



Oxford Cambridge and RSA

Practice paper – Set 1

A Level Biology A

H420/02 Biological diversity

MARK SCHEME

Duration: 2 hours 15 minutes

MAXIMUM MARK 100

FINAL

This document consists of 17 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:
- where a candidate crosses out an answer and provides an alternative response, the crossed out response is not marked and gains no marks
 - 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, 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 **18(c)** and **19(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	Mark	Guidance
1	C ✓	1	
2	C ✓	1	
3	A ✓	1	
4	C ✓	1	
5	B ✓	1	
6	B ✓	1	
7	B ✓	1	
8	C ✓	1	
9	D ✓	1	
10	B ✓	1	
11	D ✓	1	
12	A ✓	1	
13	C ✓	1	
14	B ✓	1	
15	C ✓	1	
	Total	15	

Question			Answer	Mark	Guidance
16	(a)	(i)	<p>some triplets , code for same amino acid / are degenerate ✓</p> <p>(so) the amino acid sequence is not altered ✓</p> <p>some alternative amino acids will not alter the shape of the protein ✓</p> <p>mutation occurs in intron ✓</p>	2	
		(ii)	<p>an insertion / deletion will cause frame shift ✓</p> <p>all triplets downstream will be different ✓</p> <p>the protein will have a different sequence of amino acids (downstream of the mutation) ✓</p> <p>the, tertiary structure / three dimensional shape will be different ✓</p>	2	<p>ALLOW stop codon / non sense mutation will cause truncation</p> <p>ALLOW downstream truncation</p>
	(b)	(i)	<u>promoter</u> ✓	1	
		(ii)	<p>hormone enters cell and binds to a transcription factor ✓</p> <p>transcription factor activated ✓</p> <p>binds to, site A / promoter region ✓</p> <p>RNA polymerase able to bind ✓</p>	3	
	(c)		<p>hox gene does not produce transcription factor / transcription factor not activated ✓</p> <p>molecules signalling apoptosis not produced ✓</p> <p>apoptosis (to separate fingers) does not occur ✓</p>	3	

Question			Answer	Mark	Guidance
16	(d)		primary mRNA is modified ✓ removal of introns to produce mature mRNA ✓ Alternative splicing can produce different versions of mRNA ✓ protein must be activated by cAMP / phosphorylation ✓ binding (of cAMP) alters shape of protein ✓	3	
			Total	14	

Question			Answer	Mark	Guidance
17	(a)		B, D, C ✓✓	2	One mark for D after B and one for C after D
	(b)		6 ✓✓	2	Correct response = 2 marks If response incorrect ALLOW one mark for 600 nucleotides / bases ALLOW one mark for idea of one error every 100 nucleotides
	(c)		ACCTGCCCTGG ✓	1	
	(d)	(i)	1/8 or 0.125 ✓✓	2	Correct response = 2 marks If response incorrect ALLOW one mark for working e.g. 3/24 ALLOW 12.5%

		(ii)	Sanger / chain termination technique ✓ Only 5 errors per 100 000 nucleotides compared to, 50 in Roche pyrosequencing / 500 in SOLiD / 1000 in Helicos ✓	2	
		(iii)	base sequence of normal allele and (known) alternatives held (in database) ✓ computational analysis allows rapid comparison of sequences with newly sequenced allele ✓ amino acid sequence / protein structures, also held (in database) ✓ <i>idea of</i> computer modelling of new protein structure from base sequence ✓	2	
	(e)		in most people, the genome is very similar / most genes the same ✓ using coding sequences would not provide unique profiles ✓ (parts of) non-coding DNA contains variable numbers of , short tandem repeats / repeating sequences ✓	3	
			Total	14	

Question			Answer	Mark	Guidance
18	(a)		<p><i>flaming the tube</i> causes air to expand and pushes bacteria away so less likely to settle into tube ✓</p> <p>kills bacteria on neck of tube ✓</p> <p><i>holding lid of petri dish over agar plate</i> avoids infection / inoculation with bacteria in the air ✓</p>	2	
	(b)		<p>dilute the sample taken from the colony ✓</p> <p>multiply result from agar plate by dilution factor ✓</p>	2	ALLOW for serial dilution , choose the correct plate (highest number of colonies without colonies merging)
	(c)		<p>Please refer to the marking instructions on page 3 of this mark scheme for guidance on how to mark this question.</p> <p>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):</p> <ul style="list-style-type: none"> ○ award the higher mark where the Communication Statement has been met. ○ award the lower mark where aspects of the Communication Statement have been missed. <p>• The science content determines the level. • The Communication Statement determines the mark within a level.</p>		
			<p>Level 3 (5-6 marks) A good range of correct modifications are provided. Each modification is explained. Comments both on improvement to the investigation and on validity are included.</p> <p><i>The explanations are clearly linked to the modifications with a well-reasoned explanation of how the modification will work.</i></p>	6	<p>Indicative scientific points may include:</p> <p>Modifications:</p> <ol style="list-style-type: none"> 1. Take samples more frequently than every four hours 2. Use a spreader to spread the bacteria on the agar 3. Label petri dish as soon as inoculated 4. Place petri dishes upside down 5. Use a wider range of temperatures /

