OCR
Oxford Cambridge and RSA

GCE

Biology A

H420/01: Biological processes

A Level

Mark Scheme for June 2023

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It is also responsible for developing new specifications to meet national requirements and the needs of students and teachers. OCR is a not-for-profit organisation; any surplus made is invested back into the establishment to help towards the development of qualifications and support, which keep pace with the changing needs of today's society.

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 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:

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 **16(b)*** and **20(b)***

11. **Annotations**

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

Annotation	Meaning
I	Ignore
BP	Blank page

12. **Subject Specific Marking Instructions**

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

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.

Question			Answer	Marks	AO element	Guidance
1			A ✓	1	1.1	
2			B ✓	1	1.1	
3			B ✓	1	1.1	
4			C ✓	1	1.1	
5			A ✓	1	1.1	
6			A ✓	1	1.2	
7			A ✓	1	1.1	
8			B ✓	1	2.2	
9			C ✓	1	2.1	
10			C ✓	1	1.1	
11			B ✓	1	2.7	
12			B ✓	1	1.1	
13			A ✓	1	1.2	
14			B ✓	1	2.8	
15			D ✓	1	2.8	

Question			Answer	Marks	AO element	Guidance
16	(a)	(i)	**FIRST CHECK THE ANSWER ON ANSWER LINE** **If answer = 7010 / 7012.5 / 7013 cm^3 min^{-1} award 3 marks** correct values from graph for stroke volume **and** heart rate at 20 weeks ✓ correct use of cardiac output = heart rate x stroke volume i.e. 82.5 x 85 = 7012.5 ✓ correct units = **cm^3 min^{-1}** ✓	**3**	2.2	**ALLOW for 3 marks 7.01 / 7 / 7.0 dm^3 min^{-1}** **ALLOW** for numbers indicated on graphs or seen in response SV = 85 (cm^3) **and** HR = 82.5 (bpm) **ALLOW** max 2 ECF from incorrect values from graph **e.g. 83 x 85 = 7055 cm^3 min^{-1}** **ALLOW 1 mark** for correct unit i.e. **cm^3 min^{-1}** **Answer must match unit** e.g. 7.01 cm^3 min^{-1} = 2 marks as correct answer but incorrect unit **ALLOW** cm^3 / min for cm^3 min^{-1} **ALLOW** L min^{-1} or dm^3 / min L / min or for dm^3 min^{-1} **DO NOT ALLOW** m for mins
16	(a)	(ii)	to deliver more blood to , (maternal) cells / tissues / organs / placenta ✓ to deliver more , oxygen / glucose / amino acids , to , (fetal / maternal) cells / tissues / organs ✓ to meet the need for , higher / faster , metabolic rate (of mother / fetus) ✓	**max 1**	2.1	**IGNORE** baby / body **DO NOT ALLOW** delivers more blood to fetus **IGNORE** nutrients **ALLOW** higher / faster , respiration rate for metabolic rate

Question			Answer		Marks	AO element	Guidance
16	(a)	(iii)		*conclusion is valid because*	max 3	3.2	
			1	during weeks 9 to 24 as cardiac output increases blood pressure decreases ✓			**MP1 ALLOW** any range in weeks between 9 to 24 stated that incorporates at least three bars e.g. from 13 to 24 weeks **MP1 ALLOW** conclusion is only, valid / true , up to , 20 / 24 , weeks
			2	*idea that* decreased vascular resistance could explain drop in blood pressure ✓			
				conclusion is not valid because			
			3	after 24 weeks / from 25 weeks , blood pressure increases ✓			
			4	(changes in blood pressure) could be due to (named) factor (other than vascular resistance) ✓			**MP4 ALLOW** e.g. changes in blood volume e.g. changes in hormone levels **MP4 IGNORE** suggestions for lifestyle changes that would decrease blood pressure e.g. diet, exercise
				*general statements – **max 2 marks***			
			5	overlapping error bars suggest that any changes in blood pressure are not significant ✓			
			6	no (named) statistical tests / would need to carry out appropriate statistical test ✓			**MP6 IGNORE** correlation / chi-squared for named statistical tests
			7	no mention of how many females were involved in the study ✓			**MP7 ALLOW** no sample size
			8	no data available at 0 weeks in , Fig.16.2 / bar chart ✓			

