# GCSE Biology (AQA 8461)

## Higher Tier

# Mark scheme

### Introduction

The information provided for each question is intended to be a guide to the type of answers students may produce, but can be neither exhaustive nor prescriptive. Award marks according to your professional judgement for all appropriate responses.

### Disclaimer

- These mark schemes and exemplar answer content are entirely the work of the question author and have not been produced by, reviewed by or endorsed by AQA.
- Where marks are suggested and levels mapped to particular styles or features of answers, these are intended for guidance only and cannot reflect the full examination marking process, which involves moderation and alignment of level boundaries across a full, national student cohort that cannot be determined from a standalone product such as this set of Practice Papers.
- Therefore, mark allocation, mark totals, suggested levels and overall assessments of performance as found in these Practice Papers and Mark Schemes represent only a limited guide to possible outcomes, and are not a reliable indicator of actual performance.

# Information for teachers

### 1. General

The mark scheme for each question gives:

- the marks available for each part of the question
- the total marks available for the question
- the correct answer or, if multiple correct answers are possible, a typical correct answer with variations
- extra information to help with making decisions about how many marks to award
- the Assessment Objective(s) from the GCSE Specification that the part question is intended to cover.

The 'extra information' is aligned to the appropriate answer and is only intended for consideration with that particular part of the answer.

### 2. Marking of lists

For question parts where a set number of responses is requested, all possible correct answers are stated. Each correct response should be awarded a mark as indicated, up to a maximum for the question part as stated on the question paper and as written in this marks scheme.

If a student has provided more than the set number of responses requested, the principle to be followed is that 'right + wrong = wrong'. Each error or contradictory response negates each correct response. If the number of errors and contradictions equals or exceeds the number of correct responses, no marks can be awarded for that part of the question.

### 3. Use of symbols and formulae

If an accepted scientific symbol or formula is written instead of a required chemical name or unit, award full marks if the symbol or formula is correct and if, in the context of the question, the response is appropriate.

### 4. Calculations

Award marks for each correctly completed stage of a calculation, as students are instructed to show their working.

Full marks can be given for a correct numerical answer (including units), even though no working is shown.

### 5. Interpretation of 'it' and 'them'

Answers using the word 'it' or 'them' should be awarded marks only if it is clear that the 'it' or 'them' refers to the correct subject.

### 6. Errors carried forward

An error in the answers to a structured question should be penalised once only.

Allowances for errors carried forward are usually restricted to calculation questions. Where such allowances are permissible, the mark scheme includes a statement such as 'allow ecf'.

### 7. Phonetic spelling

The phonetic spelling of correct scientific terminology should be awarded marks unless there is a possible confusion with another technical term.

### 8. Brackets

(……) in this marks scheme indicates information that is not essential for a mark to be awarded, but is included to help you identify the sense of the required answer.

### 9. Ignore / insufficient / do not allow

'Ignore' or 'insufficient' are used in this marks scheme to indicate information that is irrelevant to the question or not enough to gain the mark. Further correct amplification could gain the mark.

'Do not allow' indicates that this is a wrong answer which, even if the correct answer is also given, still means that the mark should not be awarded.

### 'Level of response' marking instructions

'Level of response' mark schemes are broken down into levels, each of which is given a descriptor. The descriptor for a level shows the average performance for that level. There are marks allocated to each level.

Before applying the mark scheme to a student's answer, read through the answer and annotate it to show the qualities that are being looked for. 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 qualities given in the descriptor for that level. If the answer meets the lowest level, move up to the next level and repeat the assessment until you find a match between the descriptors and the answer.

When assigning a level, you should look at the overall quality of the answer and not be distracted by small details of the answer where the student may not have performed quite as well as their overall performance. If an answer covers different aspects of different levels of the mark scheme, use a 'best fit' approach: for example, if a response is predominantly level 2 with a small amount of level 3 material, place it in level 2 but award a mark near the top of the level because of the level 3 content.