		<p>Level 2 (3-4 marks) Some correct modifications are provided. Each modification is explained. Comments on improvement to the investigation and/or on validity are included.</p> <p><i>The explanations are clearly linked to the improvements but it may not be clear how the modifications will work to improve the investigation or make the results more valid.</i></p> <p>Level 1 (1-2 marks) Limited correct modifications are provided. There are no clear explanations of how the modifications will improve the investigation or validity of the results. OR Only one correct modification is described with a clear explanation of how it will improve the investigation or validity.</p> <p><i>There is a logical structure to the answer. The explanation, though basic and not linked to the modification, is clear.</i></p> <p>0 marks No response or no response worthy of credit.</p>		<p>use more intermediate temperatures</p> <p>Explanations:</p> <ol style="list-style-type: none"> 1. Bacteria can reproduce (very) quickly and a big change could occur in four hours so detail of growth may be missed 2. Tilting/swirling the plate may not spread the bacteria evenly and this would make counting the colonies more difficult and cause the result to be invalid 3. The dishes could easily be confused or mixed up so that the results are invalid 4. Prevents the agar drying out which would reduce bacterial growth and make the results invalid 5. Provides more information about the effect of temperature
	(d)	(i)	65 ✓✓	<p>2</p> <p>Correct response = two marks.</p> <p>If incorrect response allow one mark for working: $\frac{(20-7)}{20} \times 100$</p>
		(ii)	<p><i>Species B</i> [no mark]</p> <p>produces more biomass ✓</p> <p>continues to produce biomass at low glucose concentration ✓</p>	<p>2</p>

	(e)	<p><i>Any four from:</i></p> <p>microorganisms grow more quickly and can produce more protein per, hour / day / week ✓</p> <p>microorganisms can be grown on waste material from other processes ✓</p> <p>beef has five times the total fat content of protein produced by microorganisms ORA ✓</p> <p>beef has 20 times the saturated fat content and is more likely to contribute to atherosclerosis / heart disease ORA ✓</p> <p>fungal protein has no cholesterol and is less likely to contribute to, atherosclerosis / heart disease ✓</p> <p>people on a weight reduction diet prefer fungal protein as it has half the energy content of beef ✓</p> <p>AVP ✓</p>	4	<p>ACCEPT reverse argument</p> <p>ACCEPT reverse argument IGNORE 'more' or 'less'</p> <p>ACCEPT reverse argument IGNORE 'more' or 'less'</p> <p>e.g. rearing beef takes up a lot more land</p>
		Total	18	

Question		Answer	Mark	Guidance
19	(a)	<p>Please refer to the marking instructions on page 3 of this mark scheme for guidance on how to mark this question.</p> <p>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 <i>italics</i>):</p> <ul style="list-style-type: none"> award the higher mark where the Communication Statement has been met. award the lower mark where aspects of the Communication Statement have been missed. <p>• The science content determines the level. • The Communication Statement determines the mark within a level.</p>		
		<p>Level 3 (5-6 marks) A clear description how the non-specific defences cause all or nearly all of the observed responses (making reference to clotting and scab formation, inflammation and swelling of lymph node). All observations are clearly explained in full and with a clear link between each observation and each explanation.</p> <p><i>There is a logical thread linking each observation in the correct time line as the immune system comes into action. Specialist terms are used throughout.</i></p> <p>Level 2 (3-4 marks) A clear description of the non-specific responses that cause some of the observed responses (making reference to clotting and scab formation, one to do with inflammation of the cut and/or swelling of lymph node). Some explanations are provided but these may not link clearly to the observation or may not be complete explanations.</p> <p><i>The information is clear and concise using a number of scientific terms appropriately.</i></p>	6	<p>Indicative scientific points may include:</p> <p>bleeding stops:</p> <ul style="list-style-type: none"> exposure (of blood / platelets) to collagen in damaged, blood vessel / tissue causes clotting response many factors involved in clotting process soluble fibrinogen converted to insoluble fibres mesh of fibres traps cells and platelets clot prevents bleeding clot dries out to produce scab scab protects against entry of pathogens <p>swelling / redness / tenderness:</p> <ul style="list-style-type: none"> infection by pathogen detection by mast cells release of, histamine / cell signals, cause response <u>arterioles</u> dilate allowing more blood to area causing redness more tissue fluid forms causing swelling (oedema)

