# GCSE
# BIOLOGY
# 8461/2H

Paper 2 Higher Tier

**Mark scheme**

June 2024

Version: 1.0 Final



Mark schemes are prepared by the Lead Assessment Writer and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation events which all associates participate in and is the scheme which was used by them in this examination. The standardisation process ensures that the mark scheme covers the students' responses to questions and that every associate understands and applies it in the same correct way. As preparation for standardisation each associate analyses a number of students' scripts. Alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, associates encounter unusual answers which have not been raised they are required to refer these to the Lead Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of students' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

No student should be disadvantaged on the basis of their gender identity and/or how they refer to the gender identity of others in their exam responses.

A consistent use of 'they/them' as a singular and pronouns beyond 'she/her' or 'he/him' will be credited in exam responses in line with existing mark scheme criteria.

Further copies of this mark scheme are available from aqa.org.uk

**Copyright information**

AQA retains the copyright on all its publications. However, registered schools/colleges for AQA are permitted to copy material from this booklet for their own internal use, with the following important exception: AQA cannot give permission to schools/colleges to photocopy any material that is acknowledged to a third party even for internal use within the centre.

Copyright © 2024 AQA and its licensors. All rights reserved.

# Information to Examiners

## 1. General

The mark scheme for each question shows:

- the marks available for each part of the question
- the total marks available for the question
- the typical answer or answers which are expected
- extra information to help the examiner make their judgement
- the Assessment Objectives and specification content that each question is intended to cover.

The extra information is aligned to the appropriate answer in the left-hand part of the mark scheme and should only be applied to that item in the mark scheme.

At the beginning of a part of a question a reminder may be given, for example: where consequential marking needs to be considered in a calculation; or the answer may be on the diagram or at a different place on the script.

In general the right-hand side of the mark scheme is there to provide those extra details which confuse the main part of the mark scheme yet may be helpful in ensuring that marking is straightforward and consistent (for example, a scientifically correct answer that could not reasonably be expected from a student's knowledge of the specification).

## 2. Emboldening and underlining

**2.1** In a list of acceptable answers where more than one mark is available 'any **two** from' is used, with the number of marks emboldened. Each of the following bullet points is a potential mark.

**2.2** A bold **and** is used to indicate that both parts of the answer are required to award the mark.

**2.3** Alternative answers acceptable for a mark are indicated by the use of **or**.
Alternative words in the mark scheme are shown by a solidus eg allow smooth / free movement.

**2.4** Any wording that is underlined is essential for the marking point to be awarded.

# 3. Marking points

## 3.1 Marking of lists

This applies to questions requiring a set number of responses, but for which students have provided extra responses. The general principle to be followed in such a situation is that 'right + wrong = wrong'.

Each error / contradiction negates each correct response. So, if the number of errors / contradictions equals or exceeds the number of marks available for the question, no marks can be awarded.

However, responses considered to be neutral (indicated as * in example 1) are not penalised.

Example 1: What is the pH of an acidic solution?

**[1 mark]**

| Student | Response | Marks awarded |
|---|---|---|
| 1 | green, 5 | 0 |
| 2 | red*, 5 | 1 |
| 3 | red*, 8 | 0 |

Example 2: Name **two** magnetic materials.

**[2 marks]**

| Student | Response | Marks awarded |
|---|---|---|
| 1 | iron, steel, tin | 1 |
| 2 | cobalt, nickel, nail* | 2 |

## 3.2 Use of symbols / formulae

If a student writes a chemical symbol / formula instead of a required chemical name, or uses symbols to denote quantities in a physics equation, full credit can be given if the symbol / formula is correct and if, in the context of the question, such action is appropriate.

## 3.3 Marking procedure for calculations

Marks should be awarded for each stage of the calculation completed correctly, as students are instructed to show their working. At any point in a calculation students may omit steps from their working. If a subsequent step is given correctly, the relevant marks may be awarded.