Question			Answer	Marks	AO element	Guidance
16	(b)*		***Please refer to the marking instructions on page 6 of this mark scheme for guidance on how to mark this question.*** ***In summary:*** *Read through the whole answer. (Be prepared to recognise and credit unexpected approaches where they show relevance.)* *Using a 'best-fit' approach based on the science content of the answer, first decide which of the level descriptors,* ***Level 1****,* ***Level 2*** *or* ***Level 3****, best describes the overall quality of the answer.* *Then, award the higher or lower mark within the level, according to the* ***Communication Statement*** *(shown in italics):* ○ *award the higher mark where the Communication Statement has been met.* ○ *award the lower mark where aspects of the Communication Statement have been missed.* • ***The science content determines the level.*** • ***The Communication Statement determines the mark within a level.***			
			Level 3 (5–6 marks) A detailed account that correctly describes blood flow through the heart **and** includes statement**s** about the role of valves **and** pressure differences. *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) An account that **partly** describes blood flow through the heart **and** includes **a** statement about the role of valves **and** pressure differences. *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) A basic outline that **partly** describes blood flow through the heart **OR**	**6**	1.2	**Loss of mark for communication statement for incorrect statements and more than 50% irrelevant points** e.g. describes flow of blood through right side of heart, incorrect sequence of blood flow, SL valves with AV function, low(er) pressure for high(er) pressure, AV valve stays shut until atrium contracts **Indicative scientific content** ***Blood flow through left side of heart*** • return via pulmonary vein • (left) atrium → (left) ventricle → aorta ***Role of valves*** • to prevent back-flow • valves open or close due to pressure differences • atrio-ventricular / AV / bicuspid **and** semi-lunar / SL / aortic • AV between atrium and ventricle • SL between ventricle and aorta

Question			Answer	Marks	AO element	Guidance
			includes a statement about the role of valves **OR** includes a statement about pressure differences *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.*			***Pressure differences*** *diastole* • during diastole pressure is (relatively) low • pressure increases as (left) atrium fills with blood *atrial systole* • pressure increases due to atrial , contraction / systole • blood forced into (left) ventricle *ventricular systole* • further increase in pressure as (left) ventricle , contracts / systole • increased pressure in (left) ventricle causes AV / bicuspid valve to close • higher pressure in ventricle forces blood into aorta • as pressure in ventricle drops, SL valve closes • pressure in ventricle drops below that of the atrium so AV valves open

16	(c)	(i)		sigmoid curve sketched to the left of the adult curve ✓	1	2.2	Curve must start and finish on same % as maternal and must not exceed 96% at any point
16	(c)	(ii)	1	(at same pO_2) fetal haemoglobin has higher affinity (for oxygen) ✓	max 3	1.1	**ALLOW** Hb for haemoglobin throughout **MP1 ALLOW** ORA i.e. maternal Hb has lower affinity
			2	low pO_2 in placenta ✓			
			3	(so) oxygen dissociates from (maternal / adult) haemoglobin (in placenta) ✓			
			4	(so) oxygen diffuses from maternal to fetal , blood / circulation ✓			**MP4 IGNORE** to / diffuses across , placenta
			5	increased saturation of fetal haemoglobin at low(er) pO_2 ✓			**MP5 ALLOW** fetal Hb associates with / binds with oxygen at low(er) pO_2 e.g. **MP3** and **MP5** so oxygen dissociating from maternal Hb is uploaded by fetal Hb at low pO2

