OCR
Oxford Cambridge and RSA

day June 20XX – Morning/Afternoon

A Level Biology B (Advancing Biology)

H422/01 Fundamentals of biology

SAMPLE MARK SCHEME

Duration: 2 hours 15 minutes

MAXIMUM MARK 110

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.

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.

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 **32(c) and 36(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.

SECTION A

Question	Answer	Marks	Guidance
1	C	1	
2	D	1	
3	A	1	
4	A	1	
5	C	1	
6	B	1	
7	B	1	
8	C	1	
9	B	1	
10	C	1	
11	A	1	
12	C	1	
13	B	1	
14	C	1	
15	D	1	
16	D	1	
17	D	1	
18	B	1	
19	D	1	
20	C	1	
21	B	1	
22	C	1	
23	C	1	
24	A	1	
25	D	1	
26	C	1	
27	C	1	
28	D	1	
29	D	1	
30	B	1	
	Total	**30**	

SECTION B

Question			Answer	Marks	Guidance
31	(a)	(i)	**Any 2 from:** *idea that* Gram stain is removed by, ethanol / AW, rinses ✓ (due to) peptidoglycan (layer) being thin ✓ *idea that* bacteria would not be visible without the counter stain ✓	2	**ALLOW** alcohol / ethyl alcohol / acetone / solvent instead of ethanol **IGNORE** reference to the outer membrane A statement such as 'the Gram stain is washed out of the peptidoglycan within the alcohol wall because the layer is thin' = **2 marks**
		(ii)	justification on cost grounds / justification on stain safety grounds ✓ *idea that* (these) pathogens would not be handled in a school lab / only allowed to handle non-pathogenic bacteria in school ✓	2	e.g. 'it is cheaper than other counter stains', 'it is less toxic than other counter stains'
	(b)	(i)	**Any 2 from:** (Gram negative bacteria have) outer, membrane / lipopolysaccharide layer ✓ *idea that* this is impermeable to penicillin ✓ *idea that* penicillin cannot reach, murein / peptidoglycan layer ✓	2	
		(ii)	animal cells do not have a cell wall **AND** cell wall in plants is, cellulose / not peptidoglycan ✓	1	Both needed for one mark
			Total	7	

Question			Answer	Marks	Guidance
32	(a)		**Any 1 from:** by apoplast and symplast pathways ✓ in xylem / phloem ✓ by, diffusion / active transport ✓	1	**ALLOW** by mass flow / translocation
	(b)		0.51 ✓ ✓	2	**ALLOW** unrounded answer for 1 mark (0.509902 etc.)
	(c)*		**Level 3 (5–6 marks)** A detailed conclusion of both hormones in germination including detailed and relevant comments on the experimental design and the strength of evidence as shown by the data. *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 conclusion on the roles of both hormones in germination including some relevant information on the experimental design using evidence from the data. *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)** A limited conclusion on the role of at least one hormone with some comment on either the experimental design or using supporting data. *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.*	6	Examples of relevant material: • GA promotes germination • GA produced by embryo & acts on aleurone layer • Aleurone layer present in the seed half without embryo • Enzyme is amylase which breaks down the starch in the endosperm • Enzyme diffuses into the agar plate • GA has largest clear zones • ABA inhibits germination • ABA zones smaller than control plates • Smaller GA zone in the presence of ABA • Sample size is limited • Ref to overlap of data or closeness of means between GA and control reducing confidence in conclusion • Ref to anomalous results • Ref to improvements in design such as more repeats • Ref to use of a named statistical test to test strength of the conclusion (if more repeats are carried out) • Comment on ABA preventing germination at the wrong time of year.

Question			Answer	Marks	Guidance
			0 marks No response or no response worthy of credit.		
	(d)		*Treatment* vernalisation / described ✓ **OR** period of short day length / AW ✓ *explanation* *idea that* no flowering will occur in winter cereals without, vernalisation / a short day length ✓ **OR** seeds are from pollination and fertilisation in (barley) flowers ✓	**2**	**ALLOW** exposure to a period of cold or low temperatures
			Total	**11**	

Question			Answer	Marks	Guidance
33	(a)	(i)	*Pathway*: Krebs cycle / link reaction ✓ *Location*: matrix, of mitochondria ✓	2	**DO NOT ALLOW** 'matrix' unqualified
		(ii)	Pathways A and B ✓ substrate level phosphorylation ✓	2	
	(b)	(i)	(limited blood supply) reduced oxygen available ✓ ref to, increased / more, anaerobic respiration ✓	2	**IGNORE** reference to glucose **DO NOT ALLOW** anaerobic respiration alone - need the idea of more anaerobic respiration
		(ii)	*idea that* (muscle) cell surface / plasma, membrane is, damaged / AW ✓ *idea that* LDH, diffuses, out of cytoplasm / into blood plasma ✓	2	
	(c)	(i)	troponin, binds to / AW, tropomyosin ✓ myosin binding site is blocked (by tropomysin) / *idea that* myosin is prevented from binding to actin ✓	2	

