



**GCE**

**Biology B**

**H422/01: Fundamentals of biology**

A Level

**Mark Scheme for June 2024**

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.

© OCR 2024

H422/01

Mark Scheme  
**MARKING INSTRUCTIONS**

June 2024

**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).

H422/01

Mark Scheme

June 2024

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. 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, using the Level descriptors to help you decide whether it is a strong or weak answer. The indicative scientific content in the Guidance column 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 skills and science content evidenced within the answer, first decide which set of level descriptors, Level 1, Level 2 or Level 3, best describes the overall quality of the answer.  
  
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 skills and science content determines the level.**  
  
**The communication statement determines the mark within a level.**  
  
Level of response questions on this paper are **32(c)** and **35(a)**.

## 11. Annotations

## Marking Annotations

| Annotation                                                                          | Use                                                                                  |
|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
|    | Benefit of Doubt                                                                     |
|    | Contradiction                                                                        |
|    | Cross                                                                                |
|    | Error Carried Forward                                                                |
|    | Given Mark                                                                           |
|    | Extendable horizontal wavy line (to indicate errors / incorrect science terminology) |
|    | Ignore                                                                               |
|    | Large dot (various uses as defined in mark scheme)                                   |
|    | Highlight (various uses as defined in mark scheme)                                   |
|  | Benefit of the doubt not given                                                       |
|  | Tick                                                                                 |
|  | Omission Mark                                                                        |
|  | Blank Page                                                                           |
|  | Level 1 answer in Level of Response question                                         |
|  | Level 2 answer in Level of Response question                                         |
|  | Level 3 answer in Level of Response question                                         |

## 12. Subject Specific Marking Instructions

Abbreviations, annotations and conventions used in the detailed Mark Scheme (to include abbreviations and subject-specific conventions).

| <b>Annotation</b>   | <b>Meaning</b>                                                |
|---------------------|---------------------------------------------------------------|
| /                   | alternative and acceptable answers for the same marking point |
| ✓                   | Separates marking points                                      |
| <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                                           |

### 13. 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 | Guidance                                        |
|----------|--------|-------|-------------------------------------------------|
| 1        | B      | 1     |                                                 |
| 2        | A      | 1     |                                                 |
| 3        | A      | 1     |                                                 |
| 4        | A      | 1     |                                                 |
| 5        | D      | 1     |                                                 |
| 6        | D      | 1     |                                                 |
| 7        | C      | 1     |                                                 |
| 8        | B      | 1     |                                                 |
| 9        | C      | 1     |                                                 |
| 10       | D      | 1     |                                                 |
| 11       | C      | 1     |                                                 |
| 12       | B      | 1     |                                                 |
| 13       | A      | 1     |                                                 |
| 14       | C      | 1     |                                                 |
| 15       | C      | 1     |                                                 |
| 16       | D      | 1     |                                                 |
| 17       | B      | 1     |                                                 |
| 18       | A      | 1     |                                                 |
| 19       | A      | 1     |                                                 |
| 20       | B      | 1     | $3.3 \times 10^{-9} \text{ m} = 3.3 \text{ nm}$ |
| 21       | B      | 1     |                                                 |
| 22       | B      | 1     |                                                 |
| 23       | A      | 1     |                                                 |
| 24       | B      | 1     |                                                 |
| 25       | D      | 1     |                                                 |

H422/01

Mark Scheme

June 2024

|           |              |           |  |
|-----------|--------------|-----------|--|
| <b>26</b> | C            | <b>1</b>  |  |
| <b>27</b> | C            | <b>1</b>  |  |
| <b>28</b> | B            | <b>1</b>  |  |
| <b>29</b> | D            | <b>1</b>  |  |
| <b>30</b> | D            | <b>1</b>  |  |
|           | <b>Total</b> | <b>30</b> |  |

