# Mark Scheme (Results)

Summer 2017

Pearson Edexcel GCSE

In Biology (5BI3H) Paper 01

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**General Marking Guidance**

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

| Question number | Answer | Acceptable answers | Marks |
|---|---|---|---|
| 1 (a) (i) | • species 2 (1)<br>• it can **reach the nectar**/proboscis is the same length as the tube (1) | ignore just feed on the nectar /has a longer proboscis | (2) |

| Question number | Answer | Marks |
|---|---|---|
| 1 (a)(ii) | **C** both species 1 and species 2<br>**The only correct answer is C**<br>***A** is not correct because species 2 can also pollinate the orchid*<br>***B** is not correct because species 1 can also pollinate the orchid*<br>***D** is not correct because species 1 and 2 can pollinate the orchid* | (1) |

| Question number | Answer | Marks |
|---|---|---|
| 1 (b) (i) | A description including three of the following;<br>• a **mutation** occurs in {orchid/hawk moth} (1)<br>• the hawk moth can feed on the nectar (1)<br>• orchid is pollinated by the hawk moth (1)<br>• **both** orchid and hawk moth survive and {reproduce/pass on genes/pass on characteristic} (1) | (3) |

| Question number | Answer | Acceptable answers | Marks |
|---|---|---|---|
| 1 (b)(ii) | less competition for nectar / less competition for food / only organism able to feed (1) | accept exclusive food source<br><br>ignore get more food/they can get the nectar | (1) |

**Total for question 1 = 7 marks**

| Question number | Answer | Acceptable answers | Marks |
|---|---|---|---|
| 2 (a) | An explanation linking the following:<br><br>• **eggs** less likely to be {seen/found} by predators/hides the eggs (1)<br><br>• increased chance of {survival/caterpillars hatching}/eggs less likely to be eaten (1) | protection of the eggs from the environment e.g. sun/rain<br><br>ignore protection unqualified<br><br>ignore references to food supply | (2) |

| Question number | Answer | Acceptable answers | Marks |
|---|---|---|---|
| 2 (b) (i) | deter {predators/birds/animals} / stops the caterpillars getting eaten / survive for longer (1) | ignore larger food supply | (1) |

| Question number | Answer | Marks |
|---|---|---|
| 2 (b) (ii) | **B** to relieve symptoms of disease<br><br>**The only correct answer is B**<br><br>***A** is not correct because they are not hormones*<br><br>***C** is not correct because they are not used to produce hybridoma cell*<br><br>***D** is not correct because they are not used medically as antigens* | (1) |

| Question number | Answer | Acceptable answers | Marks |
|---|---|---|---|
| 2 (c) | An explanation linking the following:<br><br>• increased camouflage/decrease chance of predator spotting the butterfly/decreases surface area (1)<br><br>• increased chance of survival/less likely to be eaten (1) | accept makes them less visible<br>accept innate behaviour<br>accept as a warning to other **butterflies** | (2) |

| Question number | Answer | Acceptable answers | Marks |
|---|---|---|---|
| 2 (d) (i) | operant (1) | accept phonetically correct spellings | (1) |

| Question number | Answer | Acceptable answers | Marks |
|---|---|---|---|
| 2 (d) (ii) | An description of the following:<br><br>• **{repeated/frequent}** waving of flags near the horse / exposure to flags over a long period of time (1)<br><br>• horse learns not to respond to a {neutral stimulus/flag waving}/learn to ignore the flags (1) | accept wave flags when they are young/ wave flags during training<br><br>learn that flag waving is not a danger/threat<br><br>ignore references to rewards | (2) |

**Total for question 2 = 9 marks**

| Question number | Answer | Acceptable answers | Marks |
|---|---|---|---|
| 3 (a) (i) | An explanation linking the following:<br><br>• X or Y chromosome from the {sperm/male/father} (1)<br><br>• XX female, XY male (1) | <br><br><br><br>accept correctly drawn XY Punnett square | <br><br><br><br>(2) |

| Question number | Answer | Marks |
|---|---|---|
| 3 (a) (ii) | **A** corpus luteum<br><br>**The only correct answer is A**<br><br>***B*** *is not correct because lymphocytes do not produce progesterone*<br><br>***C*** *is not correct because the pituitary gland doesn't produce progesterone*<br><br>***D*** *is not correct because the hypothalamus doesn't produce progesterone* | (1) |

| Question number | Answer | Marks |
|---|---|---|
| 3 (b) | | (3) |

| | $X^H$ | Y |
|---|---|---|
| $X^H$ | $X^HX^H$ | $X^HY$ |
| $X^h$ | $X^HX^h$ | $X^hY$ |

parents gametes (1)

offspring genotypes (1)

