

# OCR

Oxford Cambridge and RSA

Practice paper – Set 2

**A Level Biology A**

**H420/02** Biological diversity

**MARK SCHEME**

**Duration:** 2 hour 15 minutes

MAXIMUM MARK 100

Version: 5  
Last updated: FINAL  
(FOR OFFICE USE ONLY)

**This document consists of 18 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 **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 scoris 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 scoris messaging system, or by email.
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 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, 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, middle 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 middle mark** should be awarded where the level descriptor has been evidenced but aspects of the communication statement (in italics) are missing.

**The lower mark** should be awarded where the level descriptor has been evidenced but the communication statement (in italics) has not been met.

**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 **20(a)**.

## 11. Annotations

<b>Annotation</b>	<b>Meaning</b>
<b>DO NOT ALLOW</b>	Answers which are not worthy of credit
<b>IGNORE</b>	Statements which are irrelevant
<b>ALLOW</b>	Answers that can be accepted
( )	Words which are not essential to gain credit
—	Underlined words must be present in answer to score a mark
<b>ECF</b>	Error carried forward
<b>AW</b>	Alternative wording
<b>ORA</b>	Or reverse argument

Question	Answer	Mark	Guidance
1	C ✓	1	
2	C ✓	1	
3	C ✓	1	
4	D ✓	1	
5	C ✓	1	
6	B ✓	1	
7	B ✓	1	
8	D ✓	1	
9	B ✓	1	
10	C ✓	1	
11	B ✓	1	
12	B ✓	1	
13	D ✓	1	
14	D ✓	1	
15	D ✓	1	
	Total	15	

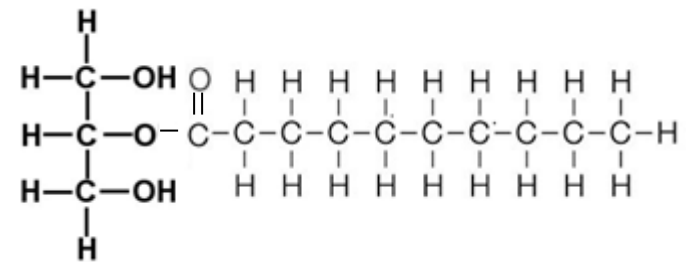
Question			Answer	Mark	Guidance
16	(a)	(i)	lay tape measure out from edge of pond ✓ place quadrat beside tape measure ✓ identify species of buttercup in quadrat ✓ count number of plants of each species (in quadrat) ✓  repeat for positions of quadrat along tape ✓	Max 3	<b>ACCEPT</b> measure % cover of each species <b>ACCEPT</b> count squares containing plants of each species
		(ii)	three columns with clear headings ✓ quadrat number / distance from pond in left hand column ✓ number of plants / % cover in right hand column(s) ✓	Max 2	<b>ACCEPT</b> two columns where second column is divided into two for separate species
	(b)	(i)	predation / herbivory ✓ competition ✓ correct ref to organisms living in soil ✓	Max 1	
	(c)	(i)	number of seeds per pot ✓ size of pot ✓ type of soil / compost used ✓ mass of soil / compost used ✓ temperature ✓ light intensity ✓ oxygen / carbon dioxide concentration ✓ AVP ✓	Max 2	e.g. depth of planting
		(ii)	% moisture on horizontal axis and number seedlings germinated on vertical axis ✓ both axes clearly labelled with unit for moisture ✓ plots for separate species clearly distinguished ✓	4	<b>ACCEPT</b> either line graph with two lines or bar chart with two bars at each moisture level

