Higher

GCSE

Combined Science Biology A Gateway Science

J250/07: Paper 7 (Higher Tier)

General Certificate of Secondary Education

Mark Scheme for June 2024

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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. **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 the annotation 'SEEN' 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 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(b)**.

11. Annotations available in RM Assessor

Annotation	Meaning
	Correct response
	Incorrect response
	Omission mark
BOD	Benefit of doubt given
CON	Contradiction
RE	Rounding error
SF	Error in number of significant figures
ECF	Error carried forward
L1	Level 1
L2	Level 2
L3	Level 3
NBOD	Benefit of doubt not given
SEEN	Noted but no credit given
I	Ignore

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

Annotation	Meaning
I	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

12. **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	B	1	1.2	
3	D	1	1.1	
4	D	1	1.1	
5	C	1	1.1	
6	B	1	2.2	
7	B	1	2.1	
8	C	1	1.1	
9	B	1	1.1	
10	C	1	2.1	

Question			Answer	Marks	AO element	Guidance
11	(a)		**Any two from:** Movement in both directions ✓ Sieve plates present ✓ Absence of lignified wall ✓	2	2 x 2.1	**IGNORE** any named substances **ALLOW** (it's taking them) up and down / nutrients go both ways / food molecules go both ways **ALLOW** description – e.g., (cells have ends with) holes / sieves / pores / selectively permeable barriers / not a continuous tube **IGNORE** a membrane between each cell **IGNORE** thinner (cell) walls / smaller lumen / just 'thinner' **IGNORE** made up of living cells
	(b)		**Any two from:** Both transport water ✓ Xylem transports mineral ions ✓ Phloem transports (dissolved) sugar ✓	2	1.1	 **ALLOW** xylem transports minerals **IGNORE** just 'ions' / nutrients / food **DO NOT ALLOW** incorrect substances e.g. sugar **ALLOW** sucrose for sugar / amino acids **IGNORE** (dissolved) food / nutrients **DO NOT ALLOW** glucose / minerals **IGNORE** any reference to direction as this is assessed in (a)

Question	Answer	Marks	AO element	Guidance
(c)		2	2.1	Assume answer refers to a warm day unless otherwise stated
	Increases (transport) ✓			**ALLOW** it will increase/ be faster / be quicker **ALLOW** water uptake is faster **IGNORE** transport will be more efficient / references to kinetic energy
	Increased transpiration **Or** Increased evaporation of water from leaf cells **Or** Increased diffusion of water vapour through stomata ✓		1.1	**ALLOW** more evaporation from leaves **ALLOW** more water evaporates through the stomata / more water vapour escapes through the stomata

Question			Answer	Marks	AO element	Guidance
12	(a)	(i)	Colour of (Benedict's) solution at the end ✓	1	2.2	**ALLOW** final colour / colour of mixture at the end / different colour at the end / coloured precipitate **DO NOT ALLOW** the time taken for the colour to change
		(ii)	Hot apparatus **and** any sensible precaution **Or** Liquid may spit out of tube **and** wear eye protection ✓	1	3.1b	**Hazard must link to precaution** **ALLOW** do not touch / wear (heatproof) gloves **ALLOW** use a water bath instead **ALLOW** flame so tie hair back **ALLOW** risk burning, keep Bunsen burner on safety flame when not in use **ALLOW k**eep flammable objects away from fire/flame **IGNORE** hazard "Bunsen burner" / heat (needs risk of fire / burning) **IGNORE** precaution "put on heat proof mat" **IGNORE** stay away from the fire / flame **ALLOW** safety glasses / goggles / plastic or glass shield **IGNORE** just 'glasses' **ALLOW** eye irritations from chemical / Benedict's and wear goggles **ALLOW** point test tube away from face when heating **IGNORE** references to glassware breaking

Question			Answer	Marks	AO element	Guidance
	(b)	(i)	percentage concentration of sugar in mixture >3.5 0.0 - 0.5 (2.5-3.5) 1.5-2.5 ✓	1	3.2a	**ALLOW** 3.5 + **ALLOW** ≥ 3.5 **DO NOT ALLOW** 3.5 < **ALLOW** 0 - 0.5
		(ii)	Not a single value / range of values ✓	1	3.1b	**ALLOW** idea colour change is subjective / colours can be perceived differently / orange can be mistaken for yellow **ALLOW** it is a large interval **ALLOW** values overlap
	(c)	(i)	2.2 (%) ✓	1	2.2	
		(ii)	Repeat (method for mixture C) and find a mean ✓	1	3.3b	**ALLOW** repeat until they have no anomalous values

