OCR
Oxford Cambridge and RSA

…day June 20XX –Morning/Afternoon

A Level Biology A
H420/03 Unified biology

SAMPLE MARK SCHEME

Duration: 1 hour 30 minutes

MAXIMUM MARK 70

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This document consists of 20 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.

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5. Work crossed out:

   a. where a candidate crosses out an answer and provides an alternative response, the crossed out response is not marked and gains no marks

   b. if a candidate crosses out an answer to a whole question and makes no second attempt, and if the inclusion of the answer does not cause a rubric infringement, the assessor should attempt to mark the crossed out answer and award marks appropriately.

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.

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10. For answers marked by levels of response:

- Read through the whole answer from start to finish.
- Decide the level that **best fits** the answer – match the quality of the answer to the closest level descriptor.
- To select a mark within the level, consider the following:

  Higher mark: A good match to main point, including communication statement (in italics), award the higher mark in the level
  Lower mark: Some aspects of level matches but key omissions in main point or communication statement (in italics), award lower mark in the level.

Level of response questions on this paper are **1(g)** and **4(c)**.

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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

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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.

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Question			Answer	Marks	Guidance
1	(a)		*idea that* the oxygen will leak from the connectors so reduce the gas movement ✓ **or** oxygen uptake may not be a good representation of respiration rate in germinating seedlings ✓ **or** a small volume of gas is being measured in the capillary ✓ **or** measurements only taken every 30 seconds ✓ **or** difficult to read the meniscus (may be subjective) ✓	1	**ALLOW** seal not air tight so will not prevent gas escaping during the experiment **or** *the idea* that gas leakage is a problem and needs to be prevented. **ALLOW** the respiratory substrate stored in the seed will affect the oxygen needed **or** the idea that if photosynthesis has begun oxygen uptake will be disrupted. **ALLOW** need to record the maximum volume of gas taken up during the experiment **ALLOW** alternative wording e.g. 'more frequent readings are needed'.

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Question	Answer	Marks	Guidance
(b)	*Variable* the mass of the seeds is not given ✓ *Improvement* take the mass of the seedlings at the start ✓ *Variable* the volume / mass of soda lime is not specified ✓ *Improvement* use a known mass of soda lime each time ✓ *Variable* the size of the syringe is not given ✓ *Improvement* use a 2 cm^3 syringe ✓ *Variable* the capillary tube internal diameter is not given ✓ *Improvement* use a capillary tube of length 20 cm and a 1 mm internal diameter ✓ *Variable* temperature not controlled ✓ *Improvement* allowing apparatus to**,** stabilise / equilibrate to temperature**,** before taking readings ✓ *AVP* ✓	**2**	The control method must be suitable, and be directly linked to the variable. **ALLOW** suggested mass values. **ALLOW** suggested mass values. **ALLOW** alternative size if suitable for the activity. **ALLOW** *idea that* only a linear measurement is obtained not a volume. **ALLOW** alternative size if suitable for the activity. **ALLOW** use of a water bath and thermometer to stabilise the temperature. Must be explicit to provide valid data e.g. no scale on the capillary tube, no timing, no details of how to take the readings. Details must be workable and suitable to provide valid results e.g. scale on the capillary tube, use of timing devices, description of how to take readings from the scale etc.

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Question			Answer	Marks	Guidance
	(c)		dipped into a small beaker and allowed to run ✓	1	**ALLOW** suitable details of how the red fluid is added.
	(d)		*Explanation* it is more than 10% from the mean **or** it is different from the other data at 60 seconds **or** it does not follow trend for the times for replicate 3 ✓ *Action* anomaly should be identified and excluded from processing **or** anomaly must be identified but could be included in calculations **or** repetition to obtain another reading ✓	2	**ALLOW** 'it is out of line' **ALLOW** 'it is out of line'
	(e)		0.36 mm s^{-1} ✓	1	Rate and units required for the mark.
	(f)	(i)	the internal diameter of the capillary tube ✓	1	
		(ii)	the mass of the bean seeds ✓	1	

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Question	Answer	Marks	Guidance
(g)*	**Level 3 (5–6 marks)** Describes a clear and detailed experiment that has been effectively adapted for use with chosen invertebrate to allow for the comparison of the rate of respiration with that of mung beans. *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)** Describes an experiment to compare the rate of respiration of chosen invertebrate with mung beans but there is insufficient detail of the procedure to allow a valid comparison. *There is a line of reasoning presented with some structure. The information presented is in the most-part relevant and supported by some evidence.* **Level 1 (1–2 marks)** An attempt to describe an experiment to investigate the respiratory rate of an invertebrate but little comparison with mung beans. If results or conclusion suggested, likely to be muddled or inaccurate. *The information is basic and communicated in an unstructured way. The information is supported by limited evidence and the relationship to the evidence may not be clear.* **0 marks** No response or no response worthy of credit.	6	**Relevant points include:** **experiment** • mass of invertebrate and mass of beans the same • safe and ethical use of invertebrates e.g. add screen so that animal(s) cannot touch the muslin bag • bigger syringe needed (5-10 cm^3) • keep temperature constant / same for both assays • keep light constant / same for both assays • use same mass of soda lime in both assays • measuring distance moved by coloured, red liquid at regular time intervals • repeat experiments. **results and conclusions** • invertebrates rate of respiration is expected to be higher than the rate of respiration of the beans *because* • invertebrates are moving around • metabolic processes require energy / generate heat.
	Total	**15**	