			points plotted accurately ✓																	
	<b>(d)</b>	<b>(i)</b>	correct data entered into all cells in table ✓ $\Sigma d^2 = 2$ ✓	<b>2</b>	<table border="1"> <tr> <td>60</td> <td>4</td> <td>42</td> <td>5</td> <td></td> </tr> <tr> <td>80</td> <td>5</td> <td>33</td> <td>4</td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </table>	60	4	42	5		80	5	33	4						
60	4	42	5																	
80	5	33	4																	
		<b>(ii)</b>	0.9 ✓✓	<b>2</b>	<p>Two marks for correct answer</p> <p>If answer incorrect allow one mark for work showing formula completed correctly</p> $r_s = 1 - \frac{6 \times 2}{5(25 - 1)}$															
		<b>(iii)</b>	the correlation (between moisture and germination) is not significant (at the $p = 0.05$ / 95% confidence level) ✓	<b>1</b>																
			<b>Total</b>	<b>17</b>																



Question		Answer	Mark	Guidance																					
17	(a)	<table border="1"> <thead> <tr> <th></th> <th>Male</th> <th>Female</th> <th></th> </tr> </thead> <tbody> <tr> <td>Parental genotypes</td> <td><math>X^{Cr}X^{Cbl}</math></td> <td><math>X^{Cbr}Y</math></td> <td>✓ ✓</td> </tr> <tr> <td>Gametes</td> <td><math>X^{Cr}</math> <math>X^{Cbl}</math></td> <td><math>X^{Cbr}</math> <math>Y</math></td> <td>✓</td> </tr> <tr> <td>F1 genotype</td> <td><math>X^{Cr}X^{Cbr}</math> <math>X^{Cr}Y</math></td> <td><math>X^{Cbr}X^{Cbl}</math> <math>X^{Cbl}Y</math></td> <td>✓</td> </tr> <tr> <td>F1 Phenotype</td> <td>1red male</td> <td>: 1red female</td> <td>: 1brown male</td> <td>: 1blue female</td> </tr> </tbody> </table>		Male	Female		Parental genotypes	$X^{Cr}X^{Cbl}$	$X^{Cbr}Y$	✓ ✓	Gametes	$X^{Cr}$ $X^{Cbl}$	$X^{Cbr}$ $Y$	✓	F1 genotype	$X^{Cr}X^{Cbr}$ $X^{Cr}Y$	$X^{Cbr}X^{Cbl}$ $X^{Cbl}Y$	✓	F1 Phenotype	1red male	: 1red female	: 1brown male	: 1blue female	4	<p>One mark for each parental genotype</p> <p><b>ALLOW</b> ecf</p>
	Male	Female																							
Parental genotypes	$X^{Cr}X^{Cbl}$	$X^{Cbr}Y$	✓ ✓																						
Gametes	$X^{Cr}$ $X^{Cbl}$	$X^{Cbr}$ $Y$	✓																						
F1 genotype	$X^{Cr}X^{Cbr}$ $X^{Cr}Y$	$X^{Cbr}X^{Cbl}$ $X^{Cbl}Y$	✓																						
F1 Phenotype	1red male	: 1red female	: 1brown male	: 1blue female																					
	(b) (i)	1.6 ✓✓	2	<p>Two marks for correct answer If answer incorrect allow one mark for correct completion of table</p> <table border="1"> <tbody> <tr> <td><math>(O-E)^2</math></td> <td>4</td> <td>0</td> <td>4</td> <td>0</td> <td></td> </tr> <tr> <td><math>(O-E)^2 / E</math></td> <td>0.8</td> <td>0</td> <td>0.8</td> <td>0</td> <td></td> </tr> </tbody> </table>	$(O-E)^2$	4	0	4	0		$(O-E)^2 / E$	0.8	0	0.8	0										
$(O-E)^2$	4	0	4	0																					
$(O-E)^2 / E$	0.8	0	0.8	0																					
	(ii)	there is no significant difference between the expected and observed results ✓	1	<p><b>ALLOW</b> the observed results are similar to the expected</p> <p><b>ALLOW</b> ecf if value of chi-squared is calculated incorrectly</p>																					
	(iii)	random fertilisation ✓	1	<b>DO NOT ALLOW</b> random mating																					
	(c) (i)	value would rise to infinity ✓	1																						
	(ii)	<i>idea of:</i> they were not monogamous / another bird was involved ✓	1																						