16	**(d)**			*Patient **A***	**max 4**	3.2, 2.2	
			1	increase in eGFR which is in line with that expected during pregnancy / AW ✓			**MP1 ALLOW** patient **A** has eGFR about 50% higher than normal which is consistent with pregnancy
			2	(high eGFR) explains increase in (urine concentration of) , glucose / protein ✓			
				*Patient **B***			
			3	has much lower eGFR than a healthy person ✓			**MP3 ALLOW** patient B has very low eGFR compared to normal / 107cm^3 min^{-1}
			4	less / no , ultrafiltration so level of (named) electrolytes is high(er) than healthy person ✓			**MP4 IGNORE** ref. to reabsorption
			5	very high protein (concentration) in urine indicates damage to , nephron / glomerulus / Bowman's capsule ✓			**MP5 ALLOW** ...in basement membrane / renal corpuscle
			6	correct calculation to support statement for **either** patient **A** or patient **B** ✓			**MP6** is awarded **once** only for patient **A** or **B** **e.g.** Patient **A** has 51.4% / 51% increase in eGFR **e.g.** Patient **A** 50% is 161 and 85% is 198 so eGFR within range **e.g.** Patient **B** eGFR has decreased by 67.3% / 67%

Question			Answer	Marks	AO element	Guidance
17	(a)	(i)	placed vertically so that , roots grow downwards / shoots grow upwards ✓ in dark so that light does not affect , results / growth **OR** in dark to prevent phototropism ✓	**2**	2.7	**DO NOT ALLOW** trop**h**ism / trop**h**ic **ALLOW** roots are positively geotropic / shoots are negatively geotropic **ALLOW** gravitropic for geotropic **ALLOW** roots grow towards gravity / shoots grow away from gravity **ALLOW** absence of light / darkness , is a control variable
17	(a)	(ii)	act as a control ✓ determine , results / growth , without , auxin / IAA ✓ compare , results / growth , with and without, auxin / IAA ✓ allow calculation of percentage , change / stimulation / inhibition ✓	**max 2**	3.4	**DO NOT ALLOW** control variable **ALLOW** e.g. shows growth without auxin **ALLOW** percentage , increase / decrease for % change
17	(b)		**FIRST CHECK THE ANSWER ON ANSWER LINE** **if answer = 19 (%) award 2 marks** change in length = 16.5 – 13.9 = 2.6 ✓ percentage change = [2.6 ÷ 13.9] x 100 **OR** [16.5 – 13.9] ÷ 13.9 x100 **OR** 18.7 ✓ 19 (%) to 2 sig. figs. ✓	**2**	**2.8**	If answer incorrect check for MP1 or MP2 **max 1 mark** if answer not to 2 sig. figs. e.g. 18.7 / 19.0 / 18.71 / 18.705.....

17	(c)	(i)	**MP1** = correct axis labels **and** appropriate correct scale and plotted points should occupy at least 50% ✓ **MP2** 16 plots mostly correct for **both** roots and shoots ✓ **MP3** appropriate lines for roots and shoots ✓ **MP4** appropriate key for root and shoot lines correctly labelled ✓	4	2.8	Should be a line graph Bar chart max 2 for **MP1** and **MP4** if correct **MP1 ALLOW** x axis in middle or at bottom / y axis in middle or left-aligned **MP1** x axis = concentration of IAA (ppm) and y axis = % change in length **MP1 DO NOT ALLOW** incorrect scale on x axis...decreasing size i.e. 10^2 to 10^{-5} **MP2** look at overall shapes for guidance **No MP2** if any plots missing **MP3 DO NOT ALLOW** double lines, lines missing the plot points by more than 1 square or extrapolation **ECF MP3** if plots wrong or missing e.g. if only root data plotted allow a correct line

Concentration of IAA (ppm)	% change in length	
	Root	Shoot
1×10^2	-100	0
1×10^1	-100	+200
1×10^0	-75	+140
1×10^{-1}	-45	+70
1×10^{-2}	+25	+30
1×10^{-3}	+65	+10
1×10^{-4}	+70	0
1×10^{-5}	+55	0