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Question			Answer	Marks	Guidance
2	(a)	(i)	DNA / RNA / nucleic acid ✓	1	
		(ii)	lower / reduce / make more negative ✓	1	
		(iii)	*two from* **1** strip is impervious to**,** water / solutions ✓ **2** forces water / solutions**,** to pass through**,** plasma / cell surface, membrane ✓ **3** phospholipid (bilayer)**,** repels / AW**,** ions / charged particles ✓	2	**1** **IGNORE** ref to suberin. **3** The idea of charge / ion impermeability is wanted here. **ALLOW** answer in terms of ions / charged particles needing channels because phospholipid bilayer does not allow charged particles through.
	(b)	(i)	3.75 ✓✓	2	**ALLOW** 3,750 μm or 0.375 cm for **one** mark. **ALLOW** 1 mark for correct working e.g. 3 x 1250
		(ii)	(with light microscope) no further resolution (at ×1250) ✓	1	**IGNORE** ref to further detail, as implied in question. **ALLOW** ref to resolution not the same as magnification.
		(iii)	*two from* stay keep indoors / increase ventilation / wear masks ✓ measures to, exclude / not attract / kill**,** rats/fleas ✓ strict / immediate quarantine for persons with symptoms ✓	2	**ALLOW** (longer term) measures to reduce overcrowding.
	(c)	(i)	(stimulates) cell**,** elongation / division ✓	1	**IGNORE** ref to action outside the cell, or to unqualified "growth" etc.

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Question			Answer	Marks	Guidance
		(ii)	*three from* **1** reduced / no**,** proton pumping / proton motive force / chemiosmosis ✓ **2** photophosphorylation stops ✓ **3** less / no**,** ATP produced ✓ **4** less / no**,** reduced NADP produced ✓ **5** no**,** Calvin cycle / carbon fixation / light independent stage ✓ *plus* **6** no**,** TP / (hexose) sugars**,** made ✓ **7** no respiratory substrate / respiration ceases ✓	**5**	**3 ALLOW** cessation of vital process that needs ATP **IF** ATP mentioned but **IGNORE** respiration (as credited in mp 7).
			Total	**15**	

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Question			Answer	Marks	Guidance
3	(a)	(i)	t = 13.61 ✓ ✓	2	**ALLOW** correct working for 1 mark. $\frac{[31.3 - 20.0]}{\sqrt{\frac{4.1^2}{50} + \frac{4.2^2}{50}}} = \frac{11.3}{\sqrt{\frac{16.81}{50} + \frac{17.64}{50}}} = \frac{11.3}{\sqrt{0.3362 + 0.3528}} = \frac{11.3}{\sqrt{0.689}}$ $= 11.3 / 0.830 = 13.61$
		(ii)	probability is highly significant, calculated t value is greater than the critical value at 0.001 / there is a chance (probability) of below 0.001 that the differences in the shell height seen can be due to chance **and** the null hypothesis can be rejected ✓	1	
	(b)		histogram correctly plotted for the values ✓ two sets of data distinguished by a key or other suitable method to identify them ✓ *x* axis labelled 'height (mm)' **and** *y* axis labelled 'number of dog whelks / *Nucella lapillus* / shells / class ' ✓ makes good use of the graph paper **and** both axes are correctly scaled with ascending equidistant intervals ✓	4	**DO NOT ALLOW** a bar chart or a line graph as neither would represent the data correctly. **ALLOW** a correlation scattergram. **ALLOW** '% of the sample' for the *y* axis if this has been calculated.

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Question			Answer	Marks	Guidance
	(c)		three from positive correlation between the height of the whelk shell and the type of the shore ✓ correct calculation of the correlation coefficient ✓ (histogram / data, indicates that) shore exposure has an impact on height ✓ Nucella show adaptation to harsher wave action ✓ shells measured may not all be exposed to wave action ✓	3	**ALLOW** correlation is strong or a reference to relationship such as:- taller shell height and sheltered shore or shorter shell height and exposed shore**.** **ALLOW** little overlap on the histogram bars. **ALLOW** the idea that the differences may be due to direct wave action or adaptation.
	(d)		no detail for the random sampling technique was given / *Nucella* from the whole population may not have been sampled ✓ **and** use(two) metre tapes to set out a grid and use randomly generated coordinates ✓ no measuring instrument specified ✓ **and** use vernier callipers with a precision of more than 0.5 mm ✓ incorrect identification of *Nucella* / several types of shelled molluscs that are similar to *Nucella* ✓ **and** use a sea shore key to correctly identify the whelk ✓ classification of the shore as sheltered or exposed was subjective ✓ **and** use an approved shore classification (such as Ballantine's) ✓	2	**Limitation and improvement must be linked for 2 marks.**

