

Foundation

GCSE

Biology B Twenty First Century Science

J257/02: Depth in Biology (Foundation 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.

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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 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 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 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 questions on this paper are **5(b)(v)** and **8(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 Biology B:

	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.

Question			Answer	Marks	AO element	Guidance
1	(a)		C ✓ it does not have a nucleus / it has a loop of DNA (in the cytoplasm) ✓	2	3.2a	ALLOW no mitochondria
	(b)		stage ✓ light ✓ objective lens ✓ focus ✓	4	1.2	
	(c)		Salmonella food poisoning ✓	1	1.1	
	(d)		hands may have bacteria/pathogens on them OR washing removes/kills/reduces number of bacteria/pathogens from your hands ✓ stops the bacteria/pathogens from your hands getting onto the sandwich ✓ stops you from eating the bacteria/pathogens OR stops the bacteria from getting inside your body / infecting you ✓	3	2.1	ALLOW germs DO NOT ALLOW disease

Question			Answer	Marks	AO element	Guidance
2	(a)	(i)	cabbage ✓	1	2.1	
		(ii)	slug ✓	1	2.1	
		(iii)	fewer foxes means fewer hedgehogs will be eaten ✓ hedgehog population size will be larger (than it would've been) ✓ more slugs will be eaten by hedgehogs ✓	3	2.1	ALLOW killed ALLOW increase ALLOW killed
	(b)	(i)	hedgehog population size decreasing over time ✓ idea of larger decrease between 1955-1995 compared with 1995-2018 ✓	2	3.1a	ALLOW quantification of 34.94 million decrease and 0.68 million decrease CHECK FIGURES NEXT TO TABLE
		(ii)	0.85 million ✓	1	3.2a	
		(iii)	Any two from: destruction of the hedgehogs' habitat ✓ nowhere to reproduce / raise young ✓ more will get eaten (by foxes/predators) ✓ more exposed to cold/weather / nowhere to shelter/hibernate ✓ less food/prey/insects (for hedgehogs) ✓ nowhere to store food ✓	2	2.1	DO NOT ALLOW nowhere to live/hide, as this is in the question stem ALLOW killed by foxes/predators DO NOT ALLOW killed/die unqualified

Question			Answer	Marks	AO element	Guidance
2	(c)		<p>Any two from:</p> <p>hedgehogs will be protected from predators/foxes in gardens</p> <p>OR</p> <p>fewer hedgehogs will be eaten/killed by predators/foxes ✓</p> <p>hedgehogs can avoid other threats ✓</p> <p>more of the hedgehogs will survive to reproduce ✓</p>	2	2.1	<p>ALLOW idea of being safer or able to escape</p> <p>ALLOW any correct example, e.g. traffic</p>

Question			Answer			Marks	AO element	Guidance
3	(a)			Only true for hormones	Only true for nerve impulses	4	1.1	
			Are secreted by glands	✓				
			Travel along neurons		✓			
			Travel in the blood	✓				
			Usually cause slower, longer-lasting responses	✓				
	(b)		<p>Any three from:</p> <p>hormones taken as a pill / implant / injected ✓</p> <p>idea that the contraceptive disrupts/affects the <u>menstrual cycle/hormones</u> ✓</p> <p>prevents/controls ovulation ✓</p> <p>prevents release of an egg ✓</p> <p>other mechanisms, e.g. prevents maturation of an egg / causes mucus around cervix ✓</p> <p>no egg present so cannot be fertilised ✓</p>			3	1.1	<p>ALLOW credit for higher level ideas e.g. effects of/on named hormones</p> <p>ALLOW ref. to male pill disrupting production of sperm</p> <p>DO NOT ALLOW ref. to thickening the uterus lining, as this does not prevent fertilisation</p>

Question			Answer	Marks	AO element	Guidance
4	(a)		A – atrium B – ventricle C – valve	2	1.1	one correct line = 1 mark two or three correct lines = 2 marks
	(b)		Heart Lungs Heart Body ✓	1	1.1	
	(c)		Any two from: get the person's permission/consent to touch their skin ✓ press fingers against a pulse point / against neck/wrist / against blood vessels (near the surface of the skin) ✓ count the number of beats in 1 minute ✓ idea of counting the number of beats in a shorter period and multiplying to convert to beats per minute ✓	2	3.3a	ORA for period longer than a minute and dividing

