# GCE A LEVEL MARKING SCHEME

**SUMMER 2022**

**A LEVEL**
**BIOLOGY – COMPONENT 2**
**A400U20-1**

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## INTRODUCTION

This marking scheme was used by WJEC for the 2022 examination. It was finalised after detailed discussion at examiners' conferences by all the examiners involved in the assessment. The conference was held shortly after the paper was taken so that reference could be made to the full range of candidates' responses, with photocopied scripts forming the basis of discussion. The aim of the conference was to ensure that the marking scheme was interpreted and applied in the same way by all examiners.

It is hoped that this information will be of assistance to centres but it is recognised at the same time that, without the benefit of participation in the examiners' conference, teachers may have different views on certain matters of detail or interpretation.

WJEC regrets that it cannot enter into any discussion or correspondence about this marking scheme.

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# GCE A LEVEL BIOLOGY

## COMPONENT 2 – CONTINUITY OF LIFE

## SUMMER 2022 MARK SCHEME

### GENERAL INSTRUCTIONS

Recording of marks

Examiners must mark in red ink.

One tick must equate to one mark (apart from the questions where a level of response mark scheme is applied).

Question totals should be written in the box at the end of the question.

Question totals should be entered onto the grid on the front cover and these should be added to give the script total for each candidate.

Marking rules

All work should be seen to have been marked.

Marking schemes will indicate when explicit working is deemed to be a necessary part of a correct answer.

Crossed out responses not replaced should be marked.

Credit will be given for correct and relevant alternative responses which are not recorded in the mark scheme.

Extended response question

A level of response mark scheme is used. Before applying the mark scheme please read through the whole answer from start to finish. Firstly, decide which level descriptor matches best with the candidate's response: remember that you should be considering the overall quality of the response. Then decide which mark to award within the level. Award the higher mark in the level if there is a good match with both the content statements and the communication statement. Award the middle mark in the level if most of the content statements are given and the communication statement is partially met. Award the lower mark if only the content statements are matched.

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Marking abbreviations

The following may be used in marking schemes or in the marking of scripts to indicate reasons for the marks awarded.

cao = correct answer only
ecf = error carried forward
bod = benefit of doubt

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<table>
<tr><th colspan="4" rowspan="2">Question</th><th rowspan="2">Marking details</th><th colspan="6">Marks Available</th></tr>
<tr><th>AO1</th><th>AO2</th><th>AO3</th><th>Total</th><th>Maths</th><th>Prac</th></tr>
<tr><td>1</td><td>(a)</td><td>(i)</td><td></td><td>9 or 10 mm (2)<br>If incorrect<br>Award 1 mark for<br>Value between 9.19 and 9.72 (1)<br>Measurement of (46 or 47 ÷ 29 or 30) x 6 (1)</td><td></td><td>2</td><td></td><td>2</td><td>2</td><td></td></tr>
<tr><td></td><td></td><td>(ii)</td><td></td><td><table><tr><td>Domain</td><td>Eukaryote / Eukarya/ Eukaryota</td></tr><tr><td>Kingdom</td><td>Animalia / Animals</td></tr><tr><td>Phylum</td><td>Mollusca</td></tr><tr><td>Class</td><td>Gastropoda</td></tr><tr><td>Order</td><td>Pulmonata</td></tr><tr><td>Family</td><td>Hygromiidae</td></tr><tr><td>Genus</td><td>Candidula must have Capital C</td></tr><tr><td>Species</td><td>intersecta must have lower case i</td></tr></table>4 correct = 2 marks<br>3/2 correct = 1 mark<br>0/1 = 0 marks<br>Correct spellings of genus and species</td><td></td><td>2</td><td></td><td>2</td><td></td><td></td></tr>
<tr><td></td><td>(b)</td><td>(i)</td><td></td><td>Any two (x1) from<br>Many alleles (1)<br>For the same gene / at the same locus (1)<br>Cannot be maintained by mutation alone / owtte (1)</td><td>2</td><td></td><td></td><td>2</td><td></td><td></td></tr>
<tr><td></td><td></td><td>(ii)</td><td></td><td>No {statistical/ significant} difference between the <u>observed</u> and <u>expected</u> (results/ bands) (1)</td><td></td><td>1</td><td></td><td>1</td><td>1</td><td></td></tr>
<tr><td></td><td></td><td>(iii)</td><td></td><td>Modes: A = 6 and B = 3(1)</td><td></td><td>1</td><td></td><td>1</td><td>1</td><td></td></tr>
</table>

