OCR
Oxford Cambridge and RSA

GCE

Biology B

H022/01: Foundations of biology

AS Level

Mark Scheme for June 2022

OCR (Oxford Cambridge and RSA) is a leading UK awarding body, providing a wide range of qualifications to meet the needs of candidates of all ages and abilities. OCR qualifications include AS/A Levels, Diplomas, GCSEs, Cambridge Nationals, Cambridge Technicals, Functional Skills, Key Skills, Entry Level qualifications, NVQs and vocational qualifications in areas such as IT, business, languages, teaching/training, administration and secretarial skills.

It is also responsible for developing new specifications to meet national requirements and the needs of students and teachers. OCR is a not-for-profit organisation; any surplus made is invested back into the establishment to help towards the development of qualifications and support, which keep pace with the changing needs of today's society.

This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by examiners. It does not indicate the details of the discussions which took place at an examiners' meeting before marking commenced.

All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the report on the examination.

MARKING INSTRUCTIONS

PREPARATION FOR MARKING
RM ASSESSOR

1. Make sure that you have accessed and completed the relevant training packages for on-screen marking: *RM Assessor 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 RM Assessor 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 RM Assessor 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 RM Assessor messaging system, or by email.

5. **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 question 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. Award No Response (NR) if:
   - there is nothing written in the answer space

   Award Zero '0' if:
   - anything is written in the answer space and is not worthy of credit (this includes text and symbols).

   Team Leaders must confirm the correct use of the NR button with their markers before live marking commences and should check this when reviewing scripts.

8. The RM Assessor **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 RM Assessor messaging system, or e-mail.

9. A*ssistant 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: Not applicable in H022/01
    a. **To determine the level** – start at the highest level and work down until you reach the level that matches the answer
    b. **To determine the mark within the level**, consider the following

Descriptor	Award mark
On the borderline of this level and the one below	At bottom of level
Just enough achievement on balance for this level	Above bottom and either below middle or at middle of level (depending on number of marks available)
Meets the criteria but with some slight inconsistency	Above middle and either below top of level or at middle of level (depending on number of marks available)
Consistently meets the criteria for this level	At top of level

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.**

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

Marking Annotations

Annotation	Use
BOD	Benefit of Doubt
CON	Contradiction
	Cross
ECF	Error Carried Forward
GM	Given Mark
	Extendable horizontal wavy line (to indicate errors / incorrect science terminology)
I	Ignore
	Large dot (various uses as defined in mark scheme)
	Highlight (various uses as defined in mark scheme)
NBOD	Benefit of the doubt not given
	Tick
^	Omission Mark
BP	Blank Page
L1	Level 1 answer in Level of Response question
L2	Level 2 answer in Level of Response question
L3	Level 3 answer in Level of Response question

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	AO element	Guidance
1	A	**1**	AO1.1	
2	C	**1**	AO2.6	
3	C	**1**	AO1.2	
4	D	**1**	AO1.2	41000/50000 = 82%
5	A	**1**	AO1.2	
6	D	**1**	AO2.6	Total = 1595/0.586 = 2722 (D = 103/2722x100)
7	C	**1**	AO1.2	
8	B	**1**	AO1.1	
9	C	**1**	AO1.1	
10	D	**1**	AO1.2	
11	B	**1**	AO1.2	
12	C	**1**	AO1.1	
13	D	**1**	AO2.5	
14	C	**1**	AO2.8	$(3.14 \times (0.5)^2 \times 60) \times 6$
15	A	**1**	AO2.3	
16	C	**1**	AO1.2	
17	B	**1**	AO2.5	
18	D	**1**	AO1.1	
19	C	**1**	AO1.2	
20	B	**1**	AO2.6	No. of polymorphic / Total number of gene loci
	Total	**20**		