Question			Answer	Marks	AO element	Guidance
13	(a)		**First check the answer in the table** **If answer = 2 : 1 award 3 marks** SA and V calculated = 54 and 27 ✓ 54 ÷ 27 or 2 ✓ = 2 : 1 ✓	3	 **1.2** **2 x 2.2**	**ALLOW** correct answer written outside table but answer in table takes precedence **ALLOW ECF** from candidates' SA and V **IGNORE** any surface area, volume or ratio already given in the table e.g. 24 : 8 = 3 : 1 **IGNORE** any ratios that are not n : 1 e.g. 8 : 3
	(b)	(i)	523 ✓	1	3.2a	**ALLOW** (agar cube) **D**
		(ii)	**Any one from:** Idea of difficulty in identifying when agar cube is completely yellow ✓ Idea of difficulty in cutting cubes to exact size ✓	1	3.1b	 **IGNORE** student error e.g., student recorded the wrong time / student stopped the stop clock too soon **IGNORE** references to different concentrations of hydrochloric acid / wrong pH / wrong volume **IGNORE** student error when measuring the cubes **IGNORE** ideas that would have caused a faster time to be obtained rather than a slower time. e.g. crack in agar **IGNORE** temperature change

Question			Answer	Marks	AO element	Guidance
	(c)		**Description:** As (the surface area to volume) ratio **decreases** the time taken (for the cube to turn yellow) **increases / ORA** **Explanation:** As cube gets **bigger**, the surface area to volume ratio gets **smaller** As size **increases** the diffusion distance **increases** / as ratio **decreases** the diffusion distance **increases**	**3**	**3 x 3.2b**	**ALLOW** the higher the surface area to volume ratio the less time it took / **ORA** **ALLOW** as the size/length/volume of the cube **increases** the time taken (for the cube to turn yellow) **increases / ORA** **IGNORE** as the surface area increases the time increases **ALLOW ORA** **ALLOW** as side gets **bigger**/ volume gets **bigger**, the surface area to volume ratio gets **smaller** **ALLOW ORA** **DO NOT ALLOW** rate of diffusion decreases/ increases/ changes **DO NOT ALLOW** references to osmosis

Question			Answer	Marks	AO element	Guidance
14	(a)		Receptors (in the eye) <u>detect</u> the <u>stimulus</u> ✓ <u>Impulses</u> are sent along the neurones ✓ (Impulses) travel along sensory neurone to relay neurone (in brain) to the motor neurone ✓ Face muscles produce the response ✓	4	3 x 2.1 1 x 1.1	**ALLOW** receptors in the <u>cornea</u> detect the <u>stimulus</u> **IGNORE** brush is stimulant **IGNORE** messages, signals /electrical signals **DO NOT ALLOW** spinal cord / spine **DO NOT ALLOW** extra steps on the pathway e.g. impulse goes from brush/stimulus to receptor **ALLOW** muscles produce the response / effectors produce the response **ALLOW** (face) muscle contracts **ALLOW** face muscle causes blinking **IGNORE** just effectors
	(b)	(i)	Thyroid ✓	1	1.1	
		(ii)	**Any two from:** Increased breathing rate ✓ Increased heart rate ✓ Increased blood pressure ✓ Direct blood flow away from digestive system / directs blood flow to muscles ✓ Dilates/widens pupils / **AW** ✓ Stimulates the conversion of glycogen to glucose ✓	2	2 x 1.1	**IGNORE** increase oxygen intake **ALLOW** increases blood glucose / blood sugar **IGNORE** increased body temperature

Question			Answer	Marks	AO element	Guidance
			Increased metabolism / increased respiration ✓			
	(c)		**Any three from:** Thickens mucus in cervix to prevent entry of sperm ✓ Inhibits FSH / LH release ✓ Prevents ovulation ✓ Prevents development of follicle ✓ Thins lining of uterus preventing implantation ✓ Suppresses LH secretion which prevents ovulation ✓	**3**	**3 x 1.1**	 **ALLOW** inhibits FSH / LH production **ALLOW** no egg is released **ALLOW** stops the egg from maturing **IGNORE** stops egg developing **IGNORE** mimics pregnancy
	(d)	(i)	Insulin ✓	**1**	**3.1a**	
		(ii)	Concentration (of glucagon) increases when concentration of glucose is at its lowest /**ORA**✓ (High concentrations of hormone **X /** glucagon) causes an increase in blood glucose levels/concentration ✓	**2**	**2 x 2.1**	**ALLOW** glucagon is released when blood glucose levels are low **ALLOW** (hormone X / glucagon raises) blood glucose levels back to normal