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| Question | | | | Marking details | Marks Available | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | AO1 | AO2 | AO3 | Total | Maths | Prac |
| | | (iv) | | **Any three (x1) from**<br>A. (Vegetation and soil type / environment) act as selection pressures / different selection pressures at each site (1)<br>B. Site A (short grass + dark soil) more bands +<br>Site B (Marram grass + sandy soil) fewer bands provide better camouflage (1)<br>C. (Better camouflaged) increased chance of survival/ selective advantage/ less chance of predation/ owtte (1)<br>D. So can reproduce + pass on (advantageous) allele(s) (to offspring) (1) | | 3 | | 3 | | |
| | | (v) | | **Any three (x1) from**<br>A. (Estuary / sea / seawater/ river) acts a {physical/ geographical} barrier between the populations / description of geographical isolation/ allopatric speciation (1)<br>B. Different selection pressures (on the populations at each site) (1)<br>C. Different alleles {selected for / provide competitive advantage} in different sites / ORA / random mutations will be different in each population/ snails with advantageous alleles are more likely to survive (1)<br>D. {Genetic drift/ no gene flow/ no exchange of alleles} due to no interbreeding (1) | | | 3 | 3 | | |
| | | | | **Question 1 total** | **2** | **9** | **3** | **14** | **4** | **2** |

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| Question | | | | Marking details | Marks Available | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | AO1 | AO2 | AO3 | Total | Maths | Prac |
| **2** | (a) | (i) | | A. {Absorption/entry} of water / imbibition (1)<br>B. Gibberellins (released by embryo)/ {proteins/food reserves} {hydrolysed/mobilised} (1)<br>C. Caused release of amino acids from aleurone layer / triggers {transcription and translation/ protein synthesis}/ to release amino acids (1)<br>D. (Amino acids) used to synthesise amylase (1) | 4 | | | 4 | | |
| | | (ii) | | **Any two (x1) from**<br>(Agar) no effect on rate of diffusion/ same resistance for amylase to diffuse (1) OWTTE<br>(Starch) same number of molecules to digest / suitable description (1)<br>Both are controlled variables / so the results are due to amylase activity only (1) | | | 2 | 2 | | 2 |
| | (b) | (i) | | 18, 18, 19 (1)<br>mean = 18 (1) reject 18.333333333 ecf from measurements | | 2 | | 2 | 2 | 2 |
| | | (ii) | | x axis: Time after germination + days **and**<br>y axis: <u>Mean</u> maximum diameter of clear area + mm (1)<br>Suitable scale on both axes + a number at origin (1)<br>Correct plots (1)<br>Correct range bars (1)<br>Suitable line drawn (1)<br>Accept inverted axes | 1<br>1 | 1<br>2 | | 5 | 2 | |

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| Question | | | | Marking details | Marks Available | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | AO1 | AO2 | AO3 | Total | Maths | Prac |
| | | (iii) | | {Range of results around / variation of results from} the mean / from maximum to minimum (1)<br>(Provide information on) {repeatability / reliability / consistency} of the data/ overlap of data (1)<br>Reject ref to accuracy / variance / standard deviation / error | | | 2 | 2 | | 2 |
| | (c) | | | **Any three (x1) from:**<br>A. {Leaves/ shoot} appears {at 8 days/ above soil} (1)<br>B. Which are able to photosynthesise (1)<br>C. So plant can produce its own glucose (1)<br>D. Therefore less starch needs to be broken down / most starch already broken down (1) | | | 3 | 3 | | |
| | | | | **Question 2 total** | **6** | **5** | **7** | **18** | **4** | **6** |