Full marks should be awarded for a correct numerical answer, without any working shown.

Full marks are **not** awarded for a correct final answer from incorrect working.

## 3.4 Interpretation of 'it'

Answers using the word 'it' should be given credit only if it is clear that the 'it' refers to the correct subject.

### 3.5 Errors carried forward

An error can be carried forward from one question part to the next and is shown by the abbreviation 'ecf'.

Within an individual question part, an incorrect value in one step of a calculation does not prevent all of the subsequent marks being awarded.

### 3.6 Phonetic spelling

Marks should be awarded if spelling is not correct but the intention is clear, **unless** there is a possible confusion with another technical term.

### 3.7 Brackets

(…...) are used to indicate information which is not essential for the mark to be awarded but is included to help the examiner identify the sense of the answer required.

### 3.8 Allow

In the mark scheme additional information, 'allow' is used to indicate creditworthy alternative answers.

### 3.9 Ignore

Ignore is used when the information given is irrelevant to the question or not enough to gain the marking point. Any further correct amplification could gain the marking point.

### 3.10 Do <u>not</u> accept

Do **not** accept means that this is a wrong answer which, even if the correct answer is given as well, will still mean that the mark is not awarded.

### 3.11 Numbered answer lines

Numbered lines on the question paper are intended to support the student to give the correct number of responses. The answer should still be marked as a whole.

## 4. Level of response marking instructions

Extended response questions are marked on level of response mark schemes.

- Level of response mark schemes are broken down into levels, each of which has a descriptor.
- The descriptor for the level shows the average performance for the level.
- There are two marks in each level.

Before you apply the mark scheme to a student's answer, read through the answer and, if necessary, annotate it (as instructed) to show the qualities that are being looked for. You can then apply the mark scheme.

**Step 1: Determine a level**

Start at the lowest level of the mark scheme and use it as a ladder to see whether the answer meets the descriptor for that level.

The descriptor for the level indicates the different qualities that might be seen in the student's answer for that level. If it meets the lowest level then go to the next one and decide if it meets this level, and so on, until you have a match between the level descriptor and the answer. With practice and familiarity you will find that for better answers you will be able to quickly skip through the lower levels of the mark scheme.

When assigning a level you should look at the overall quality of the answer. Do **not** look to penalise small and specific parts of the answer where the student has not performed quite as well as the rest. If the answer covers different aspects of different levels of the mark scheme you should use a best fit approach for defining the level.

Use the variability of the response to help decide the mark within the level, ie if the response is predominantly level 2 with a small amount of level 3 material it would be placed in level 2 but be awarded a mark near the top of the level because of the level 3 content.

**Step 2: Determine a mark**

Once you have assigned a level you need to decide on the mark. The descriptors on how to allocate marks can help with this. The exemplar materials used during standardisation will help. There will be an answer in the standardising materials which will correspond with each level of the mark scheme. This answer will have been awarded a mark by the Lead Examiner. You can compare the student's answer with the example to determine if it is the same standard, better or worse than the example. You can then use this to allocate a mark for the answer based on the Lead Examiner's mark on the example.

You may well need to read back through the answer as you apply the mark scheme to clarify points and assure yourself that the level and the mark are appropriate.

Indicative content in the mark scheme is provided as a guide for examiners. It is not intended to be exhaustive and you must credit other valid points. Students do not have to cover all of the points mentioned in the indicative content to reach the highest level of the mark scheme.

You should ignore any irrelevant points made. However, full marks can be awarded only if there are no incorrect statements that contradict a correct response.

An answer which contains nothing of relevance to the question must be awarded no marks.