Question			Answer	Marks	AO element	Guidance
		(iii)	**Any three from:** Hormone **Y** / insulin converts glucose to glycogen **and** glucagon converts glycogen to glucose ✓ Hormone **Y** / insulin is released when concentration of glucose is high **and** glucagon is released when concentration of glucose is low ✓ Hormone **Y** / insulin lowers the concentration/level of glucose **and** glucagon increases the concentration/level of glucose ✓ Hormone **Y** / insulin increases uptake of glucose by cells /liver ✓ Hormone **Y** / insulin increases rate of respiration ✓	**3**	**3 x 1.1**	**ALLOW** insulin lowers blood glucose **and** glucagon raises blood glucose

Question			Answer	Marks	AO element	Guidance
15	(a)		**First check the answer on the answer line** **If answer = 63 award 2 marks** 0.525 x 60 x 2 ✓ = 63 ✓	**2**	**2 x 2.2**	**ALLOW** for one mark 32 / 31.5 / 1 / 1.05
	(b)		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)** Detailed method **AND** Accurate explanation related to photosynthesis *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)** Detailed method **AND** simple explanation that refers to either light intensity or rate of photosynthesis **OR** Attempt at method which may lack detail **AND** mostly accurate explanation related to photosynthesis *There is a line of reasoning presented with some structure. The information presented is relevant and supported by some evidence.* **Level 1 (1–2 marks)** Attempt at method which may lack detail **OR** makes a simple explanation about how distance of light affects the rate of photosynthesis	**6**	**2 x 2.1** **2 x 2.2** **2 x 3.3a**	**AO2.2 Apply knowledge and understanding of photosynthesis investigations** • identifies at least one variable to control **and** describes how to control this variable • identifies the measurements they will take **AO3.3a Analyse information and ideas to develop investigation** • describes how to change light intensity **and** states different distances • includes repeat readings **and** calculates a mean • mention of using a heat sink / LED lamp (to control temperature) • use of gas syringe rather than counting bubbles to increase accuracy **AO2.1 Apply knowledge and understanding of photosynthesis to explain change in light intensity** • increasing light intensity will increase rate of photosynthesis until light is no longer a limiting factor • increasing rate of photosynthesis releases oxygen at a greater rate

Question			Answer	Marks	AO element	Guidance
			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.*			• lower the light intensity the fewer bubbles released / the further the lamp the lower the rate of photosynthesis/ further the distance of the lamp the lower the light intensity the fewer bubbles released

Question			Answer	Marks	AO element	Guidance
16	(a)		**Any two from:** Biconcave shape to increase surface area ✓ No nucleus to allow **more** space for haemoglobin ✓ Contains haemoglobin to carry oxygen ✓	**2**	**2 x 1.1**	**ALLOW** biconcave shape to increase surface to volume ratio **ALLOW** large SA to increase the rate of gas exchange **IGNORE** concave shape **ALLOW** no nucleus to allow more oxygen transport **ALLOW** absence of other organelles to allow more space for haemoglobin / oxygen transport **ALLOW** contains haemoglobin to bind with oxygen **ALLOW** flexible to fit through capillaries / narrow vessels **For mp 2 and 3**: **ALLOW** no nucleus for more space for oxyhaemoglobin = 2 marks
	(b)	(i)	Prevent backflow / stop blood entering atrium ✓	**1**	**1.1**	**ALLOW** only allows one way flow / makes sure blood is flowing the right way **IGNORE** names of valves **IGNORE** controls the flow

Question			Answer	Marks	AO element	Guidance
		(ii)	Only one ventricle (instead of two) / does not contain two ventricles ✓ Oxygenated and deoxygenated blood become mixed / are not separated ✓ Less oxygen will be transported to the body/cells ✓	**3**	**3 x 2.1**	**ALLOW** no septum **ALLOW** humans have two ventricles **IGNORE** not a double circulatory system / only one circuit / loop / pathway **ALLOW** oxygenated blood sent to lungs **ALLOW** deoxygenated blood sent around body **IGNORE** slower blood flow / references to pressure / blood at lower pressure

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