25% / 0.25 / 1 in 4 / ¼ / 1:3 (1)

| Question number | Answer | Marks |
|---|---|---|
| 3 (c) (i) | **A** increasing its permeability to water, decreasing urine production<br><br>**The only correct answer is A**<br><br>***B*** *is not correct because ADH does not decrease the permeability of the collecting duct*<br><br>***C*** *is not correct because ADH doesn't increase urine production*<br><br>***D*** *is not correct because ADH does not decrease the permeability of the collecting duct or increase urine production* | (1) |

| Question number | Answer | Acceptable answers | Marks |
|---|---|---|---|
| 3 (c) (ii) | lack of fluid intake/ dehydration/exercise/low water content (in the blood) (1) | accept drug intake/ sweating<br><br>ignore thirsty ignore references to food | (1) |

| Question number | Answer | Acceptable answers | Marks |
|---|---|---|---|
| 3 (d) | A description including the following<br><br>• from {amino acids/protein} (1)<br><br>• in the liver (1) | accept deamination | (2) |

**Total for question 3 = 10 marks**

| Question number | Answer | Marks |
|---|---|---|
| 4 (a) (i) | **C** photoperiodicity<br><br>**The only correct answer is C**<br><br>***A** is not correct because it is not a behaviour response*<br><br>***B** is not correct because plants do not show conditioning to different day lengths*<br><br>***D** is not correct because inheritance is not a response to different day lengths* | (1) |

| Question number | Answer | Acceptable answers | Marks |
|---|---|---|---|
| 4 (a) (ii) | An explanation linking the following:<br><br>• less (active protein) (1)<br><br>• active protein (1) | active protein converted to inactive protein = 2 marks<br><br>ignore inactive protein promotes flowering | (2) |

| Question number | Answer | Acceptable answers | Marks |
|---|---|---|---|
| 4 (a) (iii) | grow it in high light levels/grow during long days/ grow in more hours of daylight (1) | accept grow in high light intensity | (1) |

| Question number | Answer | Acceptable answers | Marks |
|---|---|---|---|
| 4 (b) | Explanation linking the following<br>• remove carbon dioxide when **photosynthesising** (1)<br>• release carbon dioxide {during combustion/during burning/when used} (1) | accept idea that they don't add to overall carbon dioxide when burnt | (2) |

| Question number | Answer | Acceptable answers | Marks |
|---|---|---|---|
| 4 (c) | An explanation including four of the following:<br>• insert the plasmid into a {vector/plant pathogen/bacterium} (1)<br>• *Agrobacterium (tumefaciens)* (1)<br>• infect {plants/leaf discs} (1)<br>• {toxin gene/plasmid} incorporated into the **plant DNA** (1)<br>• {crown gall/tumour} forms (1)<br>• isolate infected cells (1) | accept *A. tumefaciens*<br>accept inject/invades<br>using a gene gun to insert the plasmid into the plant **cells** = 2 marks | (4) |

**Total for question 4 = 10 marks**

| Question number | Answer | Acceptable answers | Marks |
|---|---|---|---|
| 5 (a) (i) | to compare with vaccinated group/control group/as a control | accept to see if the {antigen/immunisation} is effective | (1) |

| Question number | Answer | Acceptable answers | Marks |
|---|---|---|---|
| 5 (a) (ii) | 8000 x 0.00625 = 50 (1)<br><br>8000 x 0.00925 = 74 (1)<br><br>74-50 = 24<br><br>OR<br><br>0.925 – 0.625 = 0.3 (1)<br><br>0.3 /100 = 0.003 (1)<br><br>0.003 x 8000 = 24 | full marks for correct answer without calculation<br><br>award 2 marks for 48 if correct working shown for group sizes of 16 000 | (3) |