**Question 1**

| Question | Answers | Extra information | Mark | AO / Spec Ref. |
|---|---|---|---|---|
| **01.1** | a change in:<br>• DNA<br>• base code **or** nucleotide sequence<br>• base (in DNA)<br>• gene / allele<br>• part of a chromosome<br>• number of chromosomes<br>• genetic code / material | ignore genetic information / variation<br>ignore reference to amino acids or proteins | 1 | AO1<br>4.6.2.1 |

| Question | Answers | Extra information | Mark | AO / Spec Ref. |
|---|---|---|---|---|
| **01.2** | any **three** from:<br>• variation (between members of a species)<br>• better adapted survive<br>• (better adapted or survivors) reproduce<br>• pass on (favourable) allele(s) / gene(s) / mutation(s) | allow in terms of an example<br>ignore mutation<br>allow survival of the fittest<br>allow converse<br>ignore passing on genetic material **or** chromosomes **or** characteristic | 3 | AO1<br>4.6.2.1<br>4.6.2.2<br>4.6.3.1 |

| Question | Answers | Extra information | Mark | AO / Spec Ref. |
|---|---|---|---|---|
| **01.3** | Alfred Wallace and Charles Darwin | | 1 | AO1<br>4.6.2.2<br>4.6.3.1<br>4.6.3.2 |

| Question | Answers | Extra information | Mark | AO / Spec Ref. |
|---|---|---|---|---|
| **01.4** | hoverfly looks like a wasp | allow pattern of the markings is similar (on the hoverfly and wasp)<br>ignore predator / animal thinks the hoverfly is a wasp | 1 | AO3<br>4.6.3.2<br>4.7.1.1<br>4.7.1.4 |
| | predator / animal avoids **wasps** so it does not get stung | | 1 | |
| | (so) predator / animal does not attack / eat hoverfly | allow correctly named predator<br>ignore bite / harm | 1 | |

| | |
|---|---|
| **Total Question 1** | **8** |

**Question 2**

| Question | Answers | Extra information | Mark | AO / Spec Ref. |
|---|---|---|---|---|
| **02.1** | lack of oxygen for (aerobic) respiration | do **not** accept ref to respiration in dead plants | 1 | AO3 |
| | (so) less / no energy (released) | do **not** accept energy produced / made / created | 1 | AO2 |
| | (for) microorganisms / bacteria / fungi / microbes / decomposers<br><br>**OR**<br><br>low pH denatures enzymes (1)<br><br>(so) less / no (chemical) reactions / metabolism / respiration **or** less **/** no energy released (1)<br><br>in microorganisms / bacteria / fungi / microbes / decomposers (1) | allow low pH / acidity reduces enzyme activity<br><br>do **not** accept energy produced / made / created | 1 | AO2<br><br>4.2.2.1<br>4.4.2.1<br>4.7.1.2<br>4.7.2.3 |

| Question | Answers | Extra information | Mark | AO / Spec Ref. |
|---|---|---|---|---|
| **02.2** | 34 g/m$^2$/year | | 1 | AO2<br>4.7.4.3 |

| Question | Answers | Extra information | Mark | AO / Spec Ref. |
|---|---|---|---|---|
| **02.3** | DNA | | 1 | AO1<br>4.6.1.5<br>4.7.1.2<br>4.7.1.4 |

| Question | Answers | Extra information | Mark | AO / Spec Ref. |
|---|---|---|---|---|
| **02.4** | protein | | 1 | AO1<br>4.4.1.1<br>4.4.2.1<br>4.4.2.3<br>4.7.1.2<br>4.7.1.4 |

| Question | Answers | Extra information | Mark | AO / Spec Ref. |
|---|---|---|---|---|
| **02.5** | increase in temperature | allow global warming<br>allow heat (energy) is trapped<br>ignore reference to greenhouse gases | 1 | AO3 |
| | (because) carbon dioxide is released (from the peat bog) | | 1 | AO2 |
| | (because) carbon dioxide is produced by burning / decay of peat | ignore methane is released from burning / decay of peat<br>allow fewer plants to take in carbon dioxide (for photosynthesis) | 1 | AO2 |
| | (because) methane is released (from the peat bog) | | 1 | AO2 |
| | | | | 4.4.2.1<br>4.7.2.3<br>4.7.3.3<br>4.7.3.5 |

