OCR
Oxford Cambridge and RSA

Practice Paper – Set 2

A Level Biology A

H420/03   Unified biology

MARK SCHEME

Duration: 1 hour 30 minutes

MAXIMUM MARK   70

Version 5 FINAL

This document consists of 13 pages

MARKING INSTRUCTIONS

PREPARATION FOR MARKING

SCORIS

1. Make sure that you have accessed and completed the relevant training packages for on-screen marking: *scoris 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 scoris and mark the **required number** of practice responses ("scripts") and the **required number** of 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 scoris 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 scoris messaging system.

5. Work crossed out:

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

- if there is nothing written at all in the answer space

- OR if there is a comment which does not in any way relate to the question (e.g. 'can't do', 'don't know')

- OR if there is a mark (e.g. a dash, a question mark) which isn't an attempt at the question.

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

8. The scoris **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 scoris 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, concentrating on features that make it a stronger or weaker answer using the indicative scientific content as guidance. The indicative scientific content 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 science content of the answer, first decide which set of level descriptors, Level 1, Level 2 or Level 3, **best** describes the overall quality of the answer using the guidelines described in the level descriptors in the mark scheme.

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 science content determines the level.**
- **The communication statement determines the mark within a level.**

Level of response questions on this paper are **2(d)** and **6(a)**.

11. **Annotations**

Annotation	Meaning
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.

Question			Answer	Marks	Guidance
1	a		opsonins ✓ phagosome ✓ lysosomes ✓	3	
	b	i	A *because* nuclei (of white blood cells) are lobed ✓	1	Mark is for the explanation
		ii	(x) 1300 ✓✓	2	If answer is incorrect **ALLOW** 1 mark for evidence of 0.02 (m) / 0.000015 (m) or equivalent numbers in alternate units
2	a	i	action potential / nervous impulse , in sensory neurone ✓ synapse / described ✓ relay / intermediate , neurone ✓ (nervous impulse in) motor neurone , passes to / AW , effector / muscle ✓	3 max	
		ii	*idea of* maintains balance / efficiency of movement ✓	1	
		iii	kinetic / movement , energy converted ✓ to , electrical energy / action potential ✓ *idea of* movement of statolith moves sensory hairs ✓ membrane of sensory hairs depolarises ✓	3 max	
	b		*Support is weak because* *idea that* clasification based on phylogeny ✓ statocysts could , have evolved on more than one occasion / be an example of convergent evolution ✓	2	
	c	i	motor neurone ✓	1	
		ii	saltatory conduction ✓ increases speed of , impulse / action potential , transmission ✓	1 max	

Question			Answer	Marks	Guidance
			insulates axon ✓		

	d		***Please refer to the marking instructions on page 4 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 comprehensive description of the differences between the two action potentials with some explanations for the differences. *There is a well-developed line of reasoning, which is clear and logically-structured and uses scientific terminology at an appropriate level. All the information presented is relevant and forms a continuous narrative.* **Level 2 (3-4 marks)** A good description of some of the differences between the two action potentials with limited explanation. *There is a line of reasoning presented with some structure and use of appropriate scientific language. The information presented is mostly relevant.* **Level 1 (1-2 marks)** A limited description of some of the differences between the two action potentials with an attempt at some explanation.	6	**Indicative scientific points may include:** *Descriptions* Dopamine neurone: • Is less polarised / has a less negative resting potential • Depolarisation shows less change • Action potential peak is lower/less positive • No clear refractory period • Action potential duration is longer • Repolarisation is slower *Explanations* Resting potential set up by: • Different type/number of sodium/potassium pumps in neuron membrane

Question			Answer	Marks	Guidance
			The information is communicated with only a little structure. Communication is hampered by the inappropriate use of technical terms. **0 marks** No response or no response worthy of credit.		• Different type/number of potassium ion channels • Steeper sodium ion gradient in the Purkyne neurone • Steeper potassium ion gradient in the dopamine neurone • Different type/more voltage-gated sodium and potassium ion channels in the Purkyne neurone
3	a		2.4 (SA) : 1.0 (volume) ✓✓✓	3	If correct answer not given **AWARD 1 mark** for calculating surface area = 19.625 **AWARD 1 mark** for calculating volume = 8.177
	b	i	surface area: volume ratio too small ✓ *idea of* diffusion from outer surface not sufficient ✓ (transport system) ensures molecules / nutrients / sugars / water , reach all tissues ✓ (allows) high metabolic rate ✓	2 max	
		ii		3	

Cell	Location	Example of a substance transported	Contains chloroplasts? (✓ or X)	
Guard cell	Leaf	carbon dioxide	✓	✓
Companion cell	Vascular tissue / phloem / next to sieve tube	Sucrose	X	✓