### Step 2 Determine a mark

The descriptors within each level can help with this, along with the exemplar answers or extra information given. Indicative content is provided as a guide. It is not exhaustive and you should credit other valid points in the answer. Students do not have to cover all of the points mentioned in the indicative content to reach the highest level of the mark scheme.

Ignore any responses that are irrelevant. However, only award full marks if there are no incorrect or contradictory responses.

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

Read back through the full answer as you apply the mark scheme, so as to clarify points and assure yourself that the level and the mark are appropriate.

## Paper 1

### Question 01

| QUESTION | ANSWERS | EXTRA INFORMATION | MARK | AO / SPEC. REF. |
|---|---|---|---|---|
| **01.1** | translocation | | 1 | AO1/1<br>4.2.3.2 |
| **01.2** | phloem is composed of tubes of elongated cells<br>with pores in the end walls<br>cell sap can move from one phloem cell to the next | | 1<br>1<br>1 | AO1/1<br>AO2/1<br>4.2.3.2 |
| **01.3** | starch is insoluble<br>so it does not affect osmosis | Accept 'is not washed out of cells' | 1<br>1 | AO1/1<br>4.4.1.3<br>AO2/1<br>4.1.3.2 |
| **01.4** | add iodine solution<br>blue/black colour is positive test for starch | | 1<br>1 | AO2/2 |
| **TOTAL** | | | **8** | |

## Question 02

| QUESTION | ANSWERS | EXTRA INFORMATION | MARK | AO / SPEC. REF. |
|---|---|---|---|---|
| **02.1** | so roots can respire | Reject mention of respiration on its own | 1 | AO2/1<br>4.4.2.1 |
| **02.2** | active transport | | 1 | AO1/1<br>4.1.3.3 |
| **02.3** | chlorosis / yellow leaves | | 1 | AO1/1<br>4.3.3.1 |
| **02.4** | to make amino acids / proteins | | 1 | AO2/1<br>4.3.3.1 |
| **02.5** | **Level 2:** A detailed and coherent explanation is provided. The student makes logical links between clearly identified, relevant points that explain why plants with magnesium and nitrate ion deficiency have reduced yields. | | 3–4 | AO2/1<br>4.3.3.1 |
| | **Level 1:** Simple statements are made, but not precisely. The logic is unclear. | | 1–2 | |
| | No relevant content | | 0 | |
| | **Indicative content**<br>• less photosynthesis because of lack of magnesium to make chlorophyll<br>• therefore less glucose made<br>so<br>• less energy released for growth<br>• because glucose is needed for respiration<br>and / or<br>• less amino acids / proteins / because of lack of nitrogen/ nitrate<br>• less growth because amino acids / proteins are needed for growth | | | |
| **TOTAL** | | | **8** | |

## Question 03

| QUESTION | ANSWERS | EXTRA INFORMATION | MARK | AO / SPEC. REF. |
|---|---|---|---|---|
| **03.1** | to prevent microorganisms / bacteria getting into the milk | Accept pathogens, reject 'dirt' or 'germs' | 1 | AO2/2<br>4.1.1.6 |
| **03.2** | count the number of colonies on each plate<br>plate with fewest colonies is from most effective treatment | | 1<br>1 | AO3/2a<br>4.1.1.6 |
| **03.3** | **Level 3:** A clear, logical and coherent answer, with no significant redundancy. The student understands the process and links this to reasons for aseptic technique. | | 5–6 | AO1/2<br>4.1.1.6 |
| | **Level 2:** A partial answer with some stages missed or not in logical order. | | 3–4 | |
| | **Level 1:** One or two relevant points but little linkage of points or logical order. | | 1–2 | |
| | No relevant content | | 0 | |
| | **Indicative content**<br>• wash hands before starting work<br>• disinfect work surfaces<br>• Petri dishes must be sterilised before use<br>• culture media must be sterilised before use<br>• inoculating loops used to transfer microorganisms to the media must be sterilised by passing them through a flame<br>• the lid of the Petri dish should be secured with adhesive tape and the Petri dish stored upside down<br>• cultures should generally be incubated at 25 °C | | | |
| **03.4** | Any **two** from:<br>• repeat the experiment several times<br>• trial different disinfectants<br>• swab teats before treatment so it is possible to see if treatment kills any bacteria | | 2 | AO3/3a<br>4.1.1.6 |
| **TOTAL** | | | **11** | |