Question			Answer	Marks	AO element	Guidance
17	(c)	(ii)	keep , (some) stock / undiluted , solution to use for , 100 / 10^2 , ppm ✓ use serial dilution ✓ 1cm^3 of , stock / 100ppm / 10^2, solution and add 9cm^3 of (distilled) water (to get 10ppm) ✓ repeat this procedure with each previously diluted solution ✓	**max 2**	3.3	**MUST** be clear statement not implied **ALLOW** other stated volumes to give 1 in 10 **ALLOW** annotated drawing for MPs 3 and 4
17	(c)	(iii)	use , new / clean , syringe / pipette for , measuring volumes / each transfer ✓ ensure (adequate) mixing at each step / AW ✓	**2**	3.3	**Mark as continuous prose** **ALLOW** other suitable apparatus for measuring volume **ALLOW** separate / different for clean / new **IGNORE** rinsing
17	(c)	(iv)	because each interval is a factor of 10 / AW ✓	**1**	**2.4**	**DO NOT ALLOW** e.g. change by 10 each time

Question			Answer	Marks	AO element	Guidance
18	(a)	(i)	synaptic , cleft / gap ✓	1	1.1	**IGNORE** synapse
18	(a)	(ii)	structure **A** **and** vesicles (fused with membrane) **OR** exocytosis / neurotransmitter released ✓	1	3.1	**MUST** include structure **A and** a reason for one mark.
18	(a)	(iii)	positive ✓ depolarisation ✓	2	1.2	
18	(b)	(i)	**1** movement of cells ✓ **2** strengthening / supporting , cells ✓ **3** movement of (named) organelles ✓ **4** holds organelles in place ✓ **5** form (mitotic / meiotic) spindle ✓ **6** movement of , chromatids / chromosomes ✓ **7** cleavage in (some) cells / cytokinesis ✓	max 3	1.2	**Mark as continuous prose** **IGNORE** cilia / flagella **MP1 ALLOW** change in cell shape e.g phagocytosis **MP2 ALLOW** maintains cell shape **IGNORE** structure **MP3 ALLOW** form tracks for motor proteins **MP4 ALLOW** attachment of (named) organelle(s) **MP7 IGNORE** cleavage / cytokinesis , in plant cells

18	**(b)**	**(ii)**	**1**	change in , structure / function , of (cytoskeleton) protein ✓	**max 2**	**2.1**	**MP1 ALLOW** non-functional protein is produced
			2	less / no , movement of vesicles / exocytosis / release of neurotransmitter ✓			**MP2 DO NOT ALLOW** 'no vesicles released'
			3	less / no , synaptic transmission / AW ✓			**MP3 ALLOW** impulse cannot cross synapse / action potentials do not continue from one neurone to the next **MP3 DO NOT ALLOW** action potential cannot cross the synapse
			4	could change diameter of axon ✓			
			5	affects speed of nerve impulses ✓			
			6	*idea that* it could affect Schwann cell integrity / AW ✓			

Question			Answer	Marks	AO element	Guidance
19	(a)		<table><tr><th>True</th><th>False</th></tr><tr><td>✓</td><td></td></tr><tr><td></td><td>✓</td></tr><tr><td>✓</td><td></td></tr><tr><td>✓</td><td></td></tr></table> ✓ ✓	2	1.2	All **four** correct for 2 marks **Two** or **three** correct for 1 mark
19	(b)	(i)	T = (renal) medulla ✓ U = (renal) cortex ✓ V = pelvis ✓	3	2.3	**ALLOW** (renal) pyramid
19	(b)	(ii)	U ✓ (shows) glomerulus / Bowman's capsule ✓	2	2.3	**ALLOW** cortex
19	(c)	(i)	Z ✓ W ✓ Y ✓	3	2.1	**IGNORE** Y

