# GCE

# Biology A

## H020/01: Breadth in biology

AS Level

# Mark Scheme for June 2025

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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.

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## 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 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 available in RM Assessor.
3. Log-in to RM Assessor and mark the **required number** of practice responses (“scripts”) and the **required number** of standardisation responses.

### 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 50% Batch 1 and 100% Batch 2) deadlines. If you experience problems, you must contact your Team Leader (Supervisor) without delay.
4. If you are in any doubt about applying the mark scheme, consult your Team Leader by telephone, email or via the RM Assessor messaging system.

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, the one inside the box should be marked and any other responses outside the box should be ignored, unless the response inside the box has been crossed out. If no response is inside the box and a single answer is outside this can be marked. If a candidate provides two responses outside the box (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 SEEN/other appropriate annotation 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 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 email.

9. Assistant Examiners will send a brief report on the performance of candidates to their Team Leader (Supervisor) via email by the end of the marking period. The report should contain notes on particular strengths displayed as well as common errors or weaknesses. Constructive criticism of the question paper/mark scheme is also appreciated.

10. For answers marked by levels of response:

Read through the whole answer from start to finish, 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.**

There are no Level of response questions on this paper.

11. Annotations available in RM Assessor

| *Annotation* | *Meaning* |
|---|---|
|  | Correct response |
|  | Incorrect response |
|  | Omission mark |
|  | Benefit of doubt given |
|  | Contradiction |
|  | Large dot |
|  | Error carried forward |
|  | Benefit of doubt not given |
|  | Noted but no credit given |
|  | Given mark |
|  | Indicates errors / incorrect terminology |
|  | Ignore |
|  | Blank page |

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

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

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 | AO element | Guidance |
|---|---|---|---|---|---|---|
| | | | | | | |
| **1** | | | C ✓ | **1** | 1.1 | |
| **2** | | | B ✓ | **1** | 1.2 | |
| **3** | | | B ✓ | **1** | 1.1 | |
| **4** | | | C ✓ | **1** | 2.7 | |
| **5** | | | D ✓ | **1** | 2.8 | |
| **6** | | | B ✓ | **1** | 1.1 | |
| **7** | | | D ✓ | **1** | 1.1 | |
| **8** | | | B ✓ | **1** | 1.1 | |
| **9** | | | C ✓ | **1** | 2.1 | |
| **10** | | | C ✓ | **1** | 2.3 | |
| **11** | | | C ✓ | **1** | 1.2 | |
| **12** | | | C ✓ | **1** | 2.5 | |
| **13** | | | B ✓ | **1** | 1.2 | |
| **14** | | | A ✓ | **1** | 1.2 | |
| **15** | | | A ✓ | **1** | 1.2 | |
| **16** | | | C ✓ | **1** | 1.2 | |
| **17** | | | D ✓ | **1** | 2.1 | |
| **18** | | | A ✓ | **1** | 2.4 | |
| **19** | | | C ✓ | **1** | 1.1 | |
| **20** | | | A ✓ | **1** | 2.1 | |

| Question | | | Answer | Marks | AO element | Guidance |
|---|---|---|---|---|---|---|
| 21 | (a) | (i) | *Stage R* = metaphase (2)<br>**AND**<br>*Stage S* = anaphase (2) ✓ | **1** | 1.2 | **ALLOW** spelling errors if stage is clear e.g. metaphae / anaphae / metaphasse<br><br>**DO NOT ALLOW** metaphase 1<br><br>**DO NOT ALLOW** anaphase 1 |
| | | (ii) | 1 are a similar / same , length ✓<br><br>2 (consist of) one maternal and one paternal (chromosome) / AW ✓<br><br>3 (have / carry the) same, genes / gene loci / AW ✓<br><br>4 (both) have centromere, in same position ✓<br><br>5 have same banding pattern ✓<br><br>6 (may / can, have / contain) different, alleles / versions of the same gene / genotypes / AW ✓<br><br>7 able to crossover (in prophase 1) ✓ | **2 max** | 1.1 | **Mark as prose**<br><br>**ALLOW** similar / same, shape / size<br>**ALLOW** equal in length<br><br>**ALLOW** ref to DNA instead of chromosome<br>**ALLOW** one chromosome from each parent<br>**DO NOT ALLOW** ref to single chromatid<br><br>**DO NOT ALLOW** genetically identical / same genetic information / same alleles / same amount / same genotype<br><br>**DO NOT ALLOW** in the middle<br><br>**ALLOW** not genetically identical / different DNA |