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Question	Answer	Marks	Guidance
(e)	*one from* increase the number of, *Nucella* used in the data collection / samples ✓ replicate / repeat, the entire experiment again ✓	1	**ALLOW** a value given such as increasing number to 100 from each shore. **ALLOW** an understanding of the *idea* that the procedure has only been carried out once for each shore.
(f)	*not valid* a small percentage of N*ucella* sampled and some areas not sampled at all which would lead to skewed data ✓ human interpretation of the measurement causes accuracy of the data to be questioned ✓ genetic variations or sub species not taken into account ✓ *valid* random sampling techniques mean no bias in collection ✓ 100 *Nucella* sampled in total (50 in each area) so large sample size ✓ precise instructions for consistent measurement of shell height ✓	3	**ALLOW** reverse arguments made. *idea that* conclusion will be distorted
	Total	16	

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Question			Answer	Marks	Guidance
4	(a)	(i)	it (only) respires in the absence of oxygen ✓	1	Must imply that the absence of oxygen is the preferred/essential condition. e.g. 'can respire in the absence of oxygen' does not really imply this, as this statement also applies to aerobic organisms.
		(ii)	it hydrolyses a peptide bond between two amino acids (residues) which are joined by a disulfide bond ✓	1	
	(b)	(i)	amount that is required to kill the 50th mouse when they are arranged in order of lethal dose ✓	1	
		(ii)	4.25 (μg) ✓ ✓	2	**ALLOW** 1 mark for correct working using, least lethal dose is 50 ng kg^{-1} 50 × 85 = 4250 ng /1000 = 4.25 μg
		(iii)	*two from* intercostal muscles are / diaphragm muscle is**,** weakened / paralysed ✓ *idea that* ventilation and oxygenation of blood is**,** reduced / compromised ✓ cells / (named) organ(s)**,** cannot**,** obtain oxygen for respiration/ carry out aerobic respiration ✓	2	
	(c)*		**Level 3 (5–6 marks)** A full explanation of why strains are immunologically distinct **AND** a description of more than one method of action of the immune system. *There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.*	6	**Relevant points include:** **immunologically distinct** • toxins produced by each strain will be (slightly) different • each (botulinum) toxin will have different **,** 3D shape / amino acid sequence / DNA nucleotide coding sequence • toxin **,** acts as / is **,** antigen • immune response determined by shape of antigen • different compounds will have different shapes

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Question			Answer	Marks	Guidance
			Level 2 (3–4 marks) A full explanation of why strains are immunologically distinct **AND** an attempt to describe a method of action of the immune system. **OR** A description of more than one method of action of the immune system **AND** an attempt to explain why strains are immunologically distinct. *There is a line of reasoning presented with some structure. The information presented is in the most-part relevant and supported by some evidence.* **Level 1 (1–2 marks)** An attempt to explain why strains are immunologically distinct **AND** an attempt to describe a method of action of the immune system. *The information is basic and communicated in an unstructured way. The information is supported by limited evidence and the relationship to the evidence may not be clear.* **0 marks** No response or no response worthy of credit.		**immune system** • antigen presenting cells ingest antigen and display antigen on their surfaces • interaction between APCs and T-helper cells causes production of interleukins • B cells activated by T-helper cells • clonal selection and clonal expansion • B cells differentiate into plasma cells • plasma cells produce **,** antibodies / immunoglobulins • by protein synthesis antibodies bind to and neutralise toxins.
			Total	**13**	

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Question			Answer	Marks	Guidance
5	(a)	(i)	fossils in, known-age / Jurassic, strata / rocks ✓	1	
		(ii)	DNA / cytochrome c ✓	1	
	(b)	(i)	carbon dioxide diffuses down concentration gradient out of the respiring cell ✓ carried through body from cell (to tracheoles) by blood passing out via tracheoles / trachea / spiracles ✓ respiration generates heat ✓ hot gases expand and are less dense so rise up by convection through the mound to vents at mound-top ✓	4	
	(b)	(ii)	*shape,* large or increased surface area to volume ratio ✓ smallest area exposed to greatest heat ✓	2	Response **must** be linked to context of avoiding overheating / needing to get rid of heat.
	(c)		β / beta glucose ✓	1	
	(d)		*argument for* important, (N or C) recyclers / saprotrophs ✓ *argument against* not a predator ✓ large in abundance/ biomass (so effect on environment not disproportionate) ✓	2	
			Total	11	

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