Question			Answer	Marks	Guidance
			<table><tr><td>Root hair cell</td><td>roots</td><td>Nitrate ions</td><td>X</td><td>✓</td></tr></table>		
	c		*idea that* at low light levels, photosynthetic rate is greater when light is shone on the upper surface ✓ palisade cells are , nearer / AW , upper surface ✓ *idea that* chloroplasts also present in cells at lower surface ✓ (little difference because) leaf is thin ✓ *idea that* light can pass through the leaf from the lower surface to reach palisade cells ✓ no difference (in rate) at high(er) light intensity ✓ (at high light intensity) carbon dioxide (concentration) is limiting factor / number of stomata limit carbon dioxide uptake ✓ figures to support, with units ✓	**4 max**	
	d		*idea that* more than one leaf should be tested ✓ in case the leaf used was atypical ✓ sucrose is a non-reducing sugar ✓ if method is intended to measure sucrose then boiling with HCl in necessary ✓ other sugars / glucose , also present in leaf ✓ chlorophyll / other pigments , in leaf ✓ green / colour , of pigments will interfere with colorimetry results ✓ blue filter is the wrong type of filter / should have used red filter ✓	**4 max**	
4	a		the type of diabetes (being treated) ✓	**3 max**	

Question			Answer	Marks	Guidance
			age (of patients) ✓		
			gender (of patients) ✓		
			idea of how the improvement was measured ✓		**ACCEPT** extent of improvement / AW
			idea of when the improvement was measured ✓		
	b	**i**	(pancreatic) beta / β , cells ✓	**1**	
		ii	*type I because*:	**2 max**	
			*(*type I) results from a shortage of beta cells (in the pancreas) ✓		
			idea that stem cell therapy might increase insulin production ✓		
			idea that type II diabetes usually results from insulin resistance (rather than a lack of insulin) ✓		
	c	**i**	0.93 ✓✓✓	**3**	**ACCEPT** calculator value of 0.928977933 and any correct rounding Apply **ECF** throughout Max 2 if answer is incorrect **AWARD 1 mark** for calculating the mean (9.26) **AWARD 1 mark** for 5 correct subtractions (0.56, 0.56, 0.26, 0.26, 1.64) **AWARD 1 mark** for summation (Σ = 3.452) **AWARD 1 mark** for dividing by 4 (/n-1)
		ii	*standard deviation is:*	**2**	**ora throughout**
			less affected by the , 10.9 value / outlier / anomaly ✓		
			idea of takes into account every value in the data ✓		
		iii	*idea of* blood glucose measured using the same method ✓	**2 max**	**ALLOW** blood glucose measured the same number of times

Question			Answer	Marks	Guidance
			blood glucose measured at the same time , of day / after eating ✓		**ACCEPT** measurement of baseline blood glucose levels (prior to therapy)
			idea of taking into account the patients' medical history / age / sex ✓		
			idea of correct use of statistical test ✓		e.g. unpaired t-test
5	a	i	G_1 / first growth (phase) ✓	3	
			G_2 / second growth **or** end of / AW , S / synthesis ✓		
			G_1 / first growth (phase) ✓		
		ii	1.3×10^{11} ✓	1	
		iii	(red blood cells) do not contain DNA ✓	1	
	b	i	temperature ✓	2 max	
			enzyme concentration ✓		
			substrate / carbon dioxide , concentration ✓		
		ii	*idea of* H^+ reacts with haemoglobin to form haemoglobinic acid, which lowers pH (back to 7.4) ✓	3	
			idea of H^+ reacts with HCO_3^- to form H_2CO_3, which lowers pH (back to 7.4) ✓		
			idea of H_2CO_3 dissociates to form H^+ and HCO_3^-, which raises pH (back to 7.4) ✓		
6	a		*Please refer to the marking instructions on page 4 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.*		

Question			Answer	Marks	Guidance
			• *The science content determines the level.* • *The Communication Statement determines the mark within a level.*		
			Level 3 (5-6 marks) Describes the process in detail, with no significant errors. *There is a well-developed line of reasoning, which is clear and logically-structured and uses scientific terminology at an appropriate level. All the information presented is relevant and forms a continuous narrative.* **Level 2 (3-4 marks)** Describes some details of the process, with only minor errors. *There is a line of reasoning presented with some structure and use of appropriate scientific language. The information presented is mostly relevant.* **Level 1 (1-2 marks)** Describes aspects of the process, but with significant omissions or errors. *The information is communicated with only a little structure. Communication is hampered by the inappropriate use of technical terms.* **0 marks** No response or no response worthy of credit.	6	**Indicative scientific points may include:** • method for gene extraction from the bacterium (e.g. conversion of mRNA to cDNA with reverse transcriptase, or removal of gene with restriction enzymes) • use of appropriate vector (e.g. *Ti* plasmid of *Agrobacterium tumefaciens*) • electroporation • use of DNA ligase • reference to marker genes and their purpose • electrofusion
	b		base sequence in genes is unchanged ✓ *idea that* mRNA is inhibited, therefore translation does not occur ✓ gene is not expressed ✓	2 max	
			Total	70	