# GCE A LEVEL MARKING SCHEME

**SUMMER 2019**

**A LEVEL (NEW)**
**BIOLOGY - COMPONENT 1**
**A400U10-1**

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## INTRODUCTION

This marking scheme was used by WJEC for the 2019 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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**EDUQAS A LEVEL COMPONENT 1**
**ENERGY FOR LIFE**

**MARK SCHEME SUMMER 2019**

**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>10/ 11/ 12 (μm) = 2 marks<br>any measurement divided by 1000 = 1 mark<br>correct substitution = 1 mark</td><td></td><td>2</td><td></td><td>2</td><td>2</td><td>2</td></tr>
<tr><td></td><td></td><td>(ii)</td><td></td><td>Any TWO features for one mark<br>• Has a nucleus<br>• {Membrane bound organelles/ named membrane bound organelle}<br>• Chromosomes<br>• Large ribosomes/ 80S ribosomes</td><td>1</td><td></td><td></td><td>1</td><td></td><td></td></tr>
<tr><td></td><td>(b)</td><td>(i)</td><td></td><td>Hours/days</td><td></td><td>1</td><td></td><td>1</td><td></td><td></td></tr>
<tr><td></td><td></td><td>(ii)</td><td></td><td>Carrying capacity<br>Ignore maximum</td><td>1</td><td></td><td></td><td>1</td><td></td><td></td></tr>
<tr><td></td><td>(c)</td><td>(i)</td><td></td><td>
<table>
<tr><td>A</td><td>Lag phase</td><td>(Re)hydration/ {protein/enzyme} synthesis/ slow rate of {reproduction/ cell division}</td></tr>
<tr><td>B</td><td>Log / exponential phase</td><td>{Max/ high/ rapid} rate of reproduction/ reproduction greater than death/ no {limiting factors or named example}/ lack of environmental resistance</td></tr>
<tr><td>D</td><td>Stationary phase</td><td>Reproduction=cell death/ {limiting factors/ named example} prevent further increase/ carrying capacity is reached/ environmental resistance/ intraspecific competition</td></tr>
</table>
</td><td>3</td><td></td><td></td><td>3</td><td></td><td></td></tr>
<tr><td></td><td></td><td>(ii)</td><td></td><td>(Build up of) ethanol / (toxic) waste (1)<br>The population will {go into decline / death phase/ decrease} (1)<br>Ignore reference to glucose/ space</td><td></td><td>2</td><td></td><td>2</td><td></td><td></td></tr>
</table>



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| Question | | | | Marking details | Marks Available | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | AO1 | AO2 | AO3 | Total | Maths | Prac |
| | (d) | | | C and D (1) NOT B<br>Sexual reproduction leads to genetic variation/ adapt to changing environment / or description of (1)<br>Some individuals may survive as spores (1) | | | 3 | 3 | | |
| | (e) | | | 1763 = 2 marks<br>Award 1 mark for<br>$\frac{430 \times 410}{100}$<br>$\frac{430}{P} = \frac{100}{410}$ | | 2 | | 2 | 2 | 2 |
| | (f) | | | **Any two (×1) from:**<br>A. There are {few/ no} {births/ deaths} in the population/ population size is {constant/ unchanged} (1)<br>B. There is no {emigration/ immigration} (1)<br>C. The proportion of marked : unmarked individuals in the second sample is the same as the proportion in the population as a whole (1)<br>D. Marked individuals from the first sample distribute themselves evenly amongst the rest of the population / have sufficient time to spread out/ All snails have an equal chance of being captured and recaptured (1)<br>E. The method of marking is {non toxic/ does not make them more conspicuous to predation/ is not lost/rubbed off during the investigation} | | 2 | | 2 | | 2 |
| | | | | **Question 1 total** | **5** | **9** | **3** | **17** | **4** | **6** |