| Question |     |      | Answer                                                                                                                                                                                                                                                                                                                                                                                                | Marks | Guidance                                                                                                                                                                                                                                                                                                                                                                       |
|----------|-----|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 31       | (a) |      | deaminated ✓<br>carbon dioxide ✓<br>ornithine ✓                                                                                                                                                                                                                                                                                                                                                       | 3     | <b>Responses must be in order as on MS</b><br><br><b>ALLOW</b> deamination<br><b>ALLOW</b> CO <sub>2</sub><br><b>ALLOW</b> phonetic spelling                                                                                                                                                                                                                                   |
| 31       | (b) | (i)  | (samples <b>Y</b> and <b>Z</b> ) prepared by dissolving<br>(named) solutes in water ✓<br><i>idea that</i> samples prepared using (named) buffer ✓<br><br>sample <b>Y</b> has glucose added ✓<br>sample <b>Z</b> has erythrocytes added ✓<br><br>sample <b>Z</b> has proteins added ✓<br>(yellow) colour added to look like urine ✓<br><i>idea that</i> they should be checked against a combi strip ✓ | Max 3 | <b>ALLOW</b> prepared to correct pH / to give pH shown on test strip<br><b>ALLOW</b> e.g. pH lowered for sample <b>X</b><br><b>ALLOW</b> higher glucose<br><b>ALLOW</b> red blood cells/RBC<br><b>ALLOW</b> ERY = erythrocytes<br><b>ALLOW</b> higher protein<br><br><b>IGNORE</b> references to urine<br><b>IGNORE</b> references to conc. of additives (e.g. 10g of protein) |
| 31       | (b) | (ii) | (sample <b>Z</b> ) contains erythrocytes ✓<br><br><br><br><br><i>Ref to</i> prevent denaturing of (blood) proteins / enzymes ✓                                                                                                                                                                                                                                                                        | Max 1 | <b>ALLOW</b> red blood cells/RBC/ERY for erythrocytes<br><b>DO NOT ALLOW</b> <i>Ref to</i> erythrocytes unqualified<br><b>IGNORE</b> <i>Ref to</i> denature/breakdown of erythrocytes                                                                                                                                                                                          |

|    |     |       |                                                                                                                                                                                                                                                                                                                                                                                                                                                    |       |                                                                                                                                                                                                                |
|----|-----|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 31 | (b) | (iii) | <p>Ref to the use of Benedict's solution ✓<br/> use of distilled water to zero / calibrate colorimeter ✓<br/> <u>red</u> filter for coloured solution ✓<br/> measures , absorbance / transmission , (of light) ✓<br/> calibration curve/graph produced (using known concentrations) ✓<br/> (%) absorbance / transmission , reading (of sample <b>Y</b>)<br/> checked/compared on calibration curve / AW ✓<br/> provides quantitative results ✓</p> | Max 3 |                                                                                                                                                                                                                |
| 31 | (c) | (i)   | <p><i>Method</i><br/> controlled / healthy diet / reduced intake of (refined) sugar / reduce obesity / increase exercise ✓<br/> (named) drug / insulin pump / insulin injection ✓</p> <p><i>Explanations</i><br/> avoids excess, glucose in the blood/body / intake of glucose (into body) ✓<br/> lowers blood glucose concentration / cells take up more glucose ✓</p>                                                                            | 2     | <p><b>Max 1</b> for method if explanation does not match<br/> <b>ALLOW</b> weight loss<br/> e.g. metformin</p> <p><b>ALLOW</b> reduces glucose produced by liver / reduces absorption of glucose from food</p> |
| 31 | (c) | (ii)  | <p>put blood in contact with biosensor strip ✓<br/> glucose, dehydrogenase / oxidase , on test strip ✓<br/> glucose to gluconolactone (produces current) / AW ✓<br/> measures (small electric) current ✓</p>                                                                                                                                                                                                                                       | Max 2 |                                                                                                                                                                                                                |