Question			Answer	Marks	AO element	Guidance
4	(d)		Any three from: age ✓ sex/gender ✓ ethnicity ✓ smoker/non-smoker ✓ amount of rest/exercise before the test ✓ caffeine intake (before the test) ✓ water intake (before the test) ✓ food/sugar/carbohydrate/protein intake (before the test) ✓ clothing ✓ BMI / body mass / weight ✓ height ✓ medical history/conditions ✓	3	2.2	DO NOT ALLOW “diet” unqualified DO NOT ALLOW fitness (as this is the factor being tested/investigated) IGNORE “health” unqualified
	(e)	(i)	70 (beats per minute) ✓	1	3.1a	
		(ii)	4 (minutes) ✓	1	3.1a	

Question			Answer	Marks	AO element	Guidance
4		(iii)	FIRST CHECK THE ANSWER ON ANSWER LINE If answer = 58 award 2 marks 128 - 70 ✓ = 58 (beats per minute) ✓	2	3.1a 3.2b	
		(iv)	Any four from: person B's resting/normal pulse rate is <u>lower</u> (than person A's) ✓ person B's maximum pulse rate is <u>lower</u> (than person A's) / it increases less during the exercise period ✓ person B's pulse rate increased slower (than person A's) ✓ person B's pulse rate is <u>lower</u> (than person A's) after the exercise ends ✓ person B's pulse rate returns to its resting/normal value <u>faster/sooner</u> (than person A's) / person B's recovery rate is <u>faster</u> ✓	3	3.1b	ORA for person A throughout statements must be comparative

Question			Answer	Marks	AO element	Guidance
5	(a)		FIRST CHECK THE ANSWER ON ANSWER LINE If answer = 40 award 2 marks $(3.2 \div 8) \times 100 \checkmark$ $= 40 (\%) \checkmark$	2	2.1	
	(b)	(i)	A section of DNA that contains instructions. $\checkmark$	1	1.1	
		(ii)	proteins $\checkmark$	1	1.1	
		(iii)	Any two from: specific idea that the modified wheat will now be able to grow (better) in warmer/drier conditions $\checkmark$ general idea that characteristic(s)/trait(s) will be introduced/changed OR example of a characteristic/trait that could be changed $\checkmark$ its genotype / genome sequence / DNA / base sequence will be changed $\checkmark$ it will be able to make new protein(s) $\checkmark$	2	2.1	ALLOW the modified wheat will be resistant to climate change DO NOT ALLOW "it will grow quicker/faster/easier" ALLOW specific examples of changes to phenotype e.g. taste DO NOT ALLOW ref. to mutation
		(iv)	Genetic engineering $\checkmark$	1	2.1	

Question			Answer	Marks	AO element	Guidance
		(v) *	<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) Well developed explanation of benefits AND practical issues/risks/ethical issues/objections. <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) Limited explanation of benefits AND practical issues/risks/ethical objections. <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) Imbalanced answer explains only benefits. OR Imbalanced answer explains only issues/risks/objections. <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>	6	2.1	<p>AO2.1 Applying knowledge to explain benefits, practical issues and ethical issues related to genetic engineering</p> <p>For example:</p> <p><i>Benefits</i></p> <ul style="list-style-type: none"> • (more) wheat can be grown as the climate becomes warmer/drier • will ensure we can continue to feed the world's population / people who depend on wheat • 40% / high proportion of the world's population depend on wheat for their diet / they will starve without it • suggestions of other benefits, e.g. health, disease/pest resistance, economic • the benefits/need outweigh the issues/risks/objections <p><i>Practical issues/risks/ethical objections</i></p> <ul style="list-style-type: none"> • unknown/untested effects on wheat • risk of adverse effects on other species (e.g. gene transfer, toxicity) • safety risk to humans • DO NOT ALLOW “risky” / “high risk” unqualified • idea that the genetically modified wheat might out-compete other species / become invasive / cause loss of biodiversity • some people think it is wrong/unnatural to change an organism's genes/genome • DO NOT ALLOW “it's playing God” unexplained