		(iii)	in female offspring the allele for feather colour comes from male parent ✓ original male bird did not hold allele for brown feathers ✓ brown feather allele in female would not produce brown female offspring ✓	Max 2	
				<b>Total</b>	<b>12</b>

Question			Answer	Mark	Guidance
18	(a)	(i)	single bond between oxygen on glycerol and carbon on fatty acid ✓ double bonded oxygen on first carbon of the fatty acid ✓	2	<b>ALLOW</b> on any of the glycerol carbons <b>ALLOW</b> any number of carbons in chain 
		(ii)	ester ✓	1	
		(iii)	water ✓	1	
	(b)		starch <b>AND</b> glycogen ✓	1	<b>ALLOW</b> amylose , amylopectin
	(c)	(i)	<p><b>Please refer to the marking instructions on page 3 of this mark scheme for guidance on how to mark this question.</b></p> <p><b>In summary:</b> 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, <b>Level 1</b>, <b>Level 2</b> or <b>Level 3</b>, best describes the overall quality of the answer. Then award the higher, middle or lower mark within the level, according to the <b>Communication Statement</b> (shown in italics):</p> <ul style="list-style-type: none"> <li>○ award the higher mark where the Communication Statement has been met.</li> <li>○ award the middle mark where aspects of the Communication Statement are missing.</li> <li>○ award the lower mark where the Communication Statement has not been met.</li> </ul> <p>• <b>The science content determines the level.</b> • <b>The Communication Statement determines the mark within a level.</b></p>		
			<p><b>Level 3 (7-9 marks)</b> A good range of structural details and properties are provided including reference to fats and carbohydrates in both plants and animals. Explanations are provided for each structural comment.</p> <p><i>The explanations are clearly linked to the structure of the molecules and the use of scientific terminology is at an</i></p>	Max 9	<p><b>Indicative scientific points may include:</b> <b>Structures (S), Properties (P) and Explanations (E):</b></p> <p>Carbohydrates: S1. Polymers of glucose E1. Glucose can be used in respiration to release energy</p>

		<p><i>appropriate level. All the information presented is relevant and forms a continuous narrative.</i></p> <p><b>Level 2 (4-6 marks)</b> Some structural details and properties are provided including reference to molecules in both plants and animals. Explanations are provided for each structural comment.</p> <p><i>The explanations are clearly linked to the structure of the molecules but may not fully explain how the structure suits the role and use of scientific terminology may not always be appropriate. The information presented is mostly relevant.</i></p> <p><b>Level 1 (1-3 marks)</b> A limited number of structural details are provided. The explanations do not clearly show how the molecules are suited to their role.</p> <p><i>There is a logical structure to the answer. The explanations, though basic, are clear.</i></p> <p>0 marks No response or no response worthy of credit.</p>		<p>S2. Large molecules P2. Insoluble E2. Do not affect water potential of cell</p> <p>S3. 1-4 glycosidic bonds E3. Easy to make and break to release glucose / monomers</p> <p>S4. Coiled shape / compact E4. Take up less space in cell</p> <p>S5. Amylose unbranched / amylopectin with few branches E5. No need for rapid release of monomers in plants</p> <p>S6. Glycogen more branched E6. Allows more rapid release of monomers in animals</p> <p>Lipids (<b>ACCEPT</b> lipids or fats): S7. Fats have more carbon-carbon bonds / carbon-hydrogen bonds P7. Fats are energy rich / contain more energy per molecule E7. More energy stored in less space</p> <p>P8. Fats are insoluble E8. Do not affect water potential of cell</p> <p>S9. Fatty acids are long carbon chains E9. Can be broken down to release two carbon / acetyl groups (which enter Krebs cycle)</p> <p>S10. Animal fats saturated / harder E10. Have role in protection / insulation as well as energy storage.</p>
<b>Total</b>			<b>14</b>	