## Question 04

| QUESTION | ANSWERS | EXTRA INFORMATION | MARK | AO / SPEC. REF. |
|---|---|---|---|---|
| **04.1** | to stop the lamp heating the plant | | 1 | AO2/2<br>4.4.1.2 |
| **04.2** | to provide carbon dioxide | | 1 | AO2/2<br>4.4.1.2 |
| **04.3** | oxygen | | 1 | AO2/2<br>4.4.1.2 |
| **04.4** | number of bubbles<br>(in a unit of) time | accept any suitable unit of time, e.g. seconds, minutes | 1<br>1 | AO3/3A<br>4.4.1.2 |
| **04.5** | $d^2 = 100$<br><br>$\frac{1}{d^2} = 0.0100$ (arbitrary units) | Answer should be to 4 dec. places to match other values in table. | 1<br><br>1 | AO2/2<br>4.4.1.2 |
| **04.6** | light intensity | | 1 | AO3/1a<br>4.4.1.2 |
| **04.7** | carbon dioxide (concentration) is no longer a limiting factor | | 1 | AO3/1a<br>4.4.1.2 |
| **TOTAL** | | | **9** | |

## Question 05

| QUESTION | ANSWERS | EXTRA INFORMATION | MARK | AO / SPEC. REF. |
|---|---|---|---|---|
| **05.1** | 12 (volume of water)<br>16 (volume of sodium chloride solution) | | 2 | AO2/2<br>4.1.3.2 |
| **05.2** | to remove water from the surface of the potato<br>the water on the surface would increase the mass, giving a false result | <br>look for the idea for this second point | 1<br>1 | AO2/2<br>4.1.3.2 |
| **05.3** | 0.35 ($mol/dm^3$) | | 1 | AO3/2a<br>4.1.3.2 |
| **05.4** | Concentrations: at least two values in the range from 0.2 $mol/dm^3$ to 0.5 $mol/dm^3$<br>Explanation: line of best fit does not go through points so not very accurate<br>*or*<br>Concentrations: actual value of concentration in potato tissue is near to 0.35 $mol/dm^3$<br>Explanation: testing concentrations near that value is likely to give more accurate result | look for good explanation of reason for choosing values | 1<br>1 | AO3/2a<br>4.1.3.2 |
| **TOTAL** | | | **7** | |

## Question 06

| QUESTION | ANSWERS | EXTRA INFORMATION | MARK | AO / SPEC. REF. |
|---|---|---|---|---|
| **06.1** | to keep the pH constant | | 1 | AO1/1<br>4.2.2.1 |
| **06.2** | (near to) optimum temperature | | 1 | AO1/1<br>4.2.2.1 |
| **06.3** | casein has been digested by protease<br>protein broken down to amino acids | | 1<br>1 | AO3/2b<br>4.2.2.1 |
| **06.4** | Area of digestive system: pancreas<br>Explanation: works best in alkaline pH | accept answer which refers to pH in duodenum/ileum | 1<br>1 | AO1/1<br>AO3/2b<br>4.2.2.1 |
| **06.5** | requires energy and carrier proteins to move particles against a concentration gradient | | 1 | AO1/1<br>4.1.3.3 |
| **06.6** | placebo tablet does not contain the drug<br>control group to compare drug results against | | 1<br>1 | AO1/2<br>4.3.1.9 |
| **06.7** | reduces volume of acid released<br>for 3 hours | | 1<br>1 | AO3/1a<br>4.3.1.9 |
| **TOTAL** | | | **11** | |