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| Question | | | | Marking details | Marks Available | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | AO1 | AO2 | AO3 | Total | Maths | Prac |
| **2** | (a) | | | A *Staphylococcus*(1)<br>B *Lactobacillus* (1)<br>C *Neisseria* (1)<br>D *E. coli* (1) | | | 4 | 4 | | 4 |
| | (b) | | | D value = 13 minutes = 3 marks<br>**If incorrect award 2 marks for**<br>Two correct readings from two consecutive whole numbers<br>e.g. 36-23<br>**If incorrect award 1 mark for**<br>Two lines shown on graph between two consecutive whole numbers | | 3 | | 3 | 3 | |
| | (c) | | | **Any four (× 1) from:**<br>A. 10×/100× series of dilutions/1+9/0.1+9.9cm$^3$(1)<br>B. Volume 1cm$^3$ (or less) plated onto each plate (1)<br>C. Incubated at 25-37$^o$C for 24-48 hours (1)<br>D. Number of colonies counted (1)<br>E. Use of dilution factor and calculation of numbers of bacteria (per cm$^3$ in original sample)/ or description of (1)<br>F. Repeat (×3) and calculate a mean (1) | 4 | | | 4 | | |
| | (d) | | | A. Increased kinetic energy + {breaks hydrogen bonds/ denatures protein} (1)<br>B. Holding together the specific (3-D) shape/ shape of active site changes (1)<br>C. Protein can no longer carry out function/ enzyme- substrate complexes {can no longer form/ reduced} (1) | 3 | | | 3 | | |
| | | | | **Question 2 total** | **7** | **3** | **4** | **14** | **3** | **4** |



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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>
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<tr><td>3</td><td>(a)</td><td>(i)</td><td></td><td>Clear labelled arrow (thylakoid/ grana/ photosystem) to any thylakoid membrane</td><td>1</td><td></td><td></td><td>1</td><td></td><td></td></tr>
<tr><td></td><td></td><td>(ii)</td><td></td><td>Chlorophyll <u>a</u></td><td>1</td><td></td><td></td><td>1</td><td></td><td></td></tr>
<tr><td></td><td>(b)</td><td></td><td></td><td>A. Absorb {light (energy)/ photons} (1)<br>B. Act as a transducer/ transferring light energy to high energy electrons/ excites electrons/ causing chlorophyll a to emit electrons/ pass energy to reaction centre (1)<br>C. Which can be used to power proton pumps/ synthesise ATP/synthesise reduced NADP/ electrons passed down the electron transport chain (1)</td><td>3</td><td></td><td></td><td>3</td><td></td><td></td></tr>
<tr><td></td><td>(c)</td><td></td><td></td><td>
<table>
<tr><th>Chemosynthesis</th><th>Photosynthesis</th></tr>
<tr><td>No light required;</td><td>Light required</td></tr>
<tr><td>No chloroplasts/ No photosystems/no chlorophyll</td><td>chloroplasts/ photosystems/chlorophyll required</td></tr>
<tr><td>High energy electrons from {chemicals/ hydrogen sulfide}/ sulfur produced</td><td>High energy electrons from chlorophyll/ sulfur not produced</td></tr>
<tr><td>Use of oxygen</td><td>Production of oxygen</td></tr>
<tr><td>Production of water</td><td>Use of water</td></tr>
</table>
1 mark for each correct comparison</td><td></td><td></td><td>4</td><td>4</td><td></td><td></td></tr>
<tr><td></td><td>(d)</td><td></td><td></td><td>
<table>
<tr><td>Any three (x1) from:</td><td></td></tr>
<tr><td>Amino acids/proteins</td><td>Nitrates (Sulfates)</td></tr>
<tr><td>Phospholipids</td><td>Phosphates</td></tr>
<tr><td>Nucleotides/ any example</td><td>Nitrates and phosphates</td></tr>
<tr><td>Chlorophyll</td><td>Magnesium (ions) (nitrates)</td></tr>
</table>
</td><td>3</td><td></td><td></td><td>3</td><td></td><td></td></tr>
</table>



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| Question | | | | Marking details | Marks available | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | AO1 | AO2 | AO3 | Total | Maths | Prac |
| | *(e)* | | | Any **four** (×1) from:<br>A. Destruction of chlorophyll- no PS/unable to absorb light (energy) (1)<br>B. {No/ less} {red NADP/ ATP} for {Calvin cycle/ light independent reactions} (1)<br>C. {No/ less} {carbohydrate/ named carbohydrate} synthesised for {respiration/ synthesis of biological molecules} (1)<br>D. {No/ less} respiration, therefore {no/ less} ATP for {cell division/protein synthesis/ active transport} (1)<br>E. Destruction of cell membranes – kills/dries out cells (1) | | | 4 | 4 | | |
| | | | | **Question 3 total** | **8** | **0** | **8** | **16** | **0** | **0** |