Question			Answer	Marks	Guidance
		(ii)	comparison of median values in support of a statement / comparison of interquartile range values in support of a statement ✓ *plus any two from the following marks up to a maximum of 3* *idea that* (very) high concentrations are **only** seen where a heart attack is confirmed / heart attack subject have significantly higher median values than other groups ✓ *idea that* bottom of interquartile range for confirmed heart attacks is significantly higher than other groups / top of interquartile range of other groups is significantly below bottom of range for group with heart attack ✓ *idea that* unlikely to get 'false positives' or 'false negatives' ✓ *idea that* sample sizes are very different in the three groups and could affect the validity of the data ✓	**3**	**DO NOT ALLOW** a simple description of the concentrations for each group - look for a clear statement that the high levels are specific to a heart attack or that they are significantly higher for this group.
			Total	**13**	

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>34</td><td>(a)</td><td></td><td>(chlorophyll molecules) in thylakoid membrane ✓
Y / hydrocarbon chain, in the (phospholipid) bilayer of thylakoid membranes ✓
X / head, at the surface of the thylakoid membrane ✓</td><td>3</td><td>Thylakoid membrane must be stated in at least one of the mark points but can be implied in the second

ALLOW a description e.g. in the phosphate head region</td></tr>
<tr><td></td><td>(b)</td><td>(i)</td><td>**Any 1 from:**
idea that spot of extract needs to be (very) concentrated / AW ✓
allow one spot to dry before adding another ✓
sufficient length of chromatography paper ✓
AVP ✓</td><td>1</td><td>**ALLOW** a description e.g. 'put several spots of extract'
ALLOW answers which refer to different apparatus as this may have been Centre dependent
ALLOW values inserted into table</td></tr>
<tr><td></td><td></td><td>(ii)</td><td>Chlorophyll B = 62 mm ✓

Chlorophyll A = 91 mm ✓</td><td>2</td><td>0.58 x 107 = 62.06 mm

0.85 x 107 = 90.95 mm

Max 1 if units are not given OR figures not given as whole numbers</td></tr>
<tr><td></td><td></td><td>(iii)</td><td>*idea that* Chlorophyll A is less soluble than xanthophyll but more soluble than chlorophyll B / AW ✓

Rf data quote in support ✓</td><td>2</td><td>**ALLOW** answers where comparative statements are made about the three pigments

DO NOT ALLOW if units are given for the Rf value as this is a ratio</td></tr>
<tr><td></td><td>(c)</td><td>(i)</td><td><table><tr><th>Description</th><th>Name</th><th>Letter</th></tr><tr><td></td><td>Abomasum</td><td>U</td></tr><tr><td></td><td>Reticulum</td><td>S</td></tr></table>✓
✓</td><td>2</td><td>One mark for each correct row

ALLOW rumen and V</td></tr>
</table>

Question			Answer	Marks	Guidance
	(c)	(ii)	*idea that* microbes in rumen are a protein source ✓ (microbial protein) hydrolysed into amino acids by protease enzymes ✓	2	
		(iii)	(amino acids are) deaminated / AW ✓	1	
			Total	13	

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>35</td><td>(a)</td><td>(i)</td><td>conclusion
a higher BMI increases sperm concentration and quality ✓

data in support
concentrations correctly calculated ✓

correct unit given ✓

data used with units to support statement on quality ✓</td><td>4</td><td>ALLOW comments referring to a small difference

BMI 20 - 25 342 ÷ 2.6 = 131.5
AND
BMI >25 413.1 ÷ 3 = 137.7

10^6 cm^{-3} OR 10^6 / cm^3

<table><tr><th>Group</th><th>BMI</th><th>Total progressively motile sperm (10^6)</th><th>Concentration 10^6 cm^{-3}</th></tr><tr><td>A</td><td>20-25</td><td>74.2</td><td>131.5</td></tr><tr><td>B</td><td>>25</td><td>110.4</td><td>137.7</td></tr></table></td></tr>
<tr><td></td><td></td><td>(ii)</td><td>Any 2 from:
Idea that
BMI >25 needs to be subdivided ✓
age in both groups should be same ✓
larger sample size ✓
carry out study over more generations of men / time span of study ✓

named factor should be controlled ✓✓</td><td>2</td><td>e.g. smoking, fitness level, exposure to STDs or traumatic damage</td></tr>
</table>