19	(c)	(ii)	1	ascending limb is impermeable to water / water cannot leave the ascending limb ✓	max 3	1.2	
			2	Na^+ / Cl^- , diffuse , out of lower part of ascending limb ✓			**MP2** to **MP4 ALLOW** sodium / Na / chloride / Cl , <u>ions</u> **MPs 2** to **4** if only 'ions' used or incorrect ions e.g. K^+ apply ECF once only **MP2** and **MP4 ALLOW** down concentration gradient for diffusion
			3	active transport of , Na^+ / Cl^- , out of (upper part of) ascending limb ✓			**MP3 ALLOW** pumped for active transport
			4	diffusion of , Na^+ / Cl^- , into descending limb ✓			
			5	water leaves the descending limb by osmosis ✓			**MP5 ALLOW** down water potential gradient for osmosis
			6	ref to countercurrent multiplier ✓			
19	(d)			body fat / glycogen , broken down / used for respiration ✓ (respired to) produce carbon dioxide and water ✓ carbon dioxide / water / waste products from respiration , excreted (so body mass is lost) ✓	max 2	2.5	**IGNORE** urea **ALLOW** e.g. carbon dioxide removed from the lungs / exhaled

Question			Answer		Marks	AO element	Guidance
20	(a)	(i)	(endotherm) uses heat produced , within / internally , to maintain body temperature ✓		1	1.1	**ALLOW** uses heat from metabolic processes to maintain body temperature **IGNORE** control
20	(a)	(ii)		*advantage **one** from:*	max 2	1.1	
			1	less , food / energy , used / needed ✓			
			2	more , energy / nutrients , can be used for , growth / reproduction ✓			**MP2 IGNORE** food **MP2 ALLOW** named nutrients e.g. glucose
			3	less time spent , feeding / finding food ✓			**MP3 ALLOW** able to survive in habitats with low availability of food
				*disadvantage **one** from:*			
			4	metabolism slows / less active , at low(er) (environmental) temperatures ✓			**MP4 ALLOW** less able / unable , to live in cold climates **MP4 ALLOW** susceptible to freezing
			5	can be at risk from predators when body temperature is low ✓			
			6	less able / unable to , hunt for / find , food when body temperature is low ✓			

Question			Answer	Marks	AO element	Guidance
20	(b)*		***Please refer to the marking instructions on page 6 of this mark scheme for guidance on how to mark this question.*** ***In summary:*** *Read through the whole answer. (Be prepared to recognise and credit unexpected approaches where they show relevance.)* *Using a 'best-fit' approach based on the science content of the answer, first decide which of the level descriptors,* ***Level 1****,* ***Level 2*** *or* ***Level 3****, best describes the overall quality of the answer.* *Then, award the higher or lower mark within the level, according to the* ***Communication Statement*** *(shown in italics):* o *award the higher mark where the Communication Statement has been met.* o *award the lower mark where aspects of the Communication Statement have been missed.* • ***The science content determines the level.*** • ***The Communication Statement determines the mark within a level.***			
			Level 3 (5–6 marks) A detailed discussion of **both** statements **and** uses appropriate example(s) for **both** ectotherms and endotherms to support points made. *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)** A discussion of **both** statements **and** uses appropriate example(s) for **either** ectotherms **or** endotherms to support points made. *There is a line of reasoning presented with some structure. The information presented is relevant and supported by some evidence.*	**6**	2.5 3.1	**Loss of mark for communication statement if incorrect science used** e.g endotherms use the mainly behaviour to control body temperature **or more than 50% irrelevant information** **Indicative scientific content** *Statement 1 points-ectotherms* • **ectotherms** control body temperature less well than endotherms • **ectotherm** temperature varies with environment • **ectotherms** can control body temperature using behaviour • **ectotherms** use mostly behavioural but some physiological • **ectotherms** can increase or reduce absorption of heat using external sources e.g. sun *Suitable examples could include…* o move to cooler / warmer places o basking o laying on (hot rocks)

