# Markscheme

## November 2019

## Biology

## On-screen examination

12 pages

The following are the annotations available to use when marking responses.

| Annotation | Explanation |
|---|---|
|  | Correct point, place at the point in the response where it is clear that the candidate deserves the mark. For use in analytically marked questions only. |
|  | Omission, incomplete |
| CON | Contradiction |
|  | Valid part (to be used when more than one element is required to gain the mark) |
|  | Error carried forward |
|  | Dynamic annotation, it can be expanded to surround work |
|  | Horizontal wavy line that can be expanded |
|  | Highlight tool that can be expanded to mark an area of a response |

| Annotation | Explanation |
|---|---|
|  | Not good enough |
|  | The candidate has given a response but it is not worthy of any marks |
|  | Text box used for additional marking comments |
|  | Seen; must be stamped on all blank response areas and on duplicate pages of concatenated responses |
|  | Vertical wavy line that can be expanded |
|  | Words to that effect |
|  | Award 1, 2, 3, 4 marks. For use in holistically marked questions only |

**Markscheme instructions**

**1** Mark positively. Give candidates credit for what they have achieved and what is correct. Do not deduct marks for incorrect responses.

**2** Follow the markscheme provided and award only whole marks.

**3** Each marking point appears on a separate line.

**4** The maximum mark for each subpart is indicated in the "Total" column.

**5** Where a mark is awarded a tick should be placed in the text at the precise point where it is clear the candidate deserves the mark.

**6** Each marking point in a question part should be awarded separately unless there is an instruction to the contrary in the Notes column.

**7** A question subpart may have more marking points than the total allows. This will be indicated by the word "***max***" in the Answer column. Further guidance may be given in the Notes column.

**8** Additional instructions on how to interpret the markscheme are in bold italic text in the Answer column.

**9** Alternative wording may be indicated in the Answer column by a slash (/). Either alternative is equally acceptable but the candidate cannot be rewarded for both as they are associated with the same marking point.

**10** Alternative answers are indicated in the Answer column by "***or***". Either alternative is equally acceptable but the candidate cannot be rewarded for both as they are associated with the same marking point.

**11** If two related points are required to award a mark, this is indicated by "***and***" in the answer column.

**12** Words in brackets ( ) in the Answer column are not necessary to gain the mark.

**13** Words that are <u>underlined</u> are essential for the mark.

**14** In some questions a reverse argument is also acceptable. This is indicated by the abbreviation *ORA (or reverse argument)* in the Notes column. Candidates should not be rewarded for reverse arguments unless *ORA* is given in the Notes column.

**15** If the candidate's response has the same meaning or is clearly equivalent to the expected answer the mark should be awarded. In some questions this is emphasized by the abbreviation *WTTE (or words to that effect)* in the Notes column.

**16** When incorrect answers are used correctly in subsequent question parts the follow through rule applies. Award the mark and add ECF (error carried forward) to the candidate response.

**17** The order of marking points does not have to be the same as in the Answer column unless stated otherwise.

**18** Marks should not be awarded where there is a contradiction in an answer. Add CON to the candidate response at the point where the contradiction is made.

**19** Do not penalize candidates for errors in units or significant figures unless there is specific guidance in the Notes column.

**20** Questions with higher mark allocations will generally be assessed using a level response method using task specific clarifications developed with reference to the criteria level descriptors. A candidate's work should be reviewed to determine holistically the mark for each row of the holistic grid and a mark awarded for each row.