## Question 07

| QUESTION | ANSWERS | EXTRA INFORMATION | MARK | AO / SPEC. REF. |
|---|---|---|---|---|
| **07.1** | working needs to show that the equation given has be manipulated to give<br>$\text{size of real object} = \frac{\text{size of image}}{\text{magnification}}$<br>measure cell between A and B in mm<br>convert to µm<br>divide by 1000 | award 2nd and 3rd marking points even if measurement is incorrect | 1<br>1<br>1 | AO2/2<br>4.1.1.5 |
| **07.2** | an electron microscope has higher resolution and higher magnification | | 1 | AO1/1<br>4.1.1.5 |
| **07.3** | mitochondria, provide energy for active transport<br>folded membrane, increases surface area | | 1<br>1 | AO2/2<br>4.1.1.3 |
| **TOTAL** | | | **6** | |

## Question 08

| QUESTION | ANSWERS | EXTRA INFORMATION | MARK | AO / SPEC. REF. |
|---|---|---|---|---|
| **08.1** | mucus traps pathogens<br>cilia waft the mucus upwards/ away from the lungs | accept bacteria/ microorganisms | 1<br>1 | AO1/1<br>4.3.1.6 |
| **08.2** | (white blood cells) engulf the pathogen<br>digest the pathogen<br>using enzymes | | 1<br>1<br>1 | AO1/1 |
| **08.3** | a molecule/protein on the HPV virus<br>which stimulates an immune response | accept any answer which refers to stimulation of lymphocytes and/or production of antibodies | 1<br>1 | AO1/1<br>4.3.1.6 |
| **08.4** | (antigens in the vaccine) stimulate B cells/lymphocytes<br>to produce antibodies<br>if infected with HPV then the antibodies will destroy the virus | | 1<br>1<br>1 | AO1/1<br>4.3.1.7 |
| **08.5** | Prevents males being infected with HPV.<br>Prevents males passing on HPV (to unvaccinated females) / HPV may cause (other) cancers in males. | accept reference to herd effect protecting the population | 1<br>1 | AO3/2a<br>4.2.2.5 |
| **TOTAL** | | | **12** | |

## Question 09

| QUESTION | ANSWERS | EXTRA INFORMATION | MARK | AO / SPEC. REF. |
|---|---|---|---|---|
| 09.1 | **Level 3:** A detailed and coherent explanation is provided with most of the relevant content, which demonstrates a comprehensive understanding of how the body responds to exercise. The response makes logical links between content points. | | 5–6 | AO1/1<br>4.4.2.2<br>4.4.2.3<br>4.1.3.1<br>4.2.2.3 |
| | **Level 2:** The response is mostly relevant and with some logical explanation. Gives a broad understanding of how the body responds to exercise. The response makes some logical links between the content points. | | 3–4 | |
| | **Level 1:** Simple descriptions are made of the roles of some of the following: heart rate, breathing rate, supply of oxygen and removal of carbon dioxide. The response demonstrates limited logical linking of points. | | 1–2 | |
| | No relevant content | | 0 | |
| | **Indicative content**<br>• increased aerobic respiration in muscle cells<br>• increased heart rate to supply more blood to respiring cells<br>• carrying oxygen and glucose<br>• increased breathing rate and breath volume<br>• to remove carbon dioxide<br>• to oxygenate blood<br>• by diffusion in alveoli of lungs<br>• red blood cells transport oxygen in haemoglobin<br>• if insufficient oxygen, anaerobic respiration occurs<br>• lactic acid is produced<br>• lactic acid is transported in blood to liver where it is converted back to glucose<br>• oxygen debt is amount of oxygen needed to react with lactic acid<br>• glycogen in liver and muscles is converted to glucose | | | |
| **TOTAL** | | | **6** | |