Question			Answer	Marks	AO element	Guidance
			Level 1 (1–2 marks) A discussion of **either** statement that uses an appropriate example(s) to support points made. *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.			*Statement 2 points- endotherms* • **endotherms** use mostly physiological / metabolic methods, but some behavioural • **endotherms** generally use physiological responses to control temperature *Suitable examples could include…* ○ use of metabolic heat ○ sweating ○ vasoconstriction/vasodilation ○ hairs standing on end ○ shivering ○ large surface area for cooling e.g. elephant ears • **endotherms** can use behaviour to control body temperature. *Suitable examples could include…* ○ dormancy during periods of high (aestivation) or low temperatures (hibernation) ○ use of burrows / houses / shade ○ methods to warm or cool burrows / houses ○ gaping/wrist licking ○ humans wear clothes dependent on weather ○ migration ○ huddling

Question			Answer	Marks	AO element	Guidance
20	(c)	(i)	(increase in set point) will result in fever ✓ raised body temperatures help to , kill / prevent increase in number of , pathogens ✓ causes an increase in antibody production / faster immune response ✓ high body temperature can result in organ , damage / failure ✓	max 2	2.1	**ALLOW** viruses / bacteria for pathogens **IGNORE** affects enzyme activity
20	(c)	(ii)	(membrane acts in) cell signalling ✓ (membrane) controls , entry / exit , to cell ✓	2	1.2, 2.5	**ALLOW** cell communication **ALLOW** is partially permeable / selectively permeable / acts as a barrier

Question			Answer	Marks	AO element	Guidance
21	(a)	(i)	movement of <u>water</u> ✓ from roots to leaves ✓	2	1.2	
21	(a)	(ii)	to prevent air from breaking the water column ✓ to reduce , evaporation / loss of water vapour ✓ prevent entry of pathogens ✓	max 1	2.7	**ALLOW** prevents air locks (in xylem) **ALLOW** maintain continuous column of water / not break the transpiration stream
21	(a)	(iii)	*idea of* cutting a series of sections at intervals along stem ✓ transverse / longitudinal , section(s) ✓ *idea of taking* from above **and** below the site of injection ✓ (view sections) using a microscope ✓	max 2	3.3	**ALLOW** e.g. cut several sections , at intervals / along the stem **ALLOW** cross section for transverse **ALLOW** see if dye visibly appears in leaves / flowers / stem
21	(b)	(i)	the (fertiliser) solution would lower water potential (of soil) ✓ water moves out of (root) cells (into soil) by osmosis **OR** less water enters (root) cells (from soil) by osmosis ✓ plant loses more water than it gains / AW ✓ (in aerial parts of plant) turgor (pressure) is reduced ✓	max 3	2.3	**ALLOW** water potential of root cells would be higher than soil **ALLOW** down water potential gradient for osmosis **ALLOW** (leaf) cells are , flaccid / plasmolysed

21	**(b)**	**(ii)**		*correct because* **1** ATP is required for active transport of mineral ions into , root (cells) / xylem ✓ **2** (so) no water potential gradient (into root / xylem) / AW ✓ *incorrect because* **3** cyanide (ions) may not have entered roots ✓ **4** plant cells may be tolerant to cyanide ions ✓ **5** concentration of cyanide ions may not be high enough (to inhibit ATP synthesis) ✓	**max 2**	3.1	**ALLOW** more mineral ions remain in soil
21	**(b)**	**(iii)**		(high light intensity) increases (rate of), light-dependent reaction / LDR / photosynthesis ✓ more stomata open to allow , gas exchange / entry of carbon dioxide ✓ (high light intensity) increases transpiration so more , evaporation / water vapour is lost ✓	**max 2**	2.3	**ALLOW** more photolysis **ALLOW** stomata widen to allow , gas exchange / entry of carbon dioxide

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