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| Question | | | | Marking details | Marks available | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | AO1 | AO2 | AO3 | Total | Maths | Prac |
| **4** | (a) | | | {ATP/ inhibitor} binds to {a site away from the active site/ a site other then the active site} (1)<br>Changing the shape of the active site /Substrate no longer fits in active site (1) | 2 | | | 2 | | |
| | (b) | (i) | | (Inhibiting PFK means that) Glucose 6 P can be converted to glycogen (1)<br>Allows storage of (excess) glucose (1)<br>OR<br>Inhibiting HK means that no Glucose 6 P {can be produced/ can be converted to glycogen} (1)<br>So no storage of (excess) glucose (1) | | | 2 | 2 | | |
| | | (ii) | | HK is no longer able to bind with glucose (1)<br>Glycolysis cannot take place/ glucose 6P cannot be synthesised (1)<br>No ATP produced so {cell dies/ {mitosis/ cell division} stops} (1) | | | 3 | 3 | | |
| | *(c)* | (i) | | <table><tr><td>Ice cold</td><td>{Stops/slows} {enzyme activity/ disruption of membrane} (1)</td></tr><tr><td>Isotonic</td><td>Maintains same Ψ inside and outside (mitochondrion) / stops {osmosis/ water movement / (osmotic) lysis} (1)</td></tr><tr><td>Buffer</td><td>Maintains optimum pH/ stopping pH change (1)</td></tr></table> | | 3 | | 3 | | 3 |
| | | (ii) | | {Glucose hydrolysis/glycolysis} occurs in the cytoplasm (1)<br>Pyruvate is the substrate used {by mitochondria/ in the link reaction} (1) | | 2 | | 2 | | |
| | | (iii) | | 40$^{o}$C is the <u>optimum</u> temperature (1)<br>10$^{o}$C very unreliable/ least reliable (1)<br>Any correct use of data with respect to the reliability of any of 20 - 60$^{o}$C (1) | | | 3 | 3 | | |
| | | | | **Question 4 total** | **2** | **5** | **8** | **15** | **0** | **3** |



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<tr><td>5</td><td>(a)</td><td></td><td>I</td><td><u>Primary</u> succession</td><td></td><td>1</td><td></td><td>1</td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td>II</td><td>Pioneer</td><td>1</td><td></td><td></td><td>1</td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td>III</td><td>Climax community</td><td>1</td><td></td><td></td><td>1</td><td></td><td></td></tr>
<tr><td></td><td>(b)</td><td></td><td></td><td>Any three factors (x1) plus suitable explanation for each (x1)<br><br>
<table>
<tr><td>High salt content / lower water potential</td><td>(Rooted) plants will have problems getting water /<br>water would leave the plant (roots)/ owtte</td></tr>
<tr><td>Waterlogging of soil;</td><td>Roots need oxygen for {respiration/active uptake} of minerals/<br>Toxic to plants/roots die/cannot take up minerals;<br>Ref to denitrification</td></tr>
<tr><td>Tidal flow/ wave action</td><td>Causes a sideways drag on the plant;<br>With two tides a day possibly uprooting the plants;</td></tr>
<tr><td>Water contains sediment like sand and mud particles;</td><td>Scouring of the plants/ sandpaper effect/ covering of leaf (preventing PS)/<br>Damage to {root/stem/leaf}</td></tr>
<tr><td>High {nitrate/ fertiliser/ sewage} levels/ agricultural run off</td><td>Eutrophication/ description of eutrophication/ algal bloom</td></tr>
</table></td><td></td><td>6</td><td></td><td>6</td><td></td><td></td></tr>
</table>



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| Question | | | | Marking details | Marks available | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | AO1 | AO2 | AO3 | Total | Maths | Prac |
| | (c) | (i) | | involves {(Denitrifying) bacteria/ Pseudomonas} which are <u>living</u> (organisms) | 1 | | | | | |
| | | (ii) | | **Two** correct factors **= 1 mark**<br><br>**Any two** (×1) for any **two** explanations<br>• **{Waterlogging/ anaerobic conditions/ low $O_2$}** + more denitrification<br>• **Temperature** affects rate of denitrification {higher in summer so more bacterial division/more denitrifying bacteria/faster rate of reactions}<br>• **Nitrate levels in mud** higher denitrification in summer as more farming runoff (with use of fertiliser) | | 1 | 2 | | | |
| | (d) | | | **Any five (×1) from:**<br>A. Mark out a <u>permanent</u>/ same area each time (1)<br>B. 10m × 10m / other sensible area/ transect (1)<br>C. Method of sampling - use of quadrats (1)<br>D. Reviewed periodically (1)<br>E. All species {identified/ counted/ percentage cover/abundance/frequency}/ measure species diversity (1)<br>F. Ref to H & S issues re tide/ minimising damage to area (1) | | 5 | | 5 | | 5 |
| | | | | **Question 5 total** | **3** | **13** | **2** | **18** | **0** | **5** |