Question			Answer	Marks	AO element	Guidance
6	(a)		carbon dioxide – photosynthesis nitrogen – making proteins oxygen – cellular respiration ✓✓	2	1.1	one correct line = 1 mark two or three correct lines = 2 marks
	(b)	(i)	Partially-permeable ✓	1	1.1	
		(ii)	Any two from: larger/more cell membrane ✓ larger surface area ✓ the plant can take in more of the water / nitrate mineral ions / fertiliser that the student gave it ✓	2	2.1	
		(iii)	soil ✓ cell cytoplasm ✓ osmosis ✓ diffusion ✓	4	1.1	

Question			Answer	Marks	AO element	Guidance
6		(iv)	<p>Any three from:</p> <p>ref. to <u>active transport</u> (of nitrate mineral ions) ✓</p> <p>active transport requires energy/ATP/respiration ✓</p> <p>(aerobic) respiration takes place in mitochondria / mitochondria provide ATP/energy ✓</p> <p>more mitochondria means more (energy/ATP/respiration for) active transport (of nitrate mineral ions into the root hair cell) ✓</p>	3	2.1	DO NOT ALLOW produce/make energy
		(c)	<p>Any three from:</p> <p>general idea that growth involves making new cells / cell division ✓</p> <p>meristem is where new cells are made / meristem is where cell division happens ✓</p> <p>meristem is <u>un</u>specialised cells ✓</p> <p>the meristem cells become specialised OR the meristem cells differentiate (to become specialised) ✓</p>	3	2.1	<p>ALLOW meristem cells are stem cells</p> <p>IGNORE “without meristem it will not be able to grow” OR “without meristem it will not be able to produce/make any more (specialised) cells”, as this is stated in the question</p>

Question			Answer	Marks	AO element	Guidance
7	(a)			4	1.1	
	(b)		more than ✓	1	1.1	

Question	Answer	Marks	AO element	Guidance
8 (a)*	<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) Method includes references to named apparatus AND how to use apparatus to collect data AND how to avoid bias in the field. <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) Method includes how to use apparatus to collect data AND references to named apparatus OR how to avoid bias in the field. <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) Describe/name apparatus needed OR how to use apparatus to collect data OR how to avoid bias in the field. <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>	6	2 x 2.2 4 x 3.3a	<p>AO2.2 Applying knowledge of fieldwork to identify appropriate apparatus to collect the data For example:</p> <ul style="list-style-type: none"> • <u>quadrat</u>(s) for each small square • identification key/app to identify snowdrops • tape measure / trundle wheel / metre rule • random number table/generator / other suitable apparatus eg on a computer or calculator <p>AO3.3a Developing an appropriate method to collect the data For example:</p> <ul style="list-style-type: none"> • place quadrats/squares on the field/ground • use identification key/app to identify snowdrops • count/record number of snowdrops in each square/quadrat • idea of repeating / doing it 6/multiple times • ref. to safe working e.g. placing quadrats using random coordinates is safer than throwing • avoid trampling/picking snowdrops/flowers inside squares/quadrats <p>AO3.3a How to avoid bias in the data</p> <ul style="list-style-type: none"> • measure area / (length and width of) the field divide field into a grid • label grid with numbers or letters / coordinates • use random number table/generator/coordinates to decide where to place the squares/quadrats • place squares/quadrats randomly OR evenly/regularly across the field <p>IGNORE idea of transect / squares next to each other</p>

Question			Answer	Marks	AO element	Guidance
8	(b)		FIRST CHECK THE ANSWER ON ANSWER LINE If answer = 5 award 2 marks $5 + 8 + 2 + 9 + 0 + 6 = 30$ $\div 6 \checkmark$ $= 5 \checkmark$	2	2.2	
	(c)		FIRST CHECK THE ANSWER ON ANSWER LINE If answer = 2400 award 2 marks $600 \div 0.25 \checkmark$ $= 2400 \checkmark$	2	2.2	
	(d)		$(5 \times 2400) = 12000 \checkmark$	1	3.2b	ALLOW ECF from candidate's answers to parts (b) and (c)
	(e)		Any one from: haven't counted / can't count all the snowdrops / would take too long to count them all $\checkmark$ idea that it's only a (small) sample of the snowdrops/field / only a small area $\checkmark$	1	3.2a	
	(f)		bigger sample/area OR more squares/quadrats / idea of repeating OR larger squares/quadrats $\checkmark$	1	3.3b	IGNORE "collect more data" unexplained

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