p>ALLOW water moves from a higher water potential to a lower water potential</p> <p>ALLOW water moves from a higher <u>water</u> concentration to a lower <u>water</u> concentration</p> <p>ALLOW water moves from a lower <u>salt</u> concentration to a higher <u>salt</u> concentration</p> <p>ALLOW water moves from a dilute solution to a concentrated solution</p> <p>ALLOW water moves from a hypotonic solution to a hypertonic solution</p> <p>IGNORE more water molecules inside cell / less water molecules in salt solution</p> <p>IGNORE references to cell membranes / cell walls</p> <p>IGNORE concentration gradient unqualified</p> <p>ALLOW water moves from a higher water potential inside the cell to a lower water potential (in the solution) = 2 marks</p>

Question			Answer	Marks	AO element	Guidance
13	(a)	(i)	<p>Any three from:</p> <p>requires <u>light</u> (energy) ✓</p> <p>uses carbon dioxide and water ✓</p> <p>produces oxygen (and glucose) ✓</p> <p>correct reference to chlorophyll/chloroplasts ✓</p> <p>endothermic reaction ✓</p> <p>two-stage process ✓</p>	3	3 x 1.1	<p>ALLOW correct word or symbol equation for 2 marks / correct word or symbol equation with mention of light or chlorophyll = 3 marks</p> <p>IGNORE Sun's energy</p> <p>DO NOT ALLOW uses minerals / uses oxygen / uses sugar/glucose</p> <p>DO NOT ALLOW produces water</p> <p>ALLOW produces biomass</p> <p>IGNORE factors affecting the rate of photosynthesis</p> <p>IGNORE references to enzymes</p>

		(ii)	<p>idea that sugars are joined to make the (larger) carbohydrate /</p> <p>sugars are the monomers that make up (large) carbohydrates /</p> <p>(large) carbohydrates are polymers made of sugars ✓</p>	1	1 x 1.1	<p>ALLOW glucose for sugar</p> <p>ALLOW starch/glycogen for (large) carbohydrate</p> <p>ALLOW sugars form a chain to make the (larger) carbohydrate</p> <p>IGNORE just '(larger) carbohydrates are made of sugars' / sugars are turned into (larger) carbohydrates'</p> <p>IGNORE the (larger) carbohydrates are broken down into sugars</p> <p>IGNORE references to carbohydrase</p> <p>DO NOT ALLOW sugars are broken down into (larger) carbohydrates</p>
	(b)	(i)	<p>identifies count 3 or result 6 as an anomaly ✓</p> <p>idea that anomaly is not included in the mean (of 21/in brackets) ✓</p>	2	2 x 3.1b	<p>ALLOW outlier for anomaly</p> <p>ALLOW (big) difference between count 3 and other counts</p> <p>ALLOW count 3 or result 6 is an error/mistake</p> <p>ALLOW (mean of) 21 takes into account the anomaly / (mean of) 21 does not use the anomaly / (mean of) 21 only uses the count 1 and 2</p> <p>ALLOW (mean of) 16 included the anomaly</p> <p>ALLOW one mean uses the anomaly the other doesn't</p> <p>IGNORE repeated the experiments / mean was an anomaly / mean of 21 is more accurate</p> <p>DO NOT ALLOW mean of 16 is more accurate / anomaly not used to calculate mean of 16 / mean in brackets includes the anomaly</p>

Question		Answer	Marks	AO element	Guidance
(b)*	(ii)	<p>Please refer to the marking instructions on page 4 of this mark scheme for guidance on how to mark this question.</p> <p>Level 3 (5–6 marks) Demonstrate detailed knowledge of the lock and key hypothesis including correct reference to active sites AND Describes the pattern in full AND Detailed explanation of the full pattern including ideas about kinetic energy or collisions</p> <p><i>There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.</i></p> <p>Level 2 (3–4 marks) Attempts to demonstrate some knowledge of the lock and key hypothesis which may or may not mention active sites. AND Describes part of the pattern. AND Attempts to explain the pattern</p> <p><i>There is a line of reasoning presented with some structure. The information presented is relevant and supported by some evidence.</i></p> <p>Level 1 (1–2 marks)</p>	6	2 x 1.1 2 x 2.1 2 x 3.1a	<p>AO1.1 Demonstrates knowledge and understanding of scientific ideas – lock and key hypothesis</p> <ul style="list-style-type: none"> at high temperatures shape of <u>active site</u> is changed so substrate no longer fits into <u>active site</u> at high temperatures enzyme denatures so substrate no longer fits into <u>active site</u> <p>ALLOW <u>active site</u> changes shape so enzyme substrate complex cannot form at high temperatures</p> <p>ALLOW at level 1 and 2</p> <ul style="list-style-type: none"> at high temperatures shape of enzyme is changed at high temperatures substrate no longer fits with enzyme <p>AO2.1 Applies knowledge and understanding of scientific ideas to explain the pattern</p> <ul style="list-style-type: none"> low temperatures molecules will have less kinetic energy / fewer (successful) collisions as temperature increases molecules gain more kinetic energy / more (successful) collisions at high temperatures the enzymes or active sites are denatured/damaged <p>IGNORE cells damaged at high temperatures DO NOT ALLOW at level 3 'enzyme denatured below 25°C'</p>