| Question |     |      | Answer                                                                                                                                                                                                                                                                                                                 | Mark  | Guidance                                                                                                                                                                                                                                          |
|----------|-----|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 32       | (a) | (i)  | <b>FIRST CHECK THE ANSWER ON ANSWER LINE<br/>IF ANSWER = 68 (dB) AWARD 1 MARK</b><br><br>68 ✓                                                                                                                                                                                                                          | 1     |                                                                                                                                                                                                                                                   |
| 32       | (a) | (ii) | <i>Advantage</i><br>natural , habitat / environment ✓<br><br><i>Disadvantage</i><br><i>idea that</i> transmission of sound affected by ,<br>forest / trees / jungle ✓<br><br><b>OR</b><br>difficulties in placing equipment ✓                                                                                          | Max 2 | <b>IGNORE</b> realistic<br><b>ALLOW</b> close to real life / the place in<br>which it normally lives<br><br><b>IGNORE</b> not controlled / unqualified<br>external factors / other sounds interfere                                               |
| 32       | (b) | (i)  | <b>FIRST CHECK THE ANSWER ON ANSWER LINE<br/>IF ANSWER = 18 / 17.6 (%) AWARD 2 MARKS</b><br><br>$(68 - 56) \div 68 \times 100$ ✓<br>17.6 % ✓                                                                                                                                                                           | 2     | <b>ALLOW</b> 1 mark for equation <b>OR</b> incorrect<br>rounding / 17.64(70588)                                                                                                                                                                   |
| 32       | (b) | (ii) | <i>Valid because</i><br>small (%) loss in performance (over 100m) ✓<br><br>means language, can still be understood / heard /<br>is still coherent ✓<br><br><i>Invalid because</i><br>only two species used ✓<br>different species may , use different sounds /<br>have different language ✓<br><br>insufficient data ✓ | Max 3 | <b>ALLOW</b> supporting figure for small loss<br>e.g. species 1 = 68-56, 17.6%,<br>species 2 = 61-49, 19.7%<br><br><b>ALLOW</b> ref. to different species gave<br>different results/performance levels<br><b>ALLOW</b> idea that only 100m tested |

|    |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|----|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 32 | (c)* | <p><b>Please refer to the marking instructions on page 4 of this mark scheme for guidance on how to mark this question.</b></p> <p><b>In summary:</b><br/> Read through the whole answer. (Be prepared to recognise and credit unexpected approaches where they show relevance.)<br/> 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.<br/> Then, award the higher or lower mark within the level, according to the <b>Communication Statement</b> (shown in <i>italics</i>):</p> <ul style="list-style-type: none"> <li>o award the higher mark where the Communication Statement has been met.</li> <li>o award the lower mark where aspects of the Communication Statement have been missed.</li> </ul> <p>• <b>The science content determines the level.</b><br/> • <b>The Communication Statement determines the mark within a level.</b></p>                                                                                         |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|    |      | <p><b>Level 3 (5–6 marks)</b><br/> Evaluation that includes positive <b>and</b> negative statements for fossil <b>and</b> anatomical evidence.<br/> <i>There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.</i></p> <p><b>Level 2 (3–4 marks)</b><br/> Evaluation that includes positive <b>and</b> negative statements for fossil <b>or</b> anatomical evidence<br/> <b>OR</b><br/> Evaluation that includes positive only <b>or</b> negative only statements for fossil <b>and</b> anatomical evidence.<br/> <i>There is a line of reasoning presented with some structure. The information presented is relevant and supported by some evidence.</i></p> <p><b>Level 1 (1–2 marks)</b><br/> Evaluation that includes positive <b>or</b> negative statement for fossil <b>or</b> anatomical evidence.<br/> <i>There is an attempt at a logical structure with a line of reasoning. The information is in the most part relevant.</i></p> <p><b>0 marks</b><br/> <i>No response or no response worthy of credit.</i></p> | 6 | <p>Communication statement can be awarded if there is no incorrect use of terminology.</p> <p><b>Indicative scientific points may include:</b></p> <p><b>POSITIVE<br/>FOSSIL or ANATOMICAL</b></p> <ul style="list-style-type: none"> <li>• organisms based on morphological similarities / same shape</li> <li>• can see evidence</li> <li>• useful for scientists</li> </ul> <p><b>FOSSIL ONLY</b></p> <ul style="list-style-type: none"> <li>• useful in studying extinct species</li> <li>• there can be an abundance of fossils</li> <li>• can see evolutionary relationships / distance from common ancestor</li> <li>• carbon-dating/age can be determined</li> <li>• can sometimes extract DNA</li> <li>• can sometimes use molecular analysis</li> </ul> <p><b>ANATOMICAL ONLY</b></p> <ul style="list-style-type: none"> <li>• can see features that do not fossilise</li> <li>• e.g. colour/hair length</li> <li>• can see the full structure/no missing parts</li> </ul> |