| Question | | Answers | Notes | Total | Criterion |
|---|---|---|---|---|---|
| **1** | a | Food web | *Accept tropic web*<br>*Do **not** accept food chain* | **1** | A |
| | b | Energy flow or nutrient flow (through the system)<br>***or***<br>What organisms eat other organisms<br>***or***<br>Predation | | **1** | A |
| | c | ***Producer:*** tree ***or*** grass ***or*** shrub<br><br>***Secondary consumers, two needed from this list only for the mark:***<br>• shrike<br>• baboon<br>• caracal<br>• lion<br>• vulture<br>• leopard | | **2** | A |
| | d | Shrub (population) increases<br><br>(because there are) fewer impalas eating the shrub<br><br>***Any three correctly reasoned points relating to baboon population change, for example (3 max):***<br>• baboon population decreases<br>• because more are eaten by leopards<br>• because the leopards no longer eat impala<br>• baboon population might not be affected as there is more grass for consumers lower down the food chain | | **5** | A |
| | e | Break down dead organisms<br>***or***<br>Recycle nutrients | | **1** | A |
| | f | ***Any reasonable suggestion, for example (1 max):***<br>• not all relationships shown<br>• no abiotic factors shown<br>• no development over time<br>• no indication of biomass or numbers | *Accept specific named examples that are not included* | **1** | A |

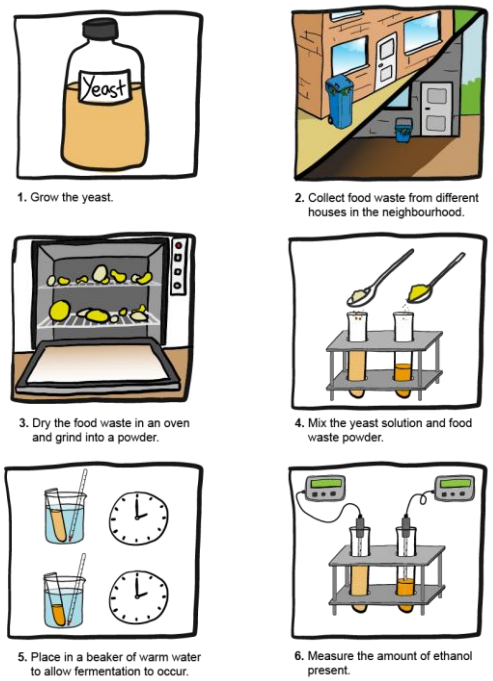
| | | | | | |
|---|---|---|---|---|---|
| **2** | a | Cells are the smallest unit of life | | **1** | A |
| | b | ***Any two from the following list (2 max):***<br>• cell wall<br>• chloroplasts<br>• (large central) vacuole<br><br>***A correctly linked outline (2 max):***<br>• cell wall provides structure ***or*** support ***or*** protection for plant<br>• chloroplast is where photosynthesis occurs<br>• (large central) vacuole stores water ***or*** provides support for plant | *Do **not** accept chlorophyll as a structure*<br><br>*Accept chlorophyll for the justification mark only if linked to photosynthesis* | **4** | A |
| | c | A correct use of the term *photosynthesis*<br><br>Chlorophyll absorbs light<br><br>***Any two points from the list (2 max):***<br>• energy from light is needed<br>• light energy is transformed into chemical energy<br>• to combine carbon dioxide and water<br>• glucose ***and*** oxygen are formed | | **4** | A |
| | d | Sugar moves ***or*** is transported<br><br>(down a tube) from where it is produced to where it is used<br><br>A correct use of the term translocation ***or*** phloem | *WTTE* | **3** | A<br><br>D |

| | | | | | |
|---|---|---|---|---|---|
| **3** | a | **IV:** temperature<br><br>**DV:** size of balloon ***or*** volume of balloon ***or*** volume of $CO_2$ produced<br><br>***Any two reasonable control variables, for example (2 max):***<br>• volume of solutions<br>• concentration of sugar ***or*** type of sugar<br>• duration of reaction<br>• starting temperature of solution | *Indication of quantity must be present* | **4** | B |
| | b | ***Any two of the following points (2 max):***<br>• no ***and*** range is insufficient<br>• no ***and*** no repeats are shown<br>• no ***and*** no numerical data is generated<br>• no ***and*** no graph is possible<br>• no ***and*** the increment is too large<br>• yes ***and*** there is a range of temps used ***or*** the size of the balloons can be compared | | **2** | B |
| | c | ***Any two reasonable improvements, for example (2 max):***<br>• use a better measuring tool<br>• more trials<br>• larger temperature range<br>• control the mass of yeast ***or*** sugar<br><br>***Correctly linked justification, for example (2 max):***<br>• this will give more precise data / quantitative data<br>• reduces experimental uncertainty<br>• this will give reliable ***or*** repeatable data | | **4** | C |