| Question | | | Answer | Marks | AO element | Guidance |
|---|---|---|---|---|---|---|
| | | **(iii)** | 1 <u>centromere</u>, divides / pulls apart / splits / AW ✓<br><br>2 spindle (fibres), shorten / contract / condense ✓<br><br>3 (individual) chromosome(s) / (sister) chromatids , pulled apart / separated ✓<br><br>4 (brought / moved / migrate) to , opposite / either , pole(s)/end(s)/side(s) (of the cell) ✓ | **2 max** | 1.2 | e.g. chromosome is pulled apart , by / at , the <u>centromere</u><br><br>**ALLOW** spindle fibres depolymerise<br><br>**DO NOT ALLOW** non-sister chromatids<br>**DO NOT ALLOW** chromosome(s) unless it is clear one chromosome is being separated into 2 chromatids |
| | **(b)** | **(i)** | asexual reproduction ✓<br><br>clonal expansion (of lymphocytes) ✓ | **1** | 1.2 | **IGNORE** development of body plan as an example of growth in the stem of the question<br><br>**ALLOW** named examples of asexual reproduction (vegetative propagation / binary fission / spore formation/ parthenogenesis/budding)<br><br>**ALLOW** described e.g. cloning of lymphocytes, clonal proliferation<br>e.g. T cells divide by mitosis<br>**DO NOT ALLOW** reference to mitosis alone |

| Question | | | Answer | Marks | AO element | Guidance |
|---|---|---|---|---|---|---|
| | | (ii) | Process: crossing over (of non-sister chromatids) / (formation of) chiasmata<br>Stage: prophase 1 ✓<br><br>Process: independent assortment of, chromosomes / homologous pairs / bivalents<br>Stage: metaphase 1 ✓<br><br>Process: independent assortment of, chromosomes / (sister) chromatids<br>Stage: in metaphase 2 ✓ | 3 | 1.2 | **ALLOW** ECF if they swap correct process and stage e.g.<br>Process 1: prophase 1 & Stage: crossing over.<br>Process 2: metaphase 1 & Stage: independent assortment of homologous pairs<br>Would be awarded 1 mark for Process 2 & Stage 2<br>**ECF**<br><br>**ALLOW** random for independent<br><br>**ALLOW** anaphase 1<br><br>**ALLOW** random for independent<br><br>**ALLOW** anaphase 2 |
| | | | **Total** | **9** | | |

| Question | | | Answer | Marks | AO element | Guidance |
|---|---|---|---|---|---|---|
| **22** | **(a)** | | double helix ✓<br><br>hydrogen / H , bond (s) ✓<br><br>three / 3 (hydrogen) ✓ | **3** | 1.1 | <br><br>**DO NOT ALLOW** $H_2$ bonds<br><br>**ALLOW** more / triple |
| | **(b)** | **(i)** | linear DNA / not circular DNA ✓<br><br>DNA (organised) in (pairs of) chromosomes (rather than 1 chromosome) ✓ | **1 max** | 1.1 | **IGNORE** ref to circular DNA in prokaryotes only<br>**IGNORE** ref to no plasmids in prokaryotes / mitochondrial/chloroplast DNA in eukaryotes |