## Question 10

| QUESTION | ANSWERS | EXTRA INFORMATION | MARK | AO / SPEC. REF. |
|---|---|---|---|---|
| **10.1** | A | | 1 | AO1/1<br>4.2.2.2 |
| **10.2** | they are made up of more than one tissue | accept named tissues from the table | 1 | AO3/1a<br>4.1.1.3 |
| **10.3** | 20 µm | | 1 | AO3/1a<br>4.2.2.2 |
| **10.4** | thickness of artery wall<br>20 + 490 + 370 + 120 = 1000 µm<br>1000 µm = 1 mm<br>there are two walls across a diameter<br>4 – 2 = 2 mm | | 1<br>1<br>1 | AO2/2<br>4.2.2.2 |
| **10.5** | to prevent backflow of blood | | 1 | AO1/1<br>4.2.2.2 |
| **10.6** | so that blood cells can pass along without friction | | 1 | AO3/1a<br>4.2.2.2 |
| **10.7** | people in USA have a diet with 40% fat<br>for every 1000 people in the population 7 died of heart disease per year | | 1<br>1 | AO3/1a<br>4.2.2.4 |
| **10.8** | as the percentage of fat in the diet increases, the greater the risk of dying of heart disease | | 1 | AO3/2b<br>4.2.2.4 |
| **TOTAL** | | | **11** | |

## Question 11

| QUESTION | ANSWERS | EXTRA INFORMATION | MARK | AO / SPEC. REF. |
|---|---|---|---|---|
| **11.1** | antigens are injected into a mouse<br>antibodies (against the antigen) are produced by B lymphocytes<br>antibody-producing B cells are fused with tumour cells<br>or<br>hybridoma formed | accept other small mammal, e.g. rat | 1<br>1<br>1 | AO1/1<br>4.3.2.1 |
| **11.2** | all the antibodies must have same shape binding site<br>so only bind to same antigen/ PSA | | 1<br>1 | AO1/1<br>4.3.2.1 |
| **11.3** | only PSA has right shape to fit into antibody binding site<br>other antigens are wrong shape | | 1<br>1 | AO1/1<br>4.3.2.1 |
| **11.4** | PSA attaches to antibody<br>antibody with enzyme attached attaches to antibodies with PSA attached<br>colourless substrate is added<br>enzyme converts colourless substrate to coloured product | | 1<br>1<br>1<br>1 | AO2/1<br>4.3.2.2 |
| **TOTAL** | | | **11** | |

## Paper 2

### Question 01

| QUESTION | ANSWERS | EXTRA INFORMATION | MARK | AO / SPEC. REF. |
|---|---|---|---|---|
| **01.1** | Kingdom<br>tigris | ignore italics or underlining | 1<br>1 | AO1/1<br>4.6.4 |
| **01.2** | weight / mass of animals available for the tiger to eat | | 1 | AO2/1<br>4.7.2.1 |
| **01.3** | 20 | | 1 | AO2/1<br>4.7.1.1 |
| **01.4** | **Level 2:** A detailed and coherent explanation is provided. Logical links between clearly identified, relevant points explain how the population of tigers is affected by deforestation. | | 3–4 | AO1/1<br>AO2/2<br>4.7.1.1<br>4.7.3.1<br>4.7.1.3 |
| | **Level 1:** Simple statements made, but not precisely. The logic is unclear. | | 1–2 | |
| | No relevant content | | 0 | |
| | **Indicative content**<br>• loss of habitat for tigers<br>• loss of habitat for prey animals<br>• loss of food sources for prey animals<br>• so fewer prey animals<br>• increased competition between tigers and/or other predators for prey<br>• as less prey fewer tigers in the forest<br>• increased competition between tigers for mates as fewer tigers | | | |
| **TOTAL** | | | **8** | |