19	(a)	(i)	(use a) 100cm <sup>3</sup> measuring cylinder ✓ mix 80cm <sup>3</sup> acid and 20cm <sup>3</sup> water ✓ take 50cm <sup>3</sup> of the resulting solution and add 50cm <sup>3</sup> water ✓ repeat 50 / 50 dilution for each subsequent solution required / AW ✓	Max 3	ACCEPT annotated diagram
		(ii)	195 – 200 s ✓	1	the unit must be included
		(iii)	range bars ✓ longer range bar indicates more variability / less repeatable ✓	2	
		(iv)	longer time taken to discolour ✓ error becomes smaller proportion of total / % error reduced ✓	2	
	(b)		cut block in half ✓ measure, thickness of colourless region / distance from edge of block to coloured region ✓ divide distance (acid diffused) by time ✓	3	
			<b>Total</b>	<b>11</b>	

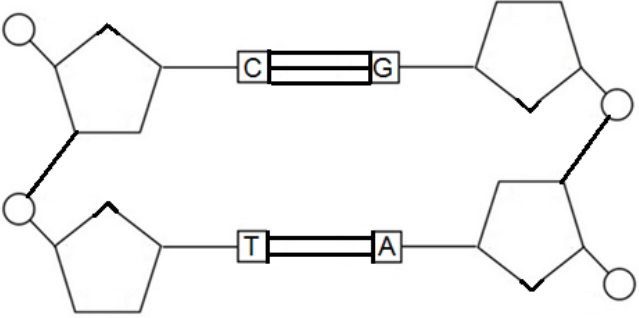
Question		Answer	Mark	Guidance
20	(a)	<p><b>Please refer to the marking instructions on page 3 of this mark scheme for guidance on how to mark this question.</b></p> <p><b>In summary:</b>            Read through the whole answer. (Be prepared to recognise and credit unexpected approaches where they show relevance.)            Using a 'best-fit' approach based on the science content of the answer, first decide which of the level descriptors, <b>Level 1</b>, <b>Level 2</b> or <b>Level 3</b>, best describes the overall quality of the answer.            Then award the higher or lower mark within the level, according to the <b>Communication Statement</b> (shown in italics):</p> <ul style="list-style-type: none"> <li>○ award the higher mark where the Communication Statement has been met.</li> <li>○ award the lower mark where aspects of the Communication Statement have been missed.</li> </ul> <p>• <b>The science content determines the level.</b>            • <b>The Communication Statement determines the mark within a level.</b></p>		
		<p><b>Level 3 (5-6 marks)</b>            A good range of explanations are provided. The explanations clearly indicate how the decrease in biodiversity is caused.</p> <p><i>The explanations are clearly linked to the factor considered. There is a logical structure and use of scientific terminology is at an appropriate level. All the information presented is relevant and forms a continuous narrative.</i></p> <p><b>Level 2 (3-4 marks)</b>            Some explanations are provided. The explanations do not always clearly show how the decrease in biodiversity is caused.</p> <p><i>The explanations are not always clearly linked correctly to the applicable factor. There is some structure and use of appropriate scientific terminology. The information presented is mostly relevant.</i></p> <p><b>Level 1 (1-2 marks)</b>            A limited number of explanations are provided. The explanations do not clearly show how the decrease in biodiversity is caused.</p> <p><i>There is some structure to the answer. The explanations</i></p>	<p><b>Max 6</b></p>	<p><b>Indicative scientific points may include:</b></p> <p>Human population growth:</p> <ul style="list-style-type: none"> <li>• Need for more agricultural land / housing</li> <li>• Destroys habitats</li> <li>• More waste produced</li> <li>• More pollution produced</li> <li>• Damaging ecosystems</li> <li>• Specific example provided</li> </ul> <p>Agriculture:</p> <ul style="list-style-type: none"> <li>• Agricultural land has monoculture / lower biodiversity</li> <li>• Loss of older / wild type strains</li> <li>• Reduced genetic diversity</li> <li>• Subject to disease</li> <li>• Inability to adapt to changing conditions</li> <li>• Altering habitats</li> <li>• Specific example provided such as draining of wetlands reduces habitat diversity</li> <li>• Pesticide use</li> <li>• Use of fertiliser</li> <li>• Nitrate pollution</li> <li>• Eutrophication</li> </ul>