| Question | | | Answer | Marks | AO element | Guidance |
|---|---|---|---|---|---|---|
| | | (ii) | *'stops DNA replication because……'*<br><br>1 (Zelpolib) acts as / is a <u>competitive inhibitor</u> ✓<br><br>2 stops DNA polymerase from binding, to a nucleotide (on the end of the chain) / to the (existing) DNA (strand)✓<br><br>3 prevents / reduces / slows down , formation of <u>phosphodiester</u> bonds between nucleotides ✓<br><br>4 (so) the sugar/deoxyribose , of one nucleotide , cannot be joined/bonded , to the phosphate of another ✓<br><br>5 stops elongating the polynucleotide chain / AW ✓ | **2 max** | 2.5 | **ALLOW** enzyme(s) for Zelpolib throughout<br>**IGNORE** description of what DNA polymerase does alone<br><br>**DO NOT ALLOW** complementary nucleotides / base pairs<br><br>**ALLOW** cannot form (new) sugar/phosphate backbone<br><br>e.g. (continuous / full) chain of DNA cannot be formed<br>e.g. inhibits the growth of the DNA chain<br>e.g. cannot add nucleotides to the, new/forming, DNA strand |
| | | | **Total** | **6** | | |

| Question | | | Answer | Marks | AO element | Guidance |
|---|---|---|---|---|---|---|
| 23 | (a) | (i) | **FIRST CHECK ON ANSWER LINE**<br>**If answer = 0.6:1 , award 2 marks** ✓✓<br><br>Surface area = 4 x π x $5^2$ = 314 - 314.1592654<br>**AND**<br>Volume = 4/3 x π x $5^3$ = 523.5987756 - 524✓ | **2** | 2.2 | **Max 1 mark for 0.6 alone on answer line**<br>**Max 1 if ratio has not been simplified e.g. 3:5, 314:524 , 314.2:523.6 , 157:262**<br>**DO NOT ALLOW** fractions e.g. 5/3:1<br>**ALLOW** any (correct) dp in range when rounded correctly e.g. 314.2<br><br>*Calculations:*<br>Surface area = 4 x π x $5^2$ = 314.1592654<br><br>Volume = 4/3 x π x $5^3$ = 523.5987756<br><br>314.1592654÷ 523.5987756 = 0.6 |
| | | (ii) | **FIRST CHECK ON ANSWER LINE**<br>**If answer = 5300 (times), award 2 marks** ✓✓<br><br>Measure length of scale bar = 42mm / 4.2 cm and convert into 42 000µm (x1000 or x10,000)<br><br>**OR**<br><br>Conversion of 8um into 0.008mm / 0.0008cm<br><br>**OR**<br><br>Correct application of magnification calculation:<br>magnification = image / actual ✓ | **2** | 2.2 | **Max 1 for more than 2 sig figs**<br><br>**ALLOW** correct standard form e.g. 5.3x$10^3$ for 2 marks<br><br>**ALLOW** for 2 marks correct sig figs for matching measurements in range of 40-45mm for e.g.:<br>40mm → 5100 / 5.1x$10^3$<br>40.5mm → 5100 / 5.1x$10^3$<br>41mm → 5100 / 5.1x$10^3$<br>41.5 mm → 5200 / 5.2x$10^3$<br>42mm → 5300 / 5.3x$10^3$<br>42.5mm → 5300 / 5.3x$10^3$<br>43mm → 5400 / 5.4x$10^3$<br>43.5mm → 5400 / 5.4x$10^3$<br>44mm → 5500 / 5.5x$10^3$<br>44.5mm → 5600 / 5.6x$10^3$<br>45mm → 5600 / 5.6x$10^3$<br><br>** See appendix for modified paper measurements |