			<p>Level 1 (1-2 marks) A limited description of the non-specific responses covering at least one of the observations (to do with clotting and scab formation, inflammation of the cut or swelling of the lymph node). Explanations are given for the observation but the explanations are not clear and there is no clear link between the observation and the explanation.</p> <p><i>There is a logical structure to the answer. The explanation, though basic, is clear.</i></p> <p>0 marks No response or no response worthy of credit.</p>		<ul style="list-style-type: none">phagocytes attracted to areaphagocytosis of pathogens <p>discomfort in armpits:</p> <ul style="list-style-type: none">excess tissue fluid drained to lymph vesselspathogens in tissue fluid enter lymph fluidtransported along lymph system to lymph nodesactivity of phagocytes (and lymphocytes) causes, swelling of lymph nodes / discomfort in armpit
	(b)	(i)	(opsonin) binds to antigen on pathogen and, assists binding / binds, to phagocyte ✓	1	
		(ii)	<p>any one:</p> <p>well-developed cytoskeleton ✓</p> <p>many lysosomes ✓</p> <p>many mitochondria ✓</p> <p>lobed nucleus ✓</p>	1	
	(c)	(i)	<p>prevents pathogens entering wound ✓</p> <p>aromatic compound is antibacterial ✓</p>	2	
		(ii)	autoimmune ✓	1	
		(iii)	<p>many, plants / microorganisms, produce molecules that may have medical benefits</p> <p>OR</p> <p>many modern medicines have been developed from traditional remedies ✓</p> <p>many such, plants /molecules, yet to be discovered ✓</p>	2	
			Total	13	

Question			Answer	Mark	Guidance
20	(a)	(i)	C / ribosomes ✓	1	
		(ii)	Any two from: A rough endoplasmic reticulum D Golgi apparatus E secretory vesicle F mitochondrion ✓✓	2	
	(b)		C/A then D then E ✓✓✓	3	letters must be in correct order, if not all correct: allow one mark if C/A as first letter given allow one mark for E as last letter given allow one mark for D in the middle IGNORE B as this is plasma membrane rather than an organelle
	(c)		attach to cytoskeleton ✓ moved by , protein motors / dynein ✓	2	ACCEPT by change in length of microtubules
	(d)	(i)	cofactor / prosthetic group ✓	1	
		(ii)	haemoglobin / myoglobin / cytochrome ✓	1	ACCEPT other correct named protein
	(e)		non-competitive (inhibition) ✓ the rate of reaction does not continue to rise as substrate concentration rises / in competitive inhibition the rate of reaction would continue to rise as substrate concentration rises ✓	2	
			Total	12	

21	(a)	(i)	hydrogen ✓	1	
		(ii)	molecules are polar ✓ (polarity) enables (water) molecules to, attract / bind to, solute molecules ✓	2	
		(iii)	hydrogen ions used to affect / regulate pH ✓ sodium ions used to regulate water potential ✓	2	
	(b)		detergent ✓ works as an emulsifier / attracts phospholipid molecules and water molecules ✓ it will break up the plasma / nuclear membranes ✓	2	
Total				7	

22	(a)		synthesise (a lot of) haemoglobin ✓ remove / digest, (named) organelles associated with protein synthesis ✓	2	ACCEPT nucleus, ribosomes, rough ER
	(b)		(can be grown into different tissues to) test how effective new medicinal drugs are ✓ (can be grown into different tissues to) test for side effects / toxicity of new drugs ✓ (can be grown and) studied to see how they develop into different cell types (developmental research) ✓ cell function can be studied to find out what can make it fail to work properly in certain (named) diseases ✓	3	e.g. cancer
	(c)		muscle tissue is a group of cells which contract together ✓ a muscle is an organ that consists of muscle tissue and other (named) tissues working together ✓	2	Other named tissues could include: nervous tissue, blood, connective tissue
Total				7	