|  |  |  |  |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|--|--|--|--|--|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  |  |  |  |  | <p><b>NEGATIVE</b><br/> <b>FOSSIL or ANATOMICAL</b></p> <ul style="list-style-type: none"> <li>members of same species can look very different</li> <li>members of different species classified together due to having similar / homologous structure / looking similar</li> <li>e.g. wings</li> <li>pitfalls of convergent evolution</li> </ul> <p><b>FOSSIL ONLY</b></p> <ul style="list-style-type: none"> <li>DNA does not preserve well</li> <li>difficult to extract DNA from old fossils</li> <li>limited to skeletal similarities / differences</li> <li>e.g. cannot see colour of feathers or tissues or organ features</li> <li>different theories/interpretations arise</li> <li>can only estimate evolutionary relationships</li> <li>damaged / missing part / weathered</li> </ul> <p><b>ANATOMICAL ONLY</b></p> <ul style="list-style-type: none"> <li>not using DNA</li> <li>cannot use molecular analysis</li> </ul> |
|--|--|--|--|--|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

| Question |     |      | Answer                                                                                                                                                                                                                                                                   | Mark  | Guidance                                                                                                                                                                                                                                         |
|----------|-----|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 33       | (a) | (i)  | lenticel ✓                                                                                                                                                                                                                                                               | 1     | <b>ALLOW</b> phonetic spelling                                                                                                                                                                                                                   |
| 33       | (a) | (ii) | <p><i>Underside of leaf</i><br/>occurs faster / higher rate ✓</p> <p>only occurs at certain times of the day<br/>e.g. during the day / occurs less at night ✓<br/>(can be controlled by) guard cells ✓<br/>uses stomata ✓<br/>stomata / pores , can open and close ✓</p> | Max 3 | <p><b>ALLOW</b> ORA statements for gas exchange on bark where relevant</p> <p><b>ALLOW</b> underside of leaf has larger SA (for gaseous exchange)</p>                                                                                            |
| 33       | (b) |      | <p><b>FIRST CHECK THE ANSWER ON ANSWER LINE IF ANSWER = 305 AWARD 2 MARKS</b></p> <p><math>4 \times \pi (4.5)^2 = 254.5 \text{ cm}^2</math> ✓</p> <p><math>254.5 \times 1.2</math> ✓</p>                                                                                 | 2     | <p><b>ALLOW</b> 1 mark for calculation of surface area i.e. <math>254(.4690049408)</math></p> <p><b>ALLOW</b> 1 mark for correct surface area <math>\div 1.2 = 212(.0575)</math></p> <p><b>ALLOW</b> 1 mark for <math>305.3(62805929)</math></p> |



|    |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |       |                                                                                                                                                                                                                                                                                                                                  |
|----|-----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 34 | (c) | <p><i>man produces sperm but sperm ducts are blocked</i><br/> <b>Max 2</b><br/> (surgical) sperm retrieval / sperm removed from epididymis / AW ✓</p> <p>(followed by) intrauterine insemination / sperm inserted in uterus ✓</p> <p><i>sperm and oocytes produced but fertilisation does not occur</i><br/> <b>Max 2</b><br/> intra-cytoplasmic sperm injection / ICSI ✓<br/> single sperm injected into oocyte ✓<br/> fertilisation outside the , body / female / uterus ✓</p> <p>fertilised oocyte / embryo / zygote implanted ✓</p> | 4     | <p><b>IGNORE</b> ref. to treatment of blocked urethra<br/> <b>IGNORE</b> references to semen extraction</p> <p><b>ALLOW</b> insertion into oviduct e.g. ZIFT / GIFT<br/> <b>IGNORE</b> AI / IVF</p> <p><b>ALLOW</b> IVF / in vitro fertilization</p> <p><b>ALLOW</b> in a lab / petri dish / test tube, for outside the body</p> |
| 34 | (d) | <p>produces (large quantities of) , gametes / sperm ✓<br/> gametes are haploid / formed by meiosis ✓<br/> restores diploid number , after fertilisation / in zygote ✓<br/> prevents doubling of chromosome number (in each generation) ✓</p>                                                                                                                                                                                                                                                                                            | Max 3 | <p><b>DO NOT ALLOW</b> haploid cells become diploid</p>                                                                                                                                                                                                                                                                          |