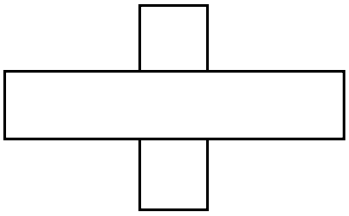
## Question 02

| QUESTION | ANSWERS | EXTRA INFORMATION | MARK | AO / SPEC. REF. |
|---|---|---|---|---|
| **02.1** | avoids the cost of keeping a bull<br>allows farmer to choose which bull he gets sperm from / characteristics of bull he gets sperm from | | 1<br>1 | AO3/2a<br>4.6.2.3 |
| **02.2** | lot of muscle tissue<br>fast growing | accept suitable suggestions related to beef cattle | 1<br>1 | AO3/2a<br>4.6.2.3 |
| **02.3** | **Level 3:** A detailed and coherent evaluation is given, which considers the advantages and disadvantages of using embryo transplantation to farmers who want to improve their herds. | | 5–6 | AO3/1b<br>4.6.2.5<br>4.6.2.3 |
| | **Level 2:** A discussion of advantages and disadvantages of embryo transplantation, with attempts at relevant explanation, but linking is not clear. | | 3–4 | |
| | **Level 1:** Simple statements are made, but no attempt to link to explanations. | | 1–2 | |
| | No relevant content | | 0 | |
| | **Indicative content**<br>Advantages:<br>• can choose characteristics in bull and cow<br>• avoids cost of buying high value bull and cows<br>• surrogate cows do not need to be high quality<br>• can transplant embryos on same day so calves will be born around same time<br>• can breed from the offspring with desired characteristics<br>Disadvantages:<br>• requires vet to carry out transplantation<br>• cost of embryos<br>• need to keep detailed records of source of eggs and sperm<br>• possibility of inbreeding if don't know parentage of calves | | | |
| **TOTAL** | | | **10** | |

## Question 03

| QUESTION | ANSWERS | EXTRA INFORMATION | MARK | AO / SPEC. REF. |
|---|---|---|---|---|
| **03.1** | oxygen is used in respiration<br>more bacteria, more respiration | | 1<br>1 | AO1/1 4.7.2.2<br>AO2/1 4.7.2.2 |
| **03.2** | so oxygen could not enter the tube from the air | | 1 | AO2/2 4.7.2.2 |
| **03.3** | blue | | 1 | AO2/2 4.7.2.2 |
| **03.4** | axis correct scale and labelled<br>5 points plotted correctly<br>points joined with straight lines | allow 1 mark for 4 points correctly plotted | 1<br>2<br>1 | AO2/2 4.7.2.2 |
| **03.5** | if not many bacteria at start it may never go white | look for more than just taking too long | 1 | AO3/2b 4.7.2.2 |
| **03.6** | pH probe gives a numerical reading<br>difficult to judge change in colour and pH probe avoids this | | 1<br>1 | AO2/2 4.7.2.2 |
| **03.7** | no bacteria present in the milk as it has been heat treated | | 1 | AO3/2b 4.7.2.2 |
| **TOTAL** | | | **12** | |

## Question 04

| QUESTION | ANSWERS | EXTRA INFORMATION | MARK | AO / SPEC. REF. |
|---|---|---|---|---|
| **04.1** | random sampling<br>use of quadrats<br>repeat several times | | 1<br>1<br>1 | AO1/1<br>4.7.2.1 |
| **04.2** | 86 | | 1 | AO2/2<br>4.7.2.1 |
| **04.3** | 98 | accept 98.4 | 1 | AO2/2<br>4.7.2.1 |
| **04.4** | secondary consumer | | 1 | AO1/1<br>4.7.2.1 |
| **04.5** |  <br>three blocks with top and bottom smaller than middle<br>• bottom labelled bean plants<br>• middle layer labelled aphids<br>• top labelled ladybirds | 1 mark for shape<br>2 marks for three correct labels, 1 mark for one correct label | 3 | AO2/2<br>4.7.4.2 |
| **04.6** | **Level 2:** A detailed and coherent explanation is provided. Logical links between use of insecticide and management of pests on crop including natural selection increasing numbers of resistant aphids. | | 3–4 | AO2/1<br>4.7.5.1<br>4.6.3.1 |
| | **Level 1:** Simple statements made, but not precisely. The logic is unclear. | | 1–2 | |
| | No relevant content | | 0 | |
| | **Indicative content**<br>• insecticide will kill ladybirds as well as aphids<br>• if aphids return there will be no ladybirds to eat aphids<br>• pollinating insects/bees may killed<br>• flowers need to be pollinated for beans to form<br>• resistant aphids may survive and reproduce<br>• insecticide may not be effective in future spraying | | | |
| **TOTAL** | | | **13** | |