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td></td><td>(b)</td><td></td><td>
<table>
<tr><th>Statement</th><th>Letter(s)</th></tr>
<tr><td>If this is enlarged it can lead to difficulty in starting to urinate or emptying a full bladder.</td><td>B ✓</td></tr>
<tr><td>Changes in this structure mean sperm can fail to become motile.</td><td>E ✓</td></tr>
<tr><td>Changes in this structure can lead to chromosome abnormalities in sperm.</td><td>F ✓</td></tr>
<tr><td>Changes in tissues here can lead to erectile dysfunction.</td><td>G ✓</td></tr>
</table>
</td><td>4</td><td></td></tr>
<tr><td></td><td>(c)</td><td>(i)</td><td>Any 2 from:
idea that nitrogen monoxide must be, lipid soluble / hydrophobic ✓
(explanation) it diffuses / AW, through the cell surface membrane ✓
binds to, receptor / AW, inside the cell ✓
idea that second messenger is cyclic GMP rather than cyclic AMP ✓</td><td>2</td><td></td></tr>
<tr><td></td><td></td><td>(ii)</td><td>Any 3 from:
Viagra acts as a competitive inhibitor (of PDE-5) ✓

idea that cyclic GMP, is not broken down / lasts longer (in cells) ✓
idea that blood vessels dilate, more / for longer ✓
idea that erection maintained for longer ✓</td><td>3</td><td>ALLOW 'Viagra forms an enzyme inhibitor complex' OR description 'prevents the formation of ESC'</td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>15</td><td></td></tr>
</table>

Question			Answer	Marks	Guidance
36	(a)*		**Level 3 (5–6 marks)** A detailed description, including at least one statement from each section in the correct sequence (from 1, 2 and then 3), showing knowledge and understanding of the production of mRNA is given and all steps are in the correct order. *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)** Description includes at least two correct statements in the correct sequence but there is some repetition or irrelevant information (e.g. about translation). *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)** One correct statement is made which include points from any of the sections shown in the guidance. *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	**Sections indicate possible scientific points and the expected sequence of the answer.** **Section 1** • RNA polymerase binds to the DNA • reference to the promoter region (for binding) • reference to transcription factors **OR** DNA unwinding (by DNA helicase) **Section 2** • reference to RNA, nucleotides / bases, pairing with bases on, template strand • reference to complementary base pairing / numbers of hydrogen bonds forming • correct reference to base pairings DNA RNA A U T A C G G C • reference to RNA polymerase, catalysing / AW, formation of, phosphodiester bonds / AW **Section 3** • reference to termination / stop sequence • reference to DNA rewinding / RNA polymerase leaving the DNA strand reference to removal of introns from primary RNA / formation of, mature / messenger RNA

Question			Answer	Marks	Guidance
	(b)	(i)	*ACGGGAAGGGCCCGAGCACGGA* **UGCCCUUCCCGGGCUCGUGCCU** ✓	1	
		(ii)	hydrolysis ✓	1	**IGNORE** 'cleavage'
		(iii)	**Any 3 from:** (activated) RISC, cleaves / AW, viral mRNA ✓ no viral proteins made ✓ no, viral particles / AW, assembled ✓ *idea that* no new cells are infected ✓	3	**IGNORE** 'virus cannot spread' as this is given in the question
			Total	11	

Question			Answer	Marks	Guidance
37	(a)		m - aorta ✓ n - pulmonary artery ✓	2	
	(b)	(i)	wall must be thinner than right ventricle wall ✓ figures in support ✓	2	**ALLOW** manipulated figures e.g. right ventricle pressure is 6 x higher, ratio is 3 : 0.5 or 6 : 1
		(ii)	ratio = 5 : 1 ✓	1	**ALLOW** 5.3 : 1
		(iii)	1.5 mm ✓✓	2	Award 1 mark if units are incorrect or omitted. If an alternative answer is given with units and to one decimal place, **ALLOW** 2 marks for 1 divided by ratio obtained from (ii) multiplied by 8 as error carried forward
	(c)	(i)	Time between them gets less / AW ✓	1	
		(ii)	**Any 2 from:** Minimum time for 1 beat = 0.3 seconds (distance from first P to T wave) ✓ 60 ÷ 0.3 ✓ Answer = 200 bpm / beats per minute ✓	2	
			Total	10	