| **Total Question 2** | **10** |
|---|---|

**Question 3**

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **03.1** | any **one** from:<br><br>• collect more samples each time<br>• collect samples more frequently<br>• use a bigger bucket / sample<br>• do not return tadpoles until after the fourth sample<br>• sample at the same time of day<br>• randomise collecting positions<br>• collect at range of depths<br>• standardised sweeps with a net instead of a bucket | <br><br><br>allow suggested time interval<br><br><br>allow a method to avoid double counting tadpoles | 1 | AO3<br>4.7.2.1<br>RPA9 |

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **03.2** | 6 | if no answer on line, allow answer in **Table 1** | 1 | AO2<br>4.7.2.1<br>RPA9 |

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **03.3** | correct linear scale and axis labelled weeks | scale must use at least half available space | 1 | AO2<br>4.7.2.1<br>RPA9 |
| | all points plotted correctly | allow a tolerance of ±½ small square<br>allow 4 or 5 correct plots for **1** mark | 2 | |
| | curved line of best fit | ignore line drawn point to point | 1 | |

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **03.4** | correct value at 0 and 4 weeks from line on student's graph, eg 60 and 22 | allow a tolerance of ± ½ small square | 1 | AO2<br>4.7.2.1 |
| | *correct calculation eg*<br>$\frac{22}{60} \times 100$ | | 1 | |
| | 36.7 | allow 37 or 36.6...<br>allow correct calculation using values from the student's graph<br><br>if no line drawn on Figure allow a calculation based on values of 60 and 24 for up to full marks<br>if line drawn on Figure but data from table used (60 and 24) only mp2 and mp3 can be awarded | 1 | |

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **03.5** | any **two** from:<br><br>• disease / (named) pathogens<br>• being eaten **or** predators<br>• lack of food<br><br>• low oxygen (concentration in water)<br>• change in temperature<br>• change in pH<br>• (some of the) pond dried out<br>• toxic chemical | <br><br><br><br>allow competition for food<br>ignore competition unqualified<br><br>allow eutrophication<br><br><br><br>allow lack of space<br>allow named example such as sewage / fertiliser<br>ignore pollution<br>ignore waste | 2 | AO2<br>4.7.1.2<br>4.7.1.3 |

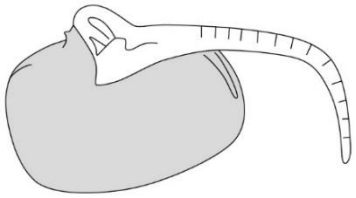
| **Total Question 3** | **11** |
|---|---|

**Question 4**

| Question | Answers | Extra information | Mark | AO / Spec Ref. |
|---|---|---|---|---|
| **04.1** | to prevent (direction of) light affecting the results<br>**or**<br>to prevent (direction of) light affecting growth (of roots) | allow to prevent phototropism<br>ignore ref to shoot<br><br>allow so **only** gravity affects results / growth<br>ignore as a control variable | 1 | AO3<br>4.5.4.1<br>RPA8 |

| Question | Answers | Extra information | Mark | AO / Spec Ref. |
|---|---|---|---|---|
| **04.2** | to prevent water affecting the direction of root growth<br><br>to provide enough water for root growth | | 1<br><br>1 | AO3<br>4.5.4.1<br>RPA8 |

| Question | Answers | Extra information | Mark | AO / Spec Ref. |
|---|---|---|---|---|
| **04.3** | to compare (with apparatus **A**)<br><br>(so) it shows that gravity caused the results in apparatus **A**<br>**or**<br>(because) gravity acted equally in all directions (in apparatus **B**)<br>**or**<br>to cancel out the (one-sided) effect of gravity | allow to see the difference (between **B** and **A**)<br><br>ignore reference to auxin<br><br>ignore to cancel out gravity | 1<br><br>1 | AO3<br>4.5.4.1<br>RPA8 |