		<p><i>though basic are linked to the applicable factor.</i></p> <p><b>0 marks</b> No response or no response worthy of credit.</p>		<p>Climate change:</p> <ul style="list-style-type: none"> <li>• Warmer / drier climate</li> <li>• Modern strains/species not adapted</li> <li>• Migration may not be possible</li> <li>• Rise in sea level reduces land area</li> <li>• More frequent flooding affects terrestrial ecosystems</li> </ul>	
	<b>(b)</b>	<b>(i)</b>	<p>have significant effect on ecosystem ✓</p> <p>many other species rely on activity of beavers ✓</p>	<b>2</b>	
		<b>(ii)</b>	<p><i>created dams</i> flooded areas upstream / reduced flow rate downstream , creating still / slow moving water for aquatic species ✓</p> <p><i>felled trees</i> opened up tree canopy allowing light to ground level ✓</p> <p><i>built lodges</i> creates sheltered habitat for insect species / beaver parasites ✓</p>	<b>Max 3</b>	<b>ALLOW</b> any other valid point
		<b>(iii)</b>	<p>ecotourism / education / scientific study ✓</p> <p>water quality improved as silt is held back by dams ✓</p>	<b>Max 1</b>	
	<b>(c)</b>		<p>species diversity will rise as more species live in the new habitats ✓</p> <p>genetic diversity will increase as species have a wider range of conditions in which to live ✓</p>	<b>2</b>	
	<b>(d)</b>		<p>loss of farmland due to flooding ✓</p> <p>strength of argument depends on area affected ✓</p> <p>(probably) not a strong argument as relatively small areas affected ✓</p> <p>trees cut down ✓</p> <p>(of concern to foresters) likely to occur only in area near</p>	<b>Max 4</b>	

			water – so not a strong argument ✓ damage to river bank needing costly repairs ✓ cost should be shared by all who benefit (including those downstream) so not a strong argument ✓		
			<b>Total</b>	<b>18</b>	



21	(a)	(i)	artificial selection ✓	1	
		(ii)	suitable named plant <b>and</b> adaptation ✓	1	e.g. wheat / barley / corn / oats , large seeds
	(b)	(iii)	wolf is the result of natural selection ✓ selected / evolved to survive in habitat ✓ no extreme features ✓  dogs bred by artificial selection ✓ dogs have extreme features ✓ example of extreme features ✓ not well adapted to survive in wild ✓	Max 4	<b>ALLOW</b> able to reproduce well in wild  e.g. long body / short legs of dachshund large ears / creased face of blood hound <b>ALLOW</b> not able to reproduce well in wild
	(c)		artificial breeding / selection can exaggerate features ✓ other characteristics may be ignored ✓ (may be) detrimental to health (of dog) ✓ club provides guidance / advice to maintain welfare ✓	Max 3	
			<b>Total</b>	<b>9</b>	

22	(a)	<p>bond drawn between phosphate and carbon 3 of sugar  <b>and</b>          labelled phosphodiester bond ✓</p> <p>two bonds drawn between bases T &amp; A  <b>and</b>          three bonds between C &amp; G  <b>and</b>          labelled hydrogen bonds ✓</p>	2	<p><b>ACCEPT</b> just one phosphodiester bond drawn</p> 
	(b)	(i) R used to label a phosphodiester bond ✓	1	
		(ii) P used to label a hydrogen bond ✓	1	
<b>Total</b>			<b>4</b>	