Question			Answer	Marks	AO element	Guidance
21	(a)		phloem / sieve tubes , are present in stems ✓ translocation / transport of sucrose, occurs in , phloem / sieve tubes ✓ sucrose transported (through the stem) from , source / leaves , to , sink / roots / rest of plant ✓ glucose / food / products of photosynthesis , (produced in leaves) transported as sucrose ✓	2 max	AO1.2 AO2.5	**IGNORE** vessels **IGNORE** xylem in MP1 **ALLOW** sugar for sucrose throughout **ALLOW** e.g. transport of sucrose through the stem occurs in phloem = **MP1** and **2** **DO NOT ALLOW** other named sugars e.g. glucose **DO NOT ALLOW** sucrose transported in xylem
21	(b)	(i)	iodine-KI ✓	1	AO1.2	**ALLOW** iodine
21	(b)	(ii)	red (light) is absorbed by a , blue / blue-black , solution (of a positive result) ✓ allows measurement of the intensity of , blue / blue-black , colour (of a positive result) ✓	1 max	AO2.7	**ALLOW** allows absorbance of blue-black colour (of positive result) to be measured
21	(b)	(iii)	*idea of needing* starch , solutions / suspensions , of known concentration ✓ measure , absorbance / transmission , of known concentrations ✓ plot graph of , absorbance / transmission , against concentration ✓ concentration on x axis **AND** , absorbance / transmission , on y axis ✓	3 max	AO2.7 AO3.3	**DO NOT ALLOW** rate of absorbance / transmission - but only penalise once. Use **ECF**

21	**(c)**		**1** species 2 ✓ **any three from** **2** (has) high yield throughout the season / AW ✓ **3** (overall) low (concentration of) starch (found in the extract) ✓ **4** (so) less sucrose lost / AW ✓ **5** (so) extraction of sucrose is more efficient ✓ **6** data quotes to include units at least once to support reasons ✓	**4 max**	AO2.8 AO3.2	**ALLOW max 2** if species is incorrect but has reasoning statements in correct context e.g. species 1 has most yield in May to August with 550kg per 1000kg = MP2 and MP6 starch concentrations (mg dm^{-3}) +/- 50

	Species 1	Species 2	Species 3
May	1700	1300	1300
June	2300	2250	1800
July	1750	1600	1000
Aug	2750	1300	1850
Sept	2900	1800	1600
Oct	3800	1500	2400
Nov	2800	1250	2000
TOTAL	18000	11000	11950
MEAN	2571	1571	1707

mass of sucrose (kg per 1000 kg) +/- 5

	Species 1	Species 2	Species 3
May	120	115	105
June	130	125	100
July	145	140	110
Aug	155	145	120
Sept	130	150	125
Oct	125	130	110
Nov	125	120	105
TOTAL	930	925	775
MEAN	133	132	111

21	**(d)**	**(i)**	hydrolysis ✓	**1**	AO1.1	
21	**(d)**	**(ii)**	(α) glucose / maltose ✓	**1**	AO1.2	
21	**(d)**	**(iii)**	breaks down / hydrolyses , (α -1,6) bonds between , links / branches ✓	**1**	AO2.1	**ALLOW** (starch) becomes less branched **IGNORE** breaks down polysaccharide **IGNORE** breaks down to glucose

Question			Answer	Marks	AO element	Guidance
22	(a)	(i)	**FIRST CHECK THE ANSWER IN TABLE** **If answer = 3.5 and 12.25 award 1 mark** $(d - \bar{d})$ = 3.5 **AND** $(d - \bar{d})^2$ = 12.25 ✓	1	AO2.8	NOTE: **mean difference *d*** = 12.5 Sum of $(d - \bar{d})^2$ = 52.5
22	(a)	(ii)	*idea that* two measurements collected from same individual ✓	1	AO3.2	**ALLOW** description e.g. each seal provided two pieces of data e.g. for each seal heart rate readings were measured in darkness **and** in daylight
22	(a)	(iii)	**FIRST CHECK THE ANSWER ON ANSWER LINE** **If answer = 16.3 award 2 marks** mean difference √10 / 2.42 ✓ 16.3 / 16.33 ✓	2	AO2.8	**ALLOW** 16.33 for 2 marks **ALLOW** 16 / 16.334 for 1 mark NOTE: **mean difference *d*** = 12.5 Sum of $(d - \bar{d})^2$ = 52.5
22	(a)	(iv)	(calculated value of) *t* / 16.3 / 16.33 , is (much) greater than , critical value / 2.26 ✓ null hypothesis , can be rejected / is not supported ✓ difference (in heart rates in light and dark) is not due to chance ✓	2 max	AO3.2	**ALLOW** ECF from 22(a)(iii) **IGNORE** null hypothesis is incorrect **ALLOW** there is (significant) difference between heart rates of young seals in darkness and daylight