| Question | Answers | Extra information | Mark | AO / Spec Ref. |
|---|---|---|---|---|
| **04.4** | root drawn bending downwards | | 1 | AO2 4.5.4.1 |
| | root drawn longer than at start | | 1 | RPA8 |
| | ink marks spread out in bent region | do **not** accept ink marks spread out before the bend<br><br>example:<br> | 1 | |

| Question | Answers | Extra information | Mark | AO / Spec Ref. |
|---|---|---|---|---|
| **04.5** | (in B) horizontal | allow (grows) straight (out)<br>allow not bent (at all) | 1 | AO2 4.5.4.1 RPA8 |

| Question | Answers | Extra information | Mark | AO / Spec Ref. |
|---|---|---|---|---|
| **04.6** | uneven distribution of auxin | allow more auxin on the lower side<br>ignore more auxin on upper side | 1 | AO1 |
| | (so) upper side grows faster / more (than lower) | allow lower side grows slower / less (than upper) | 1 | AO3<br>4.5.4.1 RPA8 |

| Question | Answers | Extra information | Mark | AO / Spec Ref. |
|---|---|---|---|---|
| **04.7** | any **two** from:<br>• weed killers<br>• rooting (powders)<br>• (promoting) growth in tissue culture | allow to grow plants from cuttings<br>ignore reference to shoots<br><br>allow inhibiting lateral buds | 2 | AO1 4.5.4.2 |

| Question | Answers | Extra information | Mark | AO / Spec Ref. |
|---|---|---|---|---|
| **04.8** | any **two** from:<br>• promote / start / initiate / force flowering<br>• more fruit<br>• bigger fruits | allow to grow more flowers<br>if neither given allow bigger yield (of apples)<br>allow idea of fruits ripening simultaneously | 2 | AO2<br>4.5.4.2 |

| **Total Question 4** | **15** |
|---|---|

**Question 5**

| Question | Answers | Extra information | Mark | AO / Spec Ref. |
|---|---|---|---|---|
| **05.1** | any **two** from:<br>• same starting position of rule(r)<br>• more precise scale<br>• repeat **and** calculate mean **or** repeat **and** eliminate anomalies<br>• convert distance to time<br>• student (**B**) rests hand / arm on table | <br>allow ensure the starting position of rule(r) is at 0cm<br>allow other control variables<br>allow two control variables for **2** marks<br>allow rule(r) with mm scale<br>ignore more accurate scale | 2 | AO3<br>4.5.2.1<br>RPA7 |

| Question | Answers | Extra information | Mark | AO / Spec Ref. |
|---|---|---|---|---|
| **05.2** | any **two** from:<br>*endocrine system:*<br>• (hormones) via blood<br>• chemical transmission<br>• slower<br>• longer-lasting | allow converse if clearly referring to nervous system<br>allow not via neurones / cells<br>allow not (electrical) impulses<br>allow not electrical signals<br>ignore messages<br>ignore hormones<br>answers must be comparative<br>ignore reference to target organs | 2 | AO1<br>4.5.2.1<br>4.5.3.1 |

| Question | Answers | Extra information | Mark | AO / Spec Ref. |
|---|---|---|---|---|
| **05.3** | thyroxine | do **not** accept thyroxide<br>ignore reference to TSH / TRH | 1 | AO1<br>4.5.3.1<br>4.5.3.7 |

| Question | Answers | Extra information | Mark | AO / Spec Ref. |
|---|---|---|---|---|
| **05.4** | any **one** from:<br>• insulin<br>• glucagon | | 1 | AO1<br>4.5.3.1<br>4.5.3.2 |