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| Question | | | | Marking details | Marks Available | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | AO1 | AO2 | AO3 | Total | Maths | Prac |
| **3** | (a) | (i) | | <table><tr><td>FSH and LH control the development and release of a secondary oocyte</td><td>**A**</td></tr><tr><td>meiosis I takes place before birth to produce about 100 000 primary oocytes</td><td>**A**</td></tr><tr><td>secretions are neutralised by alkaline seminal fluid during intercourse</td><td>**F**</td></tr><tr><td>oxytocin has a positive feedback effect during birth</td><td>**C**</td></tr></table><br>All 4 ✓ = 3; 3 ✓ = 2; 2✓ = 1; 0/1 ✓ = 0 | | 3 | | 3 | | |
| | | (ii) | | In males **G** (urethra) carries urine and semen **AND** in females only carries urine (1) | | 1 | | 1 | | |
| | | (iii) | | Ciliated (epithelium) (1)<br>B = move {blastocyst / (fertilised) ovum / ($2^o$) oocyte} to uterus (1)<br>(trachea) = move mucus (out of breathing system) (1) | 3 | | | 3 | | |
| | (b) | (i) | | Has not completed meiosis / is suspended in metaphase II / meiosis II only completed {on entry of/when fertilised by} sperm (1)<br>Chromosomes still have two chromatids / only first polar body produced / has not released second polar body (1) | 1 | 1 | | 2 | | |
| | | (ii) | | Cortical reaction /{exocytosis / release (the contents)} of cortical granules (1)<br>Zona pellucida {modified/ thickened} / fertilisation membrane formed (1) | 2 | | | 2 | | |

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| Question | | | | Marking details | Marks Available | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | AO1 | AO2 | AO3 | Total | Maths | Prac |
| | | (iii) | | In B sperm does not have to digest a path to ($2^o$) oocyte / in A sperm may not be able to penetrate the {zona pellucida / corona radiata}/ does not need an acrosome reaction (1)<br>In B nucleus injected directly (into $2^o$ oocyte)/ ensures nucleus enters (secondary oocyte) (1) | | | 2 | 2 | | |
| | | (iv) | | (Zygote) contains {(nearly) all/most of} the {cytoplasm/organelles} (1)<br>So can divide rapidly / less time needed between cell divisions/ enough {(named)organelles/ nutrients} present for cell division (1) | | 1 | 1 | 2 | | |
| | | | | **Question 3 total** | **6** | **6** | **3** | **15** | **0** | **0** |

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| Question | | | | Marking details | Marks Available | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | AO1 | AO2 | AO3 | Total | Maths | Prac |
| **4** | (a) | (i) | | Nitrate: synthesis of {proteins/ amino acids / nucleic acids / chlorophyll/ ATP/ any compound containing nitrogen}<br>Phosphate: {nucleic acids / phospholipids/nucleotides/ ATP/ DNA/ RNA} | 2 | | | 2 | | |
| | | (ii) | | Endodermis (1)<br>{Cadmium/ions} have to be actively transported into cells (1)<br>{Synthesis of ATP / {oxygen needed for/ aerobic} respiration} (1) | 1 | 2 | | 3 | | |
| | (b) | (i) | | (Area B) results show {even/ symmetrical} distribution around the mean / bell-shaped curve/ mean, median, mode the same | 1 | | | 1 | 1 | |
| | | (ii) | | Continuous | 1 | | | 1 | | |
| | | (iii) | | **Any two (x1) from**<br>Cannot use Chi$^2$ because {data is {continuous / non-categoric} / cannot calculate Expected results} (1)<br>Cannot use t-test because data is not normally distributed (1)<br>data is continuous + not normally distributed/ ORA (1) | | 2 | | 2 | 2 | |
| | | (iv) | | **Any 4 (x1) from:**<br>A. {At start/ at high concentrations} only C can survive (1)<br>B. But C can only survive at [Cd] above 10au/ ORA (1)<br>C. So would die out as Cd falls (1)<br>D. So need to grow B then A/ need to use all the (types of) seeds<br>E. Because B would die out when [Cd] falls below 2au<br>F. Only A can reduce [Cd] to <1au/ cannot just use C to get to {safe levels/ <1au} | | | 4 | 4 | | |
| | (c) | | | Proximal convoluted tubule / PCT | | 1 | | 1 | | |
| | | | | **Question 4 total** | **5** | **5** | **4** | **14** | **3** | **0** |