Question	Answer	Marks	AO element	Guidance
	<p>Describes part of the pattern OR Attempts to explain the pattern OR Attempts to demonstrate some knowledge of the lock and key hypothesis without reference to active sites</p> <p><i>There is an attempt at a logical structure with a line of reasoning. The information is in the most part relevant.</i></p> <p>0 marks <i>No response or no response worthy of credit.</i></p>			<p>AO3.1a Analyse information and ideas to interpret the results - describe the pattern in the results</p> <ul style="list-style-type: none"> • increase 15 to 25 °C more gas produced • decrease 25 to 40 °C less gas produced / started decreasing at 30°C • most gas produced at 25 °C <p>ALLOW optimum temperature is 25 °C</p> <p>IGNORE enzyme is killed</p>
(c)	<p>light intensity is no longer the limiting factor /</p> <p>photosynthesis is limited by a factor other than light intensity /</p> <p>photosynthesis is limited by carbon dioxide/temperature ✓</p>	1	1 x 3.2b	<p>ALLOW annotations on the diagram</p> <p>IGNORE light is no longer affecting the reaction</p> <p>ALLOW carbon dioxide/temperature has stopped rate or photosynthesis increasing ALLOW carbon dioxide/temperature needs to be increased (to increase photosynthesis) ALLOW chloroplasts/chlorophyll are absorbing the maximum amount of light they can</p> <p>IGNORE water IGNORE substrates have run out</p>

Question			Answer	Marks	AO element	Guidance
14	(a)	(i)	<p>Any two from:</p> <p>use oil floated on top of yeast and glucose ✓</p> <p>measure the volume of gas ✓</p> <p>use water bath (in correct context) ✓</p>	2	2 x 3.3b	<p>IGNORE seal container to stop oxygen getting in</p> <p>ALLOW use a (gas) syringe / use a measuring cylinder (to measure gas)</p> <p>IGNORE changing method of counting bubbles</p> <p>IGNORE just 'maintain temperature' / insulate beaker</p> <p>ALLOW repeat to obtain a mean/average / repeat to identify anomalies</p> <p>IGNORE just repeat</p> <p>IGNORE remove yeast</p>
		(ii)	<p>change the <u>concentration</u> (of glucose) ✓</p> <p>mention of controlling a variable ✓</p>	2	2 x 3.3a	<p>IGNORE different volumes/mass of glucose</p> <p>DO NOT ALLOW make glucose concentration the dependent variable</p> <p>ALLOW examples e.g. use same temperature / same mass of yeast / count bubbles for set amount of time</p> <p>IGNORE keep everything else the same / same type of glucose</p>

	(b)	(i)	maltose ✓	1	1 x 2.2	
		(ii)	idea that it remains at zero for first 60 minutes ✓ (starts to rise once) fructose is broken down ✓	2	2 x 3.1b	ALLOW for 60 minutes, any numbers in the range of 50 to 75 minutes ALLOW line is flat for first 60 minutes / line stays constant for first 60 minutes / gradient does not change for first 60 minutes ALLOW takes 60 minutes to start producing gas / nothing happens in the first 60 minutes / no respiration in the first 60 minutes ALLOW fructose turned into glucose IGNORE takes time to process fructose
	(c)		humans produce lactic acid ✓ yeast produces carbon dioxide and ethanol/alcohol ✓	2	2 x 1.1	IGNORE ATP/energy IGNORE references to needing oxygen or other substrates DO NOT ALLOW produces carbon dioxide/glucose/oxygen DO NOT ALLOW produces oxygen/glucose

Question			Answer	Marks	AO element	Guidance
15	(a)	(i)	<p>FIRST CHECK THE ANSWER ON ANSWER LINE If answer = 6.0 (μm) award 3 marks</p> <p>35 (mm) ✓</p> <p>$\frac{35000}{5800}$ ✓</p> <p>= 6.0 ✓</p>	3	<p>1 x 2.2</p> <p>1 x 1.1</p> <p>1 x 2.2</p>	<p>ALLOW 34 (mm) or 35 (mm) seen anywhere in answer unless they make a contradiction in their calculations</p> <p>ALLOW $\frac{\text{candidate's measurement} \times 1000}{5800}$</p> <p>ALLOW 5.9 if 34 used</p> <p>ALLOW 6.034(etc) for 2 marks ALLOW 5.862(etc) if 34 used for 2 marks ALLOW answers where the decimal point is in the wrong place e.g. $(35 \div 5800 =) 0.0060$ for 2 marks e.g. $(3.5 \times 1000 \div 5800 =) 0.60$ for 2 marks</p> <p>ALLOW evidence of rounding to 2sf = 1 mark</p> <p>if 34 (mm) or 35 (mm) not seen then ALLOW 0.006034 or 0.005862 = 1 mark</p>

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