| Question | Answers | Extra information | Mark | AO / Spec Ref. |
|---|---|---|---|---|
| **05.5** | any **two** from:<br>• increases heart rate<br>• increases breathing rate<br>• increases oxygen delivery to cells / tissues / organs<br>• increases glucose delivery to cells / tissues / organs<br>• increases respiration / metabolism<br>• increases sweat(ing) | allow increases blood flow<br>allow examples of cells / tissues / organs<br>allow increases energy release do **not** accept energy produced / made / created<br>allow dilation of pupils<br>allow vasoconstriction in skin **or** vasoconstriction in digestive system<br>allow raises blood sugar / glucose level **or** increase conversion of glycogen to glucose<br>allow vasodilation in (skeletal) muscles **/** brain<br>allow increased blood pressure<br>allow slows digestion<br>allow other correct effects of adrenaline<br>if no other marks awarded allow **1** mark for prepares for 'fight or flight' | 2 | AO1<br>4.5.3.7 |

| Question | Answers | Mark | AO / Spec Ref. |
|---|---|---|---|
| 05.6 | **Level 3:** Relevant points (reasons / causes) are identified, given in detail and logically linked to form a clear account. | 5–6 | AO1<br>4.5.3.4<br>4.5.3.5<br>4.5.3.6 |
| | **Level 2:** Relevant points (reasons / causes) are identified, and there are attempts at logical linking. The resulting account is not fully clear. | 3–4 | |
| | **Level 1:** Points are identified and stated simply, but their relevance is not clear and there is no attempt at logical linking. | 1–2 | |
| | **No relevant content** | 0 | |
| | **Indicative content**<br>**contraception:**<br>• use of hormones oestrogen and progesterone **or** progesterone (only)<br>o inhibition of FSH (production / release)<br>- lack of FSH prevents follicle / egg development / maturation<br>- therefore there is no egg to fertilise<br>o inhibition of LH (production / release)<br>- lack of LH prevents ovulation<br>- therefore there is no egg to fertilise<br>• contraceptive methods include oral contraceptive pill, injection, implant, skin patch, IUD / IUS with hormones<br>**treatment of infertility:**<br>• use of FSH<br>o (FSH) stimulates **maturation** of (several) egg(s) / follicle(s)<br>- (FSH) increases number of eggs matured<br>• use of LH<br>o (LH) stimulates ovulation<br>- (LH) allows eggs / follicles to be collected (from ovary)<br>- (so) increased chance of fertilising an egg<br>- IVF and insertion of embryo(s) into uterus<br>• use of progesterone<br>o (to) maintain uterus lining<br>- increased chance of implantation<br>For **Level 3**, details of both contraception and infertility treatment are required. | | |

| **Total Question 5** | **14** |
|---|---|

**Question 6**

| Question | Answers | Extra information | Mark | AO / Spec Ref. |
|---|---|---|---|---|
| **06.1** | (an allele) that is always expressed<br>**or**<br>(an allele) that is expressed even when the other / recessive allele is present<br>**or**<br>(an allele) that is expressed in the heterozygote<br>**or**<br>(an allele) that is expressed when only one copy is present | allow always shows in the phenotype<br>ignore stronger | 1 | AO1<br>4.6.1.6 |

| Question | Answers | Extra information | Mark | AO / Spec Ref. |
|---|---|---|---|---|
| **06.2** | | allow an annotated genetic diagram for up to **2** marks | | AO3<br>4.6.1.6<br>4.6.1.7 |
| | (person **1**) has polydactyly so must have **D** | allow (person **1**) has polydactyly so must have a dominant allele | 1 | |
| | has offspring / (person) **5** who does not have polydactyly so must have **d** from person **1**<br>**or**<br>person **5** does not have polydactyly so must be **dd** and must inherit **d** from person **1** | | 1 | |