|    |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|----|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 35 | (a)* | <p><b>Please refer to the marking instructions on page 4 of this mark scheme for guidance on how to mark this question.</b></p> <p><b>In summary:</b><br/> Read through the whole answer. (Be prepared to recognise and credit unexpected approaches where they show relevance.)<br/> 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.<br/> Then, award the higher or lower mark within the level, according to the <b>Communication Statement</b> (shown in <i>italics</i>):</p> <ul style="list-style-type: none"> <li>o award the higher mark where the Communication Statement has been met.</li> <li>o award the lower mark where aspects of the Communication Statement have been missed.</li> </ul> <p>• <b>The science content determines the level.</b><br/> • <b>The Communication Statement determines the mark within a level.</b></p>                 |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|    |      | <p><b>Level 3 (5–6 marks)</b><br/> Well-balanced comparison that includes statements of similarities <b>and</b> clear statements for differences between transcription in prokaryotes and humans.<br/> <i>There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.</i></p> <p><b>Level 2 (3–4 marks)</b><br/> Comparison that includes a statement of similarity <b>and</b> a differences between transcription in prokaryotes and humans.<br/> <b>OR</b><br/> Statements of similarities in the transcription of prokaryotes and eukaryotes.<br/> <b>OR</b><br/> Statements of differences in the transcription of prokaryotes and eukaryotes.<br/> <i>There is a line of reasoning presented with some structure. The information presented is relevant and supported by some evidence.</i></p> <p><b>Level 1 (1–2 marks)</b><br/> Comparison that includes similarities <b>or</b> differences between transcription in prokaryotes and humans.</p> | 6 | <p>Communication statement can be awarded if there is no incorrect use of terminology.</p> <p><b>Indicative scientific points may include</b></p> <p><b>SIMILARITIES</b></p> <ul style="list-style-type: none"> <li>• DNA acts as the template</li> <li>• role of DNA helicase</li> <li>• mRNA is produced</li> <li>• ribonucleotides are used</li> <li>• phosphodiester bonds formed</li> <li>• enzyme is RNA polymerase</li> <li>• binding site on DNA for RNA polymerase</li> </ul> <p><b>DIFFERENCES</b></p> <ul style="list-style-type: none"> <li>• takes place in nucleus in humans but in cytoplasm of prokaryotes</li> <li>• prokaryotic DNA template / chromosome is circular but is linear in human</li> <li>• translation and transcription occur simultaneously in prokaryotes but not in humans</li> <li>• mRNA in humans needs to be modified / spliced / edited but not in prokaryotes</li> <li>• detail of the differences in RNA splicing e.g. pre-mRNA contains introns</li> </ul> |

H422/01

Mark Scheme

June 2024

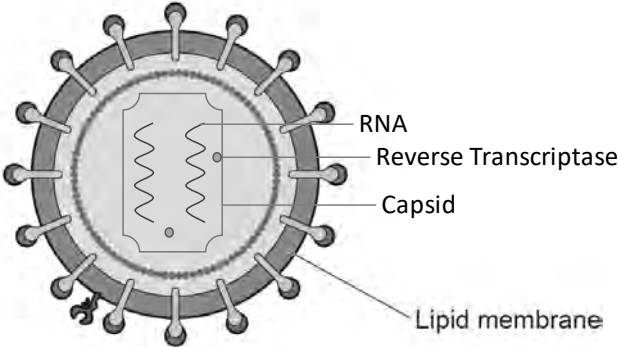
|  |  |                                                                                                                                                                                                                |  |                                                                                                                                                                                                         |
|--|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  |  | <p><i>There is an attempt at a logical structure with a line of reasoning. The information is in the most part relevant.</i></p> <p><b>0 marks</b><br/><i>No response or no response worthy of credit.</i></p> |  | <ul style="list-style-type: none"> <li>humans form pre-mRNA but mRNA in prokaryotes is (already) mature</li> <li>prokaryotic DNA is not bound to histones but human DNA is bound to histones</li> </ul> |
|--|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

H422/01

Mark Scheme

June 2024

| Question |     |  | Answer                                                                                                          | Mark         | Guidance |
|----------|-----|--|-----------------------------------------------------------------------------------------------------------------|--------------|----------|
| 35       | (b) |  | <b>Statement</b>                                                                                                | <b>T / F</b> |          |
|          |     |  | Argonaute proteins allow miRNA to bind to many different mRNA molecules.                                        | True / T ✓   |          |
|          |     |  | miRNA and siRNA are both derived from double-stranded RNA molecules.                                            | True / T ✓   |          |
|          |     |  | siRNA binds to a specific sequence of complementary DNA nucleotides which allows the Argonaute protein to bind. | False / F ✓  |          |