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| Question | | | | Marking details | Marks Available | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | AO1 | AO2 | AO3 | Total | Maths | Prac |
| **5** | (a) | (i) | | Condensation reaction (1)<br><br>**Any two for 1 mark** (1)<br>Ester / Glycosidic / Peptide<br>Ignore phosphodiester | 2 | | | 2 | | |
| | | (ii) | | X = guanine + Y = cytosine (1)<br>X is a {purine/ double ring} and Y is a {pyrimidine / single ring} (1)<br>(cannot be Adenine and Thymine as) T not found in RNA (1)<br><br>Award 1 mark<br>if they identify X as cytosine and Y as guanine but state that cytosine = pyrimidine and guanine = purine | 1 | | 2 | 3 | | |
| | (b) | (i) | | On carbon 3 {no OH / OH replaced by H} (1) ORA<br>Reject ref to oxygen molecules | | 1 | | 1 | | |
| | | (ii) | | {Cannot form a bond / no condensation reaction} (with another nucleotide)/ or description of /<br>DNA polymerase active site is not complementary / owtte (1) | | 1 | | 1 | | |
| | (c) | (i) | | **Any three (x1) from:**<br>Fragments are negatively charged (1)<br>So move towards the positive (electrode) (1)<br>Smaller fragments move {further / faster} ORA (1)<br>(Because they) can move through the pores in the gel more easily/ ORA (1) | 3 | | | 3 | | 3 |

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| Question | | | | Marking details | Marks Available | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | AO1 | AO2 | AO3 | Total | Maths | Prac |
| | | (ii) | | <table><tr><td>Sequence of bases from gel</td><td>5′</td><td>**G**</td><td>**T**</td><td>**A**</td><td>**C**</td><td>**C**</td><td>**T**</td><td>**A**</td><td>3′</td></tr><tr><td>Complementary strand</td><td>3′</td><td>**C**</td><td>**A**</td><td>**T**</td><td>**G**</td><td>**G**</td><td>**A**</td><td>**T**</td><td>5′</td></tr></table> (1) (1)<br>ecf for 2nd mark | | | 2 | 2 | | 2 |
| | | (iii) | | {Faster / better} + {diagnosis / treatment} / treatment can be tailored to the individual patient (1) | 1 | | | 1 | | |
| | | | | **Question 5 total** | **7** | **2** | **4** | **13** | **0** | **5** |

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| Question | | | | Marking details | Marks Available | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | AO1 | AO2 | AO3 | Total | Maths | Prac |
| **6** | (a) | (i) | | 1 epu = 28µm (2 marks)<br>Award 1 mark:<br>27.77 / 27.78<br>1 epu = 100smd /36 epu x 0.01mm<br>Accept any correct matches between epus and smds | | 2 | | 2 | 2 | 2 |
| | | (ii) | | Eyepiece graticule is a fixed scale but values of 1 epu differ at different magnification /<br>number of smd per epu will change (at different magnifications) / stage micrometer appears to have different sizes at different magnifications (but value of 1 smd is fixed) (1) OWTTE | | | 1 | 1 | | 1 |
| | (b) | (i) | | 2.7mm (2 marks)<br>Award 1 mark for:<br>2.716mm (1)<br>2716 / 1000 or 97epu x 28µm (1)<br><br>NOTE: if answer is wrong and cannot award 1 mark incorrect rounding, scroll up to check their answer to (a) (i) and allow ecf for correct answer – 2 marks to 1 dp, 1 mark to >1dp or sight of correct working | | 2 | | 2 | 2 | 2 |
| | | (ii) | | {Three / several} <u>Graafian</u> follicles visible (1) | | | 1 | 1 | | |
| | | (iii) | | Primary oocyte undergoes meiosis I (1)<br>To produce a secondary oocyte (and the first polar body) (1) | 2 | | | 2 | | |
| | | (iv) | | Mitosis (1)<br>Large numbers of sperm **+** increase chance of fertilisation (1) | 1 | 1 | | 2 | | |

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| Question | | | | Marking details | Marks Available | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | AO1 | AO2 | AO3 | Total | Maths | Prac |
| | (c) | (i) | | (Carried on) X-chromosome (1) | 1 | | | 1 | | |
| | | (ii) | | Parent phenotypes (either order but phenotype and gametes must then match):<br>Carrier / unaffected / normal + female **and** affected + male (1)<br><br>Parent genotypes: (1)<br>$X^DX^d$ $X^dY$<br><br>Gametes: (1)<br>$X^D$, $X^d$ $X^d$, Y<br><br>Correct female cat genotype<br>$X^dX^d$ (1) | | 4 | | 4 | | |
| | (d) | | | **Any two (x1) from**<br>Find out if they are carriers / {they/ both} may be carriers (1)<br>May want to know risk of having {sons with DMD/ a daughter who is a carrier}/ their sons may inherit DMD/ (1)<br>Know whether to screen the embryo if they get pregnant (1)<br>AVP | | 2 | | 2 | | |
| | | | | **Question 6 total** | **4** | **11** | **2** | **17** | **4** | **5** |