| Question | | | Answer | Marks | AO element | Guidance |
|---|---|---|---|---|---|---|
| | | (iii) | 1 (B lymphocyte) differentiates / specialises (into plasma cell) ✓<br><br>2a (larger cell for) more / larger, RER / AW<br>**OR**<br>2b (larger cell for) more / larger, Golgi (apparatus / body) / AW ✓<br><br>3 *idea of* RER / Golgi being used for protein production **AND** that antibodies are proteins ✓<br><br>4 more mitochondria for , (more) ATP (production) / energy release / <u>aerobic</u> respiration ✓<br><br>5 (so) more antibody production / as they (plasma cells) produce antibodies ✓ | **3 max** | 1.2<br>2.5 | **ALLOW** differentiation / specialisation in correct context<br><br>e.g. plasma cell contains large amounts of RER<br><br>e.g. B lymphocyte does not contain Golgi but plasma cells do<br><br>**DO NOT ALLOW** energy production / make energy |
| | **(b)** | **(i)** | (T) Helper (cell) ✓ | **1** | 1.1 | |

| Question | | | Answer | Marks | AO element | Guidance |
|---|---|---|---|---|---|---|
| | | (ii) | 1 (some) differentiate / specialise , into (B) memory cells ✓<br><br>2 (B memory cells) undergo / causes / result in / AW , faster / more rapid, clonal selection / clonal expansion / mitosis / division (on re-exposure to same pathogen) ✓<br><br>3 *idea of* fast(er) / great(er) / (more) rapid , secondary / AW , immune response / AW ✓<br><br>4 (providing) long-term / lasting , immunity ✓ | **2 max** | 1.2<br>2.5 | Process X = differentiation<br>Cell Y = memory cells<br><br>**DO NOT ALLOW** change / form / become / divide / clonal expansion<br><br>**ALLOW** clonal proliferation<br><br>e.g. fast secondary response<br>e.g. faster immune response in future infection<br>e.g. greater/ faster production of antibodies in future infections<br>e.g. plasma cells rapidly produce antibodies if pathogen return |
| | **(c)** | **(i)** | *No because…*<br><br>(*t*-test) measures the <u>significance</u> of the difference between <u>two</u> means ✓<br><br>median is not appropriate / mean data not available ✓ | **2** | 3.3 | **DO NOT ALLOW** if state it is appropriate<br><br>**IGNORE** average/s<br><br>**ALLOW** <u>only</u> have medians<br>**ALLOW** implication mean is needed/used<br>e.g. the t-test measures the difference between means |

| Question | | | Answer | Marks | AO element | Guidance |
|---|---|---|---|---|---|---|
| | | (ii) | 1 (the study had) small , sample sizes / patient numbers / (the study needs) larger sample sizes ✓<br><br>2 no idea of ages of individuals ✓<br><br>3 no idea of sex of individuals✓<br><br>4 no idea of , dosage / regime of drug ✓<br><br>5 no idea of health of participants (regardless of SLE) ✓<br><br>6a (only 10 weeks) too short timescale , to know long term effect<br>**OR**<br>6b may need longer to work ✓<br><br>7a starting , levels / number , of plasma cells is unknown / may vary<br>**OR**<br>7b some patients could have , higher / lower , starting levels than others ✓ | **2 max** | 3.1<br>3.2 | **Mark as prose**<br><br>**IGNORE** different , group / sample , sizes<br>e.g. CYC had the smallest sample size number of patients<br><br>**ALLOW** ages not controlled<br><br>**ALLOW** sex not controlled<br><br>**ALLOW** dosage not controlled<br><br>**ALLOW** health /previous , conditions not controlled<br>**ALLOW** no idea whether participants take other medicines which may affect SLE drug treatment |
| | | | **Total** | **14** | | |

| Question | | | Answer | Marks | AO element | Guidance |
|---|---|---|---|---|---|---|
| 24 | (a) | | *Statement 1*<br><br>Error – channel (proteins)<br>**AND**<br>Correction – carrier (proteins) ✓<br><br>*Statement 2*<br><br>Error – glucose<br>**AND**<br>Correction – sucrose ✓<br><br>*Statement 3*<br><br>Error – use ATP (to change shape)<br>**AND**<br>Correction – uses the proton gradient (to cotransport the sucrose into the sieve tubes) / AW<br><br>**OR**<br><br>Error – cotransporter (proteins) **AND** sugar (molecules)<br>**AND**<br>Correction – carrier (proteins) **AND** protons ✓ | **3** | 1.2 | **IGNORE** ref to protons / $H^+$ / hydrogen ions<br>**DO NOT ALLOW** glucose AND sucrose<br><br>**ALLOW** H ions / $H^+$ / Hydrogen ions for proton/s throughout |