## Question 05

| QUESTION | ANSWERS | EXTRA INFORMATION | MARK | AO / SPEC. REF. |
|---|---|---|---|---|
| **05.1** | ciliary muscles contract<br>suspensory ligaments loosen<br>allows lens to become thicker so light rays are refracted strongly | | 1<br>1<br>1 | AO1/1<br>4.5.2.3 |
| **05.2** | convex lens bends the light rays inward before they enter the eye<br>so they will focus on the retina | | 1<br>1 | AO1/1<br>4.5.2.3 |
| **05.3** | laser changes shape/ reduces thickness of cornea so light rays enter eye at correct angle for focussing | look for suitable description that shows understanding | 1 | AO2/2<br>4.5.2.3 |
| **TOTAL** | | | **6** | |

## Question 06

| QUESTION | ANSWERS | EXTRA INFORMATION | MARK | AO / SPEC. REF. |
|---|---|---|---|---|
| **06.1** | P = C – F – R | accept<br>P = C – (F + R) | 1 | AO2/2<br>4.7.4.3 |
| **06.2** | P = 92 – 58 – 30<br>P = 4 | | 1 | AO2/2<br>4.7.4.3 |
| **06.3** | total energy in grass<br>= 8100 × 21135 = 171 193 500<br>$\frac{4 \times 10^6}{171\ 193\ 500} \times 100 = 2.34\%$ | allow for error carried forward with answer from part 06.2 ($4 \times 10^6$) | 1<br><br>1 | AO2/2<br>4.7.4.3 |
| **06.4** | **Level 2:** A detailed and coherent explanation is provided. Logical links between amount of energy and land used in producing meat and dairy products compared to amount of energy and land used in producing vegetables. | | 3–4 | AO2/2<br>4.7.5.1<br>4.7.5.2 |
| | **Level 1:** Simple statements made, but not precisely. The logic is unclear. | | 1–2 | |
| | No relevant content | | 0 | |
| | **Indicative content**<br>• dairy products come from cows<br>• cows need a lot of land or feed to produce milk<br>• meat comes from animals which feed on grass or other vegetable material<br>• land is needed to grow feed for animals<br>• land used for growth of vegetables is less for amount of energy produced | | 2 | |
| **06.5** | Any **two** from the following:<br>• need less land than cattle<br>• produce less methane than cattle<br>• reproduce faster than cattle | accept other valid suggestions | 2 | AO2/2<br>4.7.5.2 |
| **TOTAL** | | | **10** | |

## Question 07

| QUESTION | ANSWERS | EXTRA INFORMATION | MARK | AO / SPEC. REF. |
|---|---|---|---|---|
| **07.1** | X = phosphate<br>Y = sugar | | 1<br>1 | AO1/1<br>4.6.1.4 |
| **07.2** | box drawn round one nucleotide | to include a base, phosphate and sugar | 1 | AO1/1<br>4.6.1.4 |
| **07.3** | A opposite T<br>C and G on other pair of bases | T is already shown on diagram<br>C should be the smaller base but ignore which way round the bases are labelled | 1<br>1 | AO1/1<br>4.6.1.4 |
| **07.4** | 26%<br>A = T, so T is 24%<br>A + T = 48%<br>100 – 48 = 52%<br>C = G, so G is half of 52% | allow 2 marks for correct answer even if working not shown<br>1 mark for 24% if bases not paired correctly | 2 | AO2/2<br>4.6.1.4 |
| **07.5** | mutation changes one of the bases in the triplet coding for an amino acid<br>mutation changes the amino acid<br>this could change the way the protein folds<br>so it forms a different shape/ changes shape of active site<br>so the substrate/amino acid does not fit on the enzyme | accept phenylalanine for substrate | 1<br>1<br>1<br>1<br>1 | AO1/1<br>4.6.1.5 |
| **TOTAL** | | | **12** | |