| Question number | Answer | Acceptable answers | Marks |
|---|---|---|---|
| 5 (a) (iii) | An explanation linking the following:<br><br>• immunised people still caught HIV /only caused a small reduction in infection rates (1)<br><br>• so people were not immune (1) | accept percentage of people with HIV after the immunisation is not 0% | (2) |

| Question Number | | Indicative Content | Mark |
|---|---|---|---|
| **QWC** | ***5(b)** | An explanation to include some of the following points<br><br>Graph interpretation<br>• delay in Ab production after ALVAC/first injection<br>• increased Ab production<br>• peak after 1 week<br>• greater increase after AIDSVAX/second injection<br>• approximately 5 time greater/larger number produced<br>• maintained Ab level after booster<br>• gradual decline<br><br>Immune Response<br>• definition of immunisation/ harmless pathogen/antigen<br>• production of antibodies from lymphocytes<br>• primary response<br>• production of memory lymphocytes<br>• secondary immune response by memory lymphocytes | **(6)** |
| **Level** | **0** | No rewardable content | |
| **1** | **1 - 2** | • A simple explanation of the level of antibody in the blood OR the immune response<br>• the answer communicates ideas using simple language and uses limited scientific terminology<br>• spelling, punctuation and grammar are used with limited accuracy | |
| **2** | **3 - 4** | • A detailed explanation that includes a comparison of antibody production OR a detailed explanation of the immune response OR a simple explanation of antibody levels linked to the immune response<br>• the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately<br>• spelling, punctuation and grammar are used with some accuracy | |
| **3** | **5 - 6** | • A detailed explanation of the level of antibody production linked to the time taken for production of antibodies during the immune response including the role of lymphocytes producing antibodies and memory lymphocytes<br>• the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately<br>• spelling, punctuation and grammar are used with few errors | |

**Total for question 5 = 12 marks**

| Question number | Answer | Marks |
|---|---|---|
| 6 (a) (i) | **C** sucrose ⟶ glucose + fructose<br><br>**The only correct answer is C**<br><br>***A** is not correct because lactose is not a product of the reaction*<br><br>***B** is not correct because it doesn't catalyse this reaction*<br><br>***D** is not correct because it doesn't catalyse this reaction* | (1) |

| Question number | Answer | Acceptable answers | Marks |
|---|---|---|---|
| 6 (a) (ii) | *Saccharomyces (cerevisiae)* | accept phonetically correct spellings | (1) |

| Question number | Answer | Acceptable answers | Marks |
|---|---|---|---|
| 6 (b) | An explanation linking the following<br><br>• chymosin (1)<br><br>• (added to) milk (1)<br><br>• (milk) incubated /aseptic conditions (1)<br><br>• clots/curdles/separates the curds and whey/coagulates (the milk) (1)<br><br>• which is compressed to form cheese (1) | <br><br><br><br><br>ignore references to pasteurisation/sterile conditions<br><br>ignore thicken/solidify<br><br>accept curd used to make cheese | (4) |

| Question Number | | Indicative Content | Mark |
|---|---|---|---|
| **6(c)*** | | A explanation to include some of the following points<br><br>immobilised enzymes<br>• enzyme mixed with alginate<br>• alginate beads formed by droplets into calcium chloride solution<br>• beads collected and placed in a column/syringe<br><br>Lactose free milk<br>• lactase<br>• milk filtered over the alginate beads<br>• lactose in the milk converted into glucose and galactose<br>• immobilised enzymes can be reused<br>• lactose free milk produced without enzyme present | **(6)** |
| **Level** | **0** | No rewardable content | |
| **1** | **1 - 2** | • A limited explanation of the production of immobilised enzymes or the role of enzymes in the production of lactose-free milk<br>• the answer communicates ideas using simple language and uses limited scientific terminology<br>• spelling, punctuation and grammar are used with limited accuracy | |
| **2** | **3 - 4** | • A simple explanation of the use of immobilised enzymes in the production of lactose-free milk OR a detailed explanation of the role of lactase in the production of lactose free milk OR a detailed explanation of the production of immobilised enzymes<br>• the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately<br>• spelling, punctuation and grammar are used with some accuracy | |
| **3** | **5 - 6** | • A detailed explanation of the role of immobilised enzymes in the production of lactose-free milk including the role of lactase and the use of beads containing the enzyme<br>• the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately<br>• spelling, punctuation and grammar are used with few errors | |

**Total for question 6 = 12 marks**

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