22	**(b)**		greater , distance / gap , between , QRS (complexes) / peaks ✓ P waves , same / similar (shape /size) ✓ height of QRS (complexes) , same / similar ✓	**2 max**	AO1.2	**ALLOW** fewer peaks in same time interval **ALLOW** greater gap between P waves / greater gap between T wave and next P wave **ALLOW** T waves , are the same / similar (shape / size)

Question			Answer	Marks	AO element	Guidance
23	(a)	(i)	(gene W) is a proto-oncogene / becomes oncogene ✓ (mutation) leads to uncontrolled cell division ✓ (triggers) increased DNA replication ✓ abnormally high quantities of growth factors produced ✓	2 max	AO2.1	
23	(a)	(ii)	(gene) *p53* ✓	1	AO1.1	**ALLOW** tumour-suppressor / *p63* / *p73*
23	(b)		*similarity* (contain cells undergoing) uncontrolled cell division ✓ *difference* **any one from** adenoma is slow growing ✓ adenoma (usually) located within specific tissue(s) / is not metastatic ✓ carcinoma is metastatic ✓	2 max	AO2.1	**1 mark for similarity AND 1 mark for difference** **ALLOW** ORA for carcinoma **ALLOW** carcinoma spreads to , neighbouring / other / named , tissues **ALLOW** carcinoma produces secondary tumours in other areas / AW

Question			Answer	Marks	AO element	Guidance
24	(a)		***Pre-conceptual test: 2max*** test for (immunity to) , Rubella / German measles ✓ (if contracted during pregnancy) can cause , brain damage / deafness , in baby ✓ **OR** test for , inherited disease / sickle cell anaemia / cystic fibrosis ✓ parents may , carry / pass on , genetic disorder ✓ ***Post-conceptual test: 2max*** test urine for glucose ✓ checks for gestational diabetes ✓ **OR** test urine for protein ✓ checks for , kidney disease / high blood pressure ✓ **OR** check for Rhesus (status) ✓ (if different status to fetus) may develop antibodies that attack the baby ✓ **OR** blood test for detecting genetic disorders ✓ to identify abnormalities in the fetus ✓ **ALLOW once for EITHER pre-conceptual or post-conceptual** blood test for detecting , infection / syphilis / HIV / hepatitis B ✓ (infections) can be passed on to the fetus (when pregnant) ✓	**4 max**	AO1.1	**Test MUST be linked to correct reason** **IGNORE** ultrasound scans **ALLOW** virus can cross placenta / infect fetus (during pregnancy) **ALLOW** woman can opt to have (MMR) vaccine **ALLOW** parents can be given genetic counselling **ALLOW** can indicate pre-eclampsia **ALLOW** mother may need transfusion during birth **ALLOW** CVS / amniocentesis / karyotyping as alternative to blood test to detect genetic disorders **ALLOW** named e.g. Down's Syndrome **ALLOW** so infections / syphilis / HIV / hepatitis B can be treated (before / during pregnancy)

Question			Answer	Marks	AO element	Guidance
24	(b)	(i)	**FIRST CHECK THE ANSWER ON ANSWER LINE** **If answer = 5.7 / 5.8 (g) award 2 marks** $\frac{58}{111\%}$ x 100% = 52.25 **or** 52.25225 ✓ **OR** 58 - 52.25 or 52.25225 = 5.75 or 5.74775 ✓	**2**	AO2.2	**ALLOW 1 mark** for answer if not to two sig.figs.
24	(b)	(ii)	vitamin C / vitamin A / folic acid ✓	**1**	AO1.1	