| Question | Answers | Extra information | Mark | AO / Spec Ref. |
|---|---|---|---|---|
| **06.3** | Female / **6**'s gametes correct **D** + **d**<br><br>Male / **7**'s gametes correct **d** + **d** | allow **1** mark for both sets of gametes if parents not identified | 1<br><br>1 | AO2<br>4.6.1.6<br>4.6.1.7 |
| | correct derivation of offspring genotypes: **Dd Dd dd dd** | derivation must be consistent with parental gametes | 1 | |
| | **Dd** correctly identified as polydactyly in **only** half of offspring | mp4 only awarded if mp3 is correct | 1 | |

| Question | Answers | Extra information | Mark | AO / Spec Ref. |
|---|---|---|---|---|
| **06.4** | CF allele is recessive | allow CF is recessive | 1 | AO1 |
| | to have CF, must have 2 CF alleles | | 1 | AO2 |
| | **chance** of having one CF allele is $\frac{1}{50}$ | ignore chance of having one CF allele is one in 50 | 1 | AO2 |
| | (chance of having two CF alleles is)<br>$\frac{1}{50} \times \frac{1}{50} = \frac{1}{2500}$ | ignore 50 × 50 = 2500 | 1 | AO2<br><br>4.6.1.6<br>4.6.1.7 |

| **Total Question 6** | **11** |
|---|---|

**Question 7**

| Question | Answers | Extra information | Mark | AO / Spec Ref. |
|---|---|---|---|---|
| **07.1** | 46 000 **or** 16 400 **or** 12.8 **or** 0.8 | | 1 | AO2<br>4.7.2.1<br>4.7.4.3<br>4.7.5.2 |
| | 46 000 **and** 16 400<br>**or**<br>262 400 | | 1 | |
| | 46 000 **and** 209 920<br>**or**<br>3593.75 | | 1 | |
| | 2191.3<br>**or**<br>$\frac{46\,000 \times 10\,000}{209\,920}$<br>**or**<br>$\frac{3593.75 \times 10\,000}{16\,400}$ | | 1 | |
| | 2190 | | 1 | |

| Question | Answers | Extra information | Mark | AO / Spec Ref. |
|---|---|---|---|---|
| **07.2** | suitable scale, symmetrical around 0<br><br>labels for *x*-axis **and** for bars<br><br>correct values plotted:<br>chickens 2200<br>maize 4200 | <br><br>(biomass in) kg<br>(bars) maize and chickens<br><br>allow a tolerance of ±½ small square<br>ignore height of bars | 1<br><br>1<br><br>1 | AO2<br>4.7.4.2 |

| Question | Answers | Extra information | Mark | AO / Spec Ref. |
|---|---|---|---|---|
| **07.3** | <u>2200</u><br>4200<br><br>= 0.5238… : 1<br>**or**<br>11 : 21<br>**or**<br>1 : 1.9 | <br><br><br>allow rounded value | 1<br><br><br>1 | AO2<br>4.7.4.2 |

| Question | Answers | Extra information | Mark | AO / Spec Ref. |
|---|---|---|---|---|
| **07.4** | lost via egestion / faeces | ignore urine / excretion / waste<br>ignore not digested<br>do **not** accept respiration<br>do **not** accept not eaten<br>do **not** accept movement **or** as heat **or** for keeping warm | 1 | AO1<br>4.7.4.3 |

| Question | Answers | Extra information | Mark | AO / Spec Ref. |
|---|---|---|---|---|
| **07.5** | lysine and tryptophan | | 1 | AO3<br>4.4.2.3<br>4.7.5.2 |

| Question | Answers | Extra information | Mark | AO / Spec Ref. |
|---|---|---|---|---|
| **07.6** | any **one** from:<br><br>• chickens need low amounts of leucine (for growth)<br><br>• (chicken) proteins contain low amount / proportion of leucine | do **not** accept leucine is not needed (for growth) | 1 | AO3<br>4.4.2.3<br>4.7.5.2 |