| Question | | | Answer | Marks | AO element | Guidance |
|---|---|---|---|---|---|---|
| | (b) | (i) | 1 volume of ethanol (solution beetroot placed in / in the test tube) ✓<br><br>2 temperature (of ethanol solution) ✓<br><br>3 surface area / SA of beetroot ✓<br><br>4 blotting technique (after cutting) ✓<br><br>5 same (type / varieties / age / colour / species of) beetroot ✓<br><br>6 same , area / part / no skin on , beetroot ✓ | **2 max** | 2.7<br>3.3 | **IGNORE** time (as given in method)<br>**IGNORE** pH<br>**IGNORE** ref to number of repeats (of investigation) / no statistical analysis<br><br>**IGNORE** amount of ethanol<br>**ALLOW** unit for volume e.g.$cm^3$<br><br>**ALLOW** size / length/ volume<br>**IGNORE** mass / amount / shape<br><br>**DO NOT ALLOW** in terms of 'after 10 min' |
| | | (ii) | *idea that* choice of filter depends on colour of solution measured ✓<br><br>Benedict's test is a blue solution , this is , purple / red (solution) ✓ | **1 max** | 3.4 | **ALLOW** *idea that* red pigment/solution will reflect red light (making absorption low) ORA for transmission<br>**ALLOW** like will reflect like / colour of filter should be different to colour of , pigment / solution |

| Question | | | Answer | Marks | AO element | Guidance |
|---|---|---|---|---|---|---|
| | | (iii) | 1 calculate / AW , mean ✓<br><br>2 calculate / AW , standard deviation ✓<br><br>3 calculate / AW , range of (the) date ✓<br><br>4 if the standard deviation / range , is smaller, the repeatability is high(er) / data is more repeatable ✓ | 3 | 3.1<br>3.2 | **IGNORE** average<br>**IGNORE** ref to other groups results / more repeats<br><br>e.g. get the mean<br><br>**ALLOW** SD<br>e.g. workout the standard deviation<br><br>e.g. find out the range<br><br>**ALLOW** ref to smaller error bars (if linked to SD) the repeatability is high(er) / data is more repeatable<br>**ALLOW** ORA<br><br>e.g. 'calculate mean to get standard deviation' awarded MP 1 and 2 |
| | | | **Total** | **9** | | |

| Question | | | Answer | Marks | AO element | Guidance |
|---|---|---|---|---|---|---|
| **25** | **(a)** | | has a small(er) / low surface area to volume ratio ✓<br><br>has a high(er) <u>metabolic</u> , demand / rate / activity / need(s) ✓ | **2** | 2.1 | **IGNORE** diffusions rate too slow<br><br>**ALLOW** SA:V<br><br>**IGNORE** use more energy |

| Question | | | Answer | Marks | AO element | Guidance |
|---|---|---|---|---|---|---|
| | (b) | | Convention (on) International Trade (in) Endangered Species / CITES ✓<br><br>(Rio) Convention (on) Biological Diversity / CBD ✓ | 1 max | 2.1 | **IGNORE** other examples e.g. CPPS , IUCN<br><br>**DO NOT ALLOW** CITE |
| | (c) | (i) | **FIRST CHECK ON ANSWER LINE**<br>**If answer = 43, award 2 marks** ✓✓<br><br>1 beat in 1.4 (s / seconds)<br><br>OR<br><br>60 / 1.4 = 42.857<br><br>OR<br><br>1 / 1.4 x 60 = 42.857 ✓ | 2 | 2.8 | **ALLOW** 41 – 44 bpm<br><br>**MAX 1 answer not to nearest whole number e.g. 42.857**<br><br>**ALLOW** 1 beat in 1.35-1.48 s range<br>**ALLOW** 1.4 annotated on trace<br><br>**ECF for 1 mark**<br>incorrect reading of beats per second e.g.<br>3.75 seconds for 3 beats<br>3.75 / 3 = 1 beat per 1.25 seconds<br>60 / 1.25 = 48bpm gets 1 mark<br><br>3 beats in 3.75 seconds<br>3 / 3.75 = 0.8 beats per second<br>0.8 x 60 = 48bpm gets 1 mark |