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| Question | | | | Marking details | Marks available | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | AO1 | AO2 | AO3 | Total | Maths | Prac |
| **6** | (a) | | | 1 455/ 1 456/ 1 455.5 = 3 marks<br>If incorrect award 1 mark for each of<br>any number divided by 2 (to show breeding pairs)<br>any number multiplied by 1 025/100 or 10.25 | | 3 | | 3 | 3 | |
| | (b) | | | A. Fewer predators (1)<br>B. Less intraspecific competition (1)<br>C. for food/ nest sites/habitat (1) NOT space/ resources<br>D. Less likely to pass on disease as fewer numbers (initially) (1) | | 3 | | 3 | | |
| | (c) | | | Theft of {eggs/chicks}/ poachers/ hunting | | 1 | | 1 | | |
| | (d) | | | Any **two** (×1) from<br>A. Prosecution/ legislation/ ban hunting (1)<br>B. Education/ increase awareness/ ecotourism (1)<br>C. Making holding of poisons illegal/difficult to obtain (1)<br>D. Feeding sites (1)<br>E. Breeding programmes (1) | | 2 | | 2 | | |
| | (e) | | | Site of Special Scientific Interest (1)<br>SSSIs protected from development or other damage (1) | 1 | 1 | | 2 | | |
| | | | | **Question 6 total** | **1** | **10** | **0** | **11** | **3** | **0** |



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| Question | Marking details | Marks available | | | | | |
|---|---|---|---|---|---|---|---|
| | | AO1 | AO2 | AO3 | Total | Maths | Prac |
| 7 | **Carbon cycle – section A**<br>1. People burning fossil fuels<br>2. Trees store carbon in wood, stems, and leaves—biomass.<br>3. Deforestation eliminates plants which take carbon out of the atmosphere as they grow/ref to less PS removing $CO_2$<br>4. Clearing land for other use<br>5. Replaced by crops which store less carbon/less wood.<br>6. Replaced by other animals/ cattle producing $CO_2$/ methane<br>7. Increased decay of vegetation.<br>8. Ref to oceans absorbing heat which slows/gives a lag of increasing $CO_2$ and increasing temps – will not have reached Max<br><br>**Data usage – Section B**<br>1. Significant increase in both $CO_2$ levels and temp since {approx. 1 850 - 1 900/ industrial revolution}<br>2. Ref to Temperature + year<br>3. Ref to $CO_2$ levels ppm + year<br>4. Currently at 408ppm / increase of approx. 25-31 ppm since 2000<br>5. Correlation between $CO_2$ levels ppm in atmosphere and global temperatures very close/ indicating {direct relationship/ link} between the two.<br>6. **human activities increasing $CO_2$** raising global temperatures.<br>7. Rising to highest level since 1 000 years ago.<br><br>**Aquatic – Section C**<br>1. Dissolving carbon dioxide in the ocean creates carbonic acid, which increases the acidity of the water.<br>2. Shells end up being thinner and more fragile.<br>3. Could be increased photosynthesis<br>4. Increased algal blooms with higher temperatures<br>5. Higher temperatures = lower $O_2$ in water – effect on fish<br>6. Migration of fish to cooler/warmer waters<br>7. Effect on fisheries/ fish<br>8. Coral reef destruction/coral bleaching/ loss of biodiversity | | | | | | |



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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 content from all three areas<br><br>*The candidate constructs an articulate, integrated account, correctly linking relevant points, such as those in the indicative content, 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 detail from two areas or some detail from three areas<br><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 any point of indicative content from any area<br><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.*<br><br>**0 marks**<br>*The candidate does not make any attempt or give a relevant answer worthy of credit.* | | | | | | |
| | | | | **Question 7 total** | **4** | **5** | **0** | **9** | **0** | **0** |



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## COMPONENT 1: ENERGY FOR LIFE

## SUMMARY OF MARKS ALLOCATED TO ASSESSMENT OBJECTIVES

| Question | AO1 | AO2 | AO3 | TOTAL MARK | MATHS | PRAC |
|---|---|---|---|---|---|---|
| 1 | **5** | **9** | **3** | **17** | **4** | **6** |
| 2 | **7** | **3** | **4** | **14** | **3** | **4** |
| 3 | **8** | **0** | **8** | **16** | **0** | **0** |
| 4 | **2** | **5** | **8** | **15** | **0** | **3** |
| 5 | **3** | **13** | **2** | **18** | **0** | **5** |
| 6 | **1** | **10** | **0** | **11** | **3** | **0** |
| 7 | **4** | **5** | **0** | **9** | **0** | **0** |
| **TOTAL** | **30** | **45** | **25** | **100** | **10** | **18** |



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