24	**(c)**	**(i)**	(at 34 weeks) on 10th percentile for weight **AND** 50th percentile for length **AND** 90th percentile for HC ✓ underweight (for gestational age) as on 10th percentile ✓ average length (for gestational age) as on 50th percentile ✓ above average HC (for gestational age) as on 90th percentile / ✓ fetal development is a concern ✓	**3 max**	AO3.2	**ALLOW** underweight as , only 10% of fetuses weigh less / 90% fetuses weigh more **ALLOW** above average as only 10% of fetuses will have higher value
24	**(c)**	**(ii)**	**FIRST CHECK THE ANSWER ON ANSWER LINE** **If answer = 77:1 award 1 mark** Weight ÷ length 3950 ÷ 51.5 77:1 ✓	**1**	AO2.6	**ALLOW** any ratio between 75:1 and 78:1
24	**(d)**		width of fetal head at widest point ✓	**1**	AO1.2	

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>AO element</th><th>Guidance</th></tr>
<tr><td>25</td><td>(a)</td><td></td><td><table><tr><th>Name</th><th>Letter</th></tr><tr><td>Erythrocyte</td><td>P</td></tr><tr><td>Monocyte</td><td>Q</td></tr><tr><td>Lymphocyte</td><td>R</td></tr></table>✓✓</td><td>2</td><td>AO2.1</td><td>Two marks for 3 correct
One mark for 2 correct
Zero marks for 0 or 1 correct</td></tr>
<tr><td>25</td><td>(b)</td><td>(i)</td><td>(so) individual cells can be seen clearly / AW ✓

(so) representative sample (of cells) ✓</td><td>1 max</td><td>AO1.2</td><td>ALLOW e.g. prevent cells , overlapping / being on top of each other
ALLOW cells can’t be seen clearly if smear is too thick
ALLOW if too thin small number of cells present</td></tr>
<tr><td>25</td><td>(b)</td><td>(ii)</td><td>(so) nuclei , are stained / can be clearly seen ✓
to distinguish between different ,
leucocytes / white blood cells ✓</td><td>1 max</td><td>AO1.2</td><td></td></tr>
<tr><td>25</td><td>(b)</td><td>(iii)</td><td>idea that macrophages develop (from monocytes)
after they have left the blood stream ✓

macrophages found in (other) tissues ✓</td><td>1 max</td><td>AO2.5</td><td>

ALLOW named e.g liver / lung</td></tr>
</table>

25	**(c)**		(neutrophils) are phagocytes / carry out phagocytosis ✓ engulf / AW , pathogen in(to) , vesicle / phagosome ✓ lysosomes fuse with , vesicle / phagosome ✓ pathogen is digested ✓ AVP ✓	**3 max**	AO2.5	 e.g. role of opsonins / role of cytokines e.g. lysosomes contain hydrolytic / digestive enzymes
25	**(d)**		clotting factors ✓ erythrocytes / red blood cells ✓ platelets ✓	**3**	AO1.2	**If more than one answer given mark the first on the line**

Need to get in touch?

If you ever have any questions about OCR qualifications or services (including administration, logistics and teaching) please feel free to get in touch with our customer support centre.

Call us on

01223 553998

Alternatively, you can email us on

support@ocr.org.uk

For more information visit

ocr.org.uk/qualifications/resource-finder

ocr.org.uk

Twitter/ocrexams

/ocrexams

/company/ocr

/ocrexams

CAMBRIDGE
UNIVERSITY PRESS & ASSESSMENT

OCR is part of Cambridge University Press & Assessment, a department of the University of Cambridge.

OCR operates academic and vocational qualifications regulated by Ofqual, Qualifications Wales and CCEA as listed in their qualifications registers including A Levels, GCSEs, Cambridge Technicals and Cambridge Nationals.

OCR provides resources to help you deliver our qualifications. These resources do not represent any particular teaching method we expect you to use. We update our resources regularly and aim to make sure content is accurate but please check the OCR website so that you have the most up-to-date version. OCR cannot be held responsible for any errors or omissions in these resources.

Though we make every effort to check our resources, there may be contradictions between published support and the specification, so it is important that you always use information in the latest specification. We indicate any specification changes within the document itself, change the version number and provide a summary of the changes. If you do notice a discrepancy between the specification and a resource, please contact us.

Whether you already offer OCR qualifications, are new to OCR or are thinking about switching, you can request more information using our Expression of Interest form.

Please get in touch if you want to discuss the accessibility of resources we offer to support you in delivering our qualifications.