<table>
<tr><td rowspan="3">4</td><td>a</td><td>A research question linking different sugars with an implied DV for example (1 max):<br>• respiration<br>• rate of respiration<br>• effect on yeast<br><br>Implied DV is measurable, for example (1 max):<br>• volume<br>• amount of $CO_2$<br>• size of balloon</td><td></td><td>2</td><td>B</td></tr>
<tr><td>b</td><td>Glucose<br><br>(glucose) fits in the (active site of the) enzyme or glucose is the correct shape or the other sugars don’t fit<br><br>(glucose) fits best or fits better than the other sugars<br><br>A correct use of either the term “active site” or mention of lock-and-key model</td><td></td><td>4</td><td>B<br><br>D</td></tr>
<tr><td>c</td><td>
<table>
<tr><th></th><th>1</th><th>2</th><th>3</th><th>4</th></tr>
<tr><td>Variables</td><td>some variables are implied</td><td>different sugars identified as IV or DV and one CV identified</td><td>different sugars identified as IV and DV and one CV identified</td><td>different sugars identified as IV and DV and two CV identified</td></tr>
<tr><td>Data</td><td>reference to different sugars or trials</td><td>all five sugars or three trials</td><td>all five sugars and three trials</td><td>all five sugars and three trials and calculates mean</td></tr>
<tr><td>Equipment</td><td>equipment is suggested but is not relevant</td><td>equipment to measure DV or to control or monitor one CV</td><td>equipment to measure DV and to control or monitor one CV</td><td></td></tr>
<tr><td>Method</td><td>attempt at a method but it may be not relevant</td><td>attempt at method, but with insufficient detail and not likely to give relevant data</td><td>method is described, could be followed and will produce relevant data</td><td>complete method to measure a rate is fully explained and could be replicated</td></tr>
</table>
</td><td>15</td><td>B</td></tr>
</table>

| | | | | | |
|---|---|---|---|---|---|
| **5** | a | Biofuels are renewable ***or*** fossil fuels are non-renewable | *Accept less pollution only if it is clear that this is linked to production and not combustion* | **1** | D |
| | b | ***Any two reasonable points, for example (2 max)***<br>• if crops were used there would be less food for eating<br>• waste would otherwise be thrown away<br>• less waste in landfills<br>• agricultural land could be used for crop production rather than biofuel | | **2** | D |
| | c | Water chestnut<br>Response Short Textbox<br>Day 3<br>Text Object<br>Pineapple<br>Response Short Textbox<br>Day 5 | | **1** | C |
| | d | ***Title:***<br>Mass of ethanol produced linked to time (with reference to two different types of food waste)<br><br>***Plotting:***<br>Three points correctly plotted ± 0.2<br><br>All points plotted correctly<br><br>***Axis labels:***<br>x: day ***or*** time/day(s)<br><br>y: mass of ethanol / mg | <br><br><br><br><br><br><br>*No unit needed if day is given on x axis. Time must have an associated unit of day(s)*<br><br>*Unit is needed for this mark* | **5** | C |

| | | | | | |
|---|---|---|---|---|---|
| | e | ***Trend 1:***<br>Alcohol production increases initially (until day 5)<br><br>***One pair of explanatory points***<br>The yeast population increases<br><br>(so) there is more respiration<br><br>***or***<br><br>Respiration generates heat<br><br>Which increases rate of respiration<br><br>***Trend 2:***<br>(after day 5 or then) alcohol production decreases ***or*** plateaus<br><br>***One pair of explanatory points***<br>Food supply has become limited<br><br>(so) less respiration is taking place<br><br>***or***<br><br>Ethanol increases (to toxic levels)<br><br>(so) the yeast cells die (and no longer respire) ***or*** respiration is inhibited ***or*** enzymes are denatured | *Accept trends if seen in explanation box only, ignore incorrect use of "exponential"*<br><br>*WTTE*<br><br>*WTTE* | **6** | C |
| | f | Pineapple: 22.9 (mg) | *Accept correct answer in table or response box* | **1** | C |
| | g | Difference in mass: (-) 5.0 (mg) | *Must be quoted to 2 sig figs* | **1** | C |