| Question | | | Answer | Marks | AO element | Guidance |
|---|---|---|---|---|---|---|
| | | (ii) | **more**, heart beats / waves /spikes, in same / shorter time (period) / visible / shown<br>**OR**<br>**higher frequency** of beats ✓<br><br>(P)QRS(T) (complex/s) / R (peaks), **closer** together<br>**OR**<br>**smaller gap** between T and P (waves) ✓ | **2** | 2.6 | **IGNORE** description of tachycardia, response must link to appearance of ECG – so ref to rate not awarded<br><br>**ALLOW** more/higher , beats per minute / bpm<br>**ALLOW** more beats in 3.75 seconds<br><br>**ALLOW** (P)QRS(T) wave more frequent<br><br>**ALLOW** annotated diagram |
| | | | **Total** | **7** | | |

| Question | | | Answer | Marks | AO element | Guidance |
|---|---|---|---|---|---|---|
| **26** | **(a)** | | <table><tr><th>Statement</th><th>True</th><th>False</th></tr><tr><td>They both contain mitochondria</td><td></td><td>✓</td></tr><tr><td>They both contain enzymes</td><td>✓</td><td></td></tr><tr><td>They can both undergo mitosis</td><td></td><td>✓</td></tr></table> | **2** | 1.1<br>2.1 | 3 correct = 2 marks<br>1 or 2 correct = 1 mark<br>**ALLOW** crosses in place of ticks where only 1 response is used per row |

| Question | | | Answer | Marks | AO element | Guidance |
|---|---|---|---|---|---|---|
| | (b) | | *Suggest 1*<br>(student) had not added stain(s) / not visible unless stained / stain should have been added AW ✓<br><br>*Explain 2*<br>*idea that* staining increases contrast (to make white blood cells visible) ✓<br><br>**OR**<br><br>*Suggest 2*<br>*idea that* no white blood cells in field of view ✓<br><br>*Explain 2*<br>(due to) small number of white blood cells in blood smear<br>**OR**<br>*idea of* proportionally less white blood cells lowering chances of seeing one✓ | **2 max** | 3.3<br>3.4 | **ALLOW** examples of relevant named stains: haemtoxylin , Eosin , HE , Giemsa, Pappenheim, hematoxylin-eosin, methylene blue, tetrachrome.<br>**ALLOW** dye/s in place of stain<br>**ALLOW** ORA<br><br>e.g. some parts of the cell will appear darker than others<br><br>e.g. field of view is too small to see any WBCs<br><br>e.g. if the person does not have an infection there will be less / few WBCs<br>**DO NOT ALLOW** no white blood cells in blood<br>**IGNORE** ref to ill/ness / sick/ness unqualified |
| | (c) | | 1 research / developmental biology ✓<br><br>2 to treat autoimmune diseases ✓<br><br>3 develop new drugs ✓<br><br>4 regenerative medicine / growing new organs (around bioscaffold/s) ✓<br><br>5 micropropagation (in plants) ✓ | **1 max** | 1.1 | **IGNORE** personalised medicine<br><br>**ALLOW** named disease e.g. type 1 diabetes,<br>**DO NOT ALLOW** named neurological diseased<br><br>**ALLOW** test/ing new drugs<br>**DO NOT ALLOW** develop/ing new medicine/s<br><br>**ALLOW** tissue engineering / skin graft<br>**IGNORE** growing new limbs / body parts |
| | | | **Total** | **5** | | |

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