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<table>
<tr><th rowspan="2">Question</th><th rowspan="2">Marking details</th><th colspan="6">Marks Available</th></tr>
<tr><th>AO1</th><th>AO2</th><th>AO3</th><th>Total</th><th>Maths</th><th>Prac</th></tr>
<tr><td>7</td><td>
Pollination types + Advantages<br>
• Insect + cross + self<br>
• (Insect) to increase chance of pollination<br>
• (Cross) to increase genetic variation<br>
• (Self) to ensure pollination if no insects available / preserves alleles<br><br>
Adaptations for pollination types<br><br>
<table>
<tr><th>Types of Pollination</th><th>Adaptations</th></tr>
<tr><td>(insect-pollinated)</td><td>• {Brightly coloured/ owtte} to attract insects<br>• Open during day more insects around</td></tr>
<tr><td>(cross-pollinated)</td><td>• Stigmas mature before anthers so can’t be self-pollinated at that time<br>• Anthers mature after stigma so only produce pollen after stigmas have degenerated</td></tr>
<tr><td>(self-pollinated)</td><td>• (Low insect levels) anthers mature earlier<br>• Anthers pushed against stigma {for pollination/ transfer of pollen}</td></tr>
</table>
<br>
Other reproductive strategies<br>
• Seeds produced over long period of time / can colonise most of the year<br>
• Large numbers of seeds increased chance of survival<br>
• Germinate quickly / established quickly from seeds<br>
• Wind dispersal + colonise other habitats/ be dispersed over greater distances<br>
• {Lightweight / feathery} seeds + carried by the wind/ stay in air for longer<br>
• Regrow from taproot (as well as seeds)
</td></tr>
<tr><td></td><td></td><td></td><td>7</td><td>2</td><td>9</td><td></td><td></td></tr>
</table>

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| Question | Marking details | Marks Available | | | | | |
|---|---|---|---|---|---|---|---|
| | | AO1 | AO2 | AO3 | Total | Maths | Prac |
| | **7-9 marks**<br>Indicative content of this level is… detailed description of all three areas of indicative content<br>*The candidate constructs an articulate, integrated account, which shows sequential reasoning. The answer fully addresses the question with no irrelevant inclusions or significant omissions. The candidate uses scientific conventions and vocabulary appropriately and accurately*.<br><br>**4-6 marks**<br>Indicative content of this level is… description of at least two areas of indicative content or less detail of three<br>*The candidate constructs an account correctly linking some relevant points, such as those in the indicative content, showing some reasoning. The answer addresses the question with some omissions. The candidate usually uses scientific conventions and vocabulary appropriately and accurately*<br><br>**1-3 marks**<br>Indicative content of this level is… description of at least one area of indicative content<br>*The candidate makes some relevant points, such as those in the indicative content, showing limited reasoning. The answer addresses the question with significant omissions. The candidate has limited use of scientific conventions and vocabulary.* | | | | | | |
| | **Question 7 total** | **0** | **7** | **2** | **9** | **0** | **0** |

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## SUMMARY OF MARKS ALLOCATED TO ASSESSMENT OBJECTIVES

| Q | AO1 | AO2 | AO3 | TOTAL MARK | MATHS | PRAC |
|---|---|---|---|---|---|---|
| **1** | 2 | 9 | 3 | **14** | 4 | 2 |
| **2** | 6 | 5 | 7 | **18** | 4 | 6 |
| **3** | 6 | 6 | 3 | **15** | 0 | 0 |
| **4** | 5 | 5 | 4 | **14** | 3 | 0 |
| **5** | 7 | 2 | 4 | **13** | 0 | 5 |
| **6** | 4 | 11 | 2 | **17** | 4 | 5 |
| **7** | 0 | 7 | 2 | **9** | 0 | 0 |
| **TOTAL** | **30** | **45** | **25** | **100** | **15** | **18** |



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