## Question 08

| QUESTION | ANSWERS | EXTRA INFORMATION | MARK | AO / SPEC. REF. |
|---|---|---|---|---|
| **08.1** | Non-taster female 4: tt | | 1 | AO1/1 4.6.1.6 |
| | Taster male 3: Tt | | 1 | |
| **08.2** | genotypes of both parents are Tt, so both phenotypes are tasters (but no marks for this information) | | | AO3/2b 4.6.1.6 |
| | both male and female gametes are T, t | allow errors carried forward from the starting information | 1 | |
| | correct derivation of offspring in Punnett square | | 1 | |
| | TT and Tt circled as tasters | | 1 | |
| | probability = 0.75 | allow 75% or 3 in 4 or a 3 : 1 ratio | 1 | |
| **TOTAL** | | | **6** | |

## Question 09

| QUESTION | ANSWERS | EXTRA INFORMATION | MARK | AO / SPEC. REF. |
|---|---|---|---|---|
| **09.1** | 1400 $cm^3$ | allow answer written on table | 1 | AO2/2<br>4.5.3.3 |
| **09.2** | liver | | 1 | AO1/1<br>4.5.3.3 |
| **09.3** | protein molecules are too large to pass through filter | | 1 | AO2/1<br>4.5.3.3 |
| **09.4** | the concentration of urea (and salt) is higher in urine than in blood | look for the idea that less water in urine will increase concentration | 1 | AO2/1<br>4.5.3.3 |
| **09.5** | **Level 2:** A detailed and coherent explanation is given, which logically links the role of ADH with control of water content of blood in the situation given. | | 3–4 | AO1/1<br>4.5.3.3 |
| | **Level 1:** Simple statements relating to the role of ADH in control of water content of blood but no attempt to link them or apply to situation given. | | 1–2 | |
| | No relevant content | | 0 | |
| | **Indicative content**<br>• running on a hot day will increase sweating<br>• sweating reduces water content of blood<br>• reduced water content is detected and ADH is released<br>• by pituitary gland<br>• ADH travels in blood to kidney<br>• ADH acts on kidney tubules to reabsorb more water into blood<br>• less urine is produced<br>• more concentrated urine is produced | | | |

(Marks continued over the page)

## Question 09

| QUESTION | ANSWERS | EXTRA INFORMATION | MARK | AO / SPEC. REF. |
|---|---|---|---|---|
| **09.6** | blood passes from patient into dialysis machine<br>dialysis fluid is separated from blood by a partially permeable membrane<br>urea diffuses out of blood into dialysis fluid | | 1<br>1<br>1 | AO2/2<br>4.5.3.3 |
| **09.7** | water may move into blood by osmosis and burst blood cells<br>glucose and salts may diffuse out of blood into dialysis fluid | | 1<br>1 | AO2/2<br>4.1.3.2<br>4.1.3.1 |
| **09.8** | need to take drugs to prevent rejection of new kidney | look for idea of rejecting the kidney | 1 | A02/2<br>4.5.3.3 |
| **TOTAL** | | | **14** | |

## Question 10

| QUESTION | ANSWERS | EXTRA INFORMATION | MARK | AO / SPEC. REF. |
|---|---|---|---|---|
| **10.1** | pituitary (gland) | | 1 | AO1/1<br>4.5.3.4 |
| **10.2** | LH peaks | ignore reference to FSH | 1 | AO3/1a<br>4.5.3.4 |
| **10.3** | as concentration of oestrogen increases the concentration of FSH falls<br>oestrogen inhibits FSH so no eggs can mature | need to see that student has looked at graph for evidence<br>look for explanation | 1<br>1 | AO3/1a<br>AO3/2b<br>4.5.3.4<br>4.5.3.5 |
| **10.4** | increases to prepare uterine lining for implantation of embryo/fertilised egg<br>decreases because fertilisation did not occur | | 1<br>1 | AO1/1<br>AO3/2b<br>4.5.3.4 |
| **10.5** | FSH stimulates follicle to develop<br>developing follicles release oestrogen which inhibits FSH production<br>without inhibition by oestrogen FSH continues to be produced (leading to high levels in blood) | | 1<br>1<br>1 | AO3/2b<br>4.5.3.4 |
| **TOTAL** | | | **9** | |

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