<table>
<tr>
<td></td>
<td>h</td>
<td>First mark:<br>Water chestnut has the highest amount of carbohydrate and the lowest total of ethanol produced<br><br>Second mark, either<br>The sugars present in the carbohydrate may not always be fermented by the yeast<br>or<br>Nutritional data is about food, but food waste was used in the investigation</td>
<td>WTTE</td>
<td>2</td>
<td>C</td>
</tr>
<tr>
<td></td>
<td>i</td>
<td>
<table>
<tr><th>Variable that was not controlled</th><th>Effect on the results</th></tr>
<tr><td>the temperature of the water bath was not controlled</td><td>a higher temperature might give a faster rate of reaction</td></tr>
</table>
Variables (2 max):<br>• storage of waste<br>• has food been dried completely<br>• different mass/amount/volume of food or yeast<br>• different volume of solutions<br>• time in the water bath<br><br>Any reasonable linked effect, for example (2 max):<br>• food might already have started fermenting<br>• water present makes the food heavier or sugar might have been lost through burning<br>• more fruit will give more ethanol<br>• larger volume will give more ethanol<br>• longer time would give more ethanol
</td>
<td> 
</td>
<td>4</td>
<td>C</td>
</tr>
</table>

<table>
<tr><td>6</td><td>a</td><td>The maintenance of a constant internal environment</td><td></td><td>1</td><td>A</td></tr>
<tr><td></td><td>b</td><td>1. Human insulin gene extracted<br>2. Plasmid DNA opened<br>3. Genetically modified bacteria reproduce<br>4. Extraction and purification of human insulin</td><td></td><td>4</td><td>D</td></tr>
<tr><td></td><td>c</td><td>Any two marks from the following (2 max):<br>• eating increases blood sugar<br>• insulin reduces blood sugar<br>• people with diabetes do not produce or respond to insulin<br>• fast-acting insulin means people with diabetes do not need to plan ahead</td><td></td><td>2</td><td>D</td></tr>
<tr><td></td><td>d</td><td>
<table>
<tr><th></th><th>1</th><th>2</th><th>3</th><th>4</th></tr>
<tr><td>Individual</td><td>suggestion linked to an individual but this is not specific</td><td>a correct impact on an individual is stated</td><td>more than one correct impact is stated or one impact is stated with added detail</td><td>more than one correct impact on an individual is described</td></tr>
<tr><td>Community</td><td>suggestion linked to a community but this is not specific</td><td>a correct impact on a community is stated</td><td>more than one correct impact is stated or one impact is stated with added detail</td><td>more than one correct impact on a community is described</td></tr>
<tr><td>Economic</td><td>suggestion linked to economics but this is not specific</td><td>a correct economic impact is stated</td><td>more than one correct impact is stated or one impact is stated with added detail</td><td>more than one correct economic impact described</td></tr>
<tr><td>Appraisal</td><td>a concluding comment</td><td>a concluding comment linking two or more statements</td><td></td><td></td></tr>
</table>
</td><td></td><td>14</td><td>D</td></tr>
<tr><td></td><td>e</td><td>Any reasonable response, for example (2 max):<br>• some religious groups may have concerns<br>• vegetarians or other groups may prefer to avoid using animals for human benefit<br>• could be concerns that diseases could be transmitted<br>• DNA crossing the species barrier</td><td></td><td>2</td><td>D</td></tr>
</table>