| Question |     |     | Answer                                                                                                                                                                                                                                                                                                                                    | Mark  | Guidance                                                                                                                                                                                                                                  |
|----------|-----|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 36       | (a) |     |  <p>inner core of HIV virus drawn to show, capsid, RNA and reverse transcriptase ✓<br/> <b>two</b> correctly labelled features ✓✓</p>                                                                                                                   | Max 3 | <p><b>ALLOW</b> only correct positions for the 3 inner core components<br/> <b>ALLOW</b> a max. 2 marks for labels<br/> e.g. reverse transcriptase / enzyme / capsid / capsomeres / RNA / glycoprotein / antigen / attachment protein</p> |
| 36       | (b) | (i) | <p>(viral) RNA is inserted into host cell / AW ✓<br/> reverse transcriptase turns RNA into (viral) DNA ✓<br/> (viral) DNA integrated into host cell DNA ✓<br/> host cell used , for transcription / to produce (viral) mRNA (from , viral / copy, DNA) ✓<br/> protease / enzyme / protein , synthesised / translated (by host cell) ✓</p> | Max 2 |                                                                                                                                                                                                                                           |

H422/01

Mark Scheme

June 2024

|    |     |       |                                                                                                                                                                                                                                                                                                                                                              |       |                                                                                                             |
|----|-----|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-------------------------------------------------------------------------------------------------------------|
| 36 | (b) | (ii)  | inhibitor / saquinavir , is similar shape to ,<br>substrate / large proteins ✓<br>(saquinavir) binds to active site of (protease enzyme) ✓<br>prevents / blocks, substrate / large proteins , binding ✓<br>prevents formation of<br>enzyme-substrate complexes / ESC ✓<br>binding of inhibitor / saquinavir is , reversible /<br>temporary / not permanent ✓ | Max 3 | <b>DO NOT ALLOW</b> reference to target molecules<br><br><b>IGNORE</b> causes a decrease in enzyme activity |
| 36 | (b) | (iii) | cannot , breakdown (large) proteins /<br>produce smaller polypeptides ✓<br>cannot form , structural / functional , viral ,<br>polypeptides / proteins / enzymes / protease ✓<br>example e.g. small polypeptides may be<br>needed to form (viral) protein coat ✓                                                                                              | Max 2 |                                                                                                             |
| 36 | (c) | (i)   | many / collection of , symptoms /<br>may affect different body organs ✓<br><i>idea that</i> involves different (named) diseases<br>caused by suppressed immune system ✓<br>characteristic of a condition ✓                                                                                                                                                   | Max 2 | <b>ALLOW</b> systems for organs<br><br>e.g. pneumonia                                                       |
| 36 | (c) | (ii)  | <b>Any two from</b><br>use of (named) antivirals for infected people ✓<br>screening blood ✓<br>encouraging , protected sex / use of condoms ✓<br>testing 'at risk' groups ✓<br>encouraging use of clean needles e.g. for drug users ✓                                                                                                                        | Max 2 |                                                                                                             |

23

|           |            |  |                                                                                                                                                                                                                                                                                                                                                                                                  |              |                                                       |
|-----------|------------|--|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|-------------------------------------------------------|
| <b>37</b> | <b>(b)</b> |  | <p>increased <math>\text{VO}_2</math> max ✓</p> <p>enlarged heart / hypertrophy ✓</p> <p>increased force of ventricular systole ✓</p> <p>increased thickness of heart muscle wall ✓</p> <p>decreased resting heart rate / bradycardia ✓</p> <p>increased stroke volume / cardiac output ✓</p> <p>decreased recovery time (for resting heart rate) ✓</p> <p>increase in erythrocytes number ✓</p> | <b>Max 3</b> | <b>Answers must relate to circulatory system only</b> |
|-----------|------------|--|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|-------------------------------------------------------|

## 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/ocrextams**



**/ocrextams**



**/company/ocr**



**/ocrextams**



**CAMBRIDGE**  
UNIVERSITY PRESS & ASSESSMENT

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

For staff training purposes and as part of our quality assurance programme your call may be recorded or monitored. © OCR 2024 Oxford Cambridge and RSA Examinations is a Company Limited by Guarantee. Registered in England. Registered office The Triangle Building, Shaftesbury Road, Cambridge, CB2 8EA.

Registered company number 3484466. OCR is an exempt charity.

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.