| **Total Question 7** | **13** |
|---|---|

**Question 8**

| Question | Answers | Extra information | Mark | AO / Spec Ref. |
|---|---|---|---|---|
| **08.1** | regulation / control / maintenance of internal conditions | allow keeping internal conditions the same | 1 | AO1 4.5.1 |
| | for optimum conditions for cell(s) / enzyme(s) (activity) | allow a description of optimum functioning of cell / body | 1 | |

| Question | Answers | Extra information | Mark | AO / Spec Ref. |
|---|---|---|---|---|
| **08.2** | glucose **and** urea are filtered (out of the blood) | allow a description of filtration of glucose **and** urea (out of the blood) | 1 | AO1 4.5.1 4.5.3.3 |
| | protein is not filtered (out of the blood) | | 1 | |
| | all glucose reabsorbed | allow all glucose absorbed back into the blood | 1 | |
| | urea (mostly) not reabsorbed **or** urea passes out in urine | allow urea not absorbed back into the blood | 1 | |

| Question | Answers | Extra information | Mark | AO / Spec Ref. |
|---|---|---|---|---|
| **08.3** | (increased / high) ADH increases water reabsorption<br>**or**<br>(increased / high) ADH increases permeability to water | allow converse for decreased / low / no ADH | 1 | AO1 |
| | (water reabsorption) from kidney tubules | | 1 | AO1 |
| | (so) ADH increases the concentration (of urine) | | 1 | AO1 |
| | (so) ADH decreases the <u>volume</u> (of urine) | | 1 | AO2<br><br>4.5.1<br>4.5.3.3 |

| | |
|---|---|
| **Total Question 8** | **10** |

**Question 9**

| Question | Answers | Mark | AO / Spec Ref. |
|---|---|---|---|
| 09.1 | **Level 3:** Relevant points (reasons / causes) are identified, given in detail and logically linked to form a clear account. | 5–6 | AO1<br>4.2.3.2<br>4.4.1.1<br>4.4.1.3<br>4.6.2.4<br>4.7.1.1<br>4.7.2.4<br>4.7.5.4 |
| | **Level 2:** Relevant points (reasons / causes) are identified, and there are attempts at logical linking. The resulting account is not fully clear. | 3–4 | |
| | **Level 1:** Points are identified and stated simply, but their relevance is not clear and there is no attempt at logical linking. | 1–2 | |
| | **No relevant content** | 0 | |
| | **Indicative content**<br>• glyphosate kills weeds but does not harm GM soya<br>• (so) less competition for light / water / ions / (named) minerals / (named) salts / space<br>• more light / water for <u>photosynthesis</u><br>  ○ (so) more glucose produced<br>• more glucose for<br>  ○ respiration for energy<br>  ○ cellulose for cell walls<br>  ○ starch for stored energy / glucose (in soya beans)<br>  ○ protein for cell structure / storage (in soya beans)<br>  ○ lipids for energy storage (in soya beans)<br>• more water for<br>  ○ turgor / support<br>  ○ transport<br>  ○ medium for reactions<br>  ○ hydrolysis / digestion of (stored) organic substances<br>• more magnesium<br>  ○ for chlorophyll<br>• more nitrate<br>  ○ for amino acids / proteins<br>• more phosphate<br>  ○ for DNA<br><br>For **Level 3**, answers must include detail of factors that increase the yield of GM maize. | | |

| Question | Answers | Extra information | Mark | AO / Spec Ref. |
|---|---|---|---|---|
| **09.2** | any **two** from:<br><br>• do not know effects on animals / humans (when eaten)<br><br>• gene / allele may be transferred to other (wild) plants<br><br>• reduce biodiversity<br><br>• increased cost of seed (for farmers)<br>**or**<br>increased cost to consumer (for product)<br><br>• may affect flavour / taste (of product) | ignore reference to ethical concerns or religion<br><br>allow do not know side effects on animals / humans (when eaten)<br><br>ignore cost unqualified | 2 | AO2<br>4.6.2.4 |

| **Total Question 9** | **8** |
|---|---|