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# Mark Scheme (Results)

## Summer 2016

Pearson Edexcel International GCSE
Biology (4BI0) Paper 1B
Science Double Award (4SC0) Paper 1B

Pearson Edexcel Level 1/Level 2 Certificate
Biology (KBI0) Paper 1B
Science (Double Award) (KSC0) Paper 1B

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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 | Notes | Marks |
|---|---|---|---|
| 1 (a) | 1. cell wall;<br><br>2. chloroplasts;<br><br>3. vacuole; | ignore cellulose<br><br>ignore chlorophyll | <br><br><br>3 |
| (b)(i) | A receptor;<br><br>(B sensory neurone)<br><br>C relay / intermediate / association / inter;<br><br>D motor;<br><br>E effector / muscle; | ignore sense organ<br>reject receptor neurone | <br><br><br><br><br>4 |
| (ii) | synapse(s) / synaptic cleft / synaptic gap; | | 1 |
| (c) | 0.0075 / 7.5 x $10^{-3}$;; | allow one mark for number ÷ 120 in working | 2 |

Total 10 marks

| Question number | Answer | Notes | Marks |
|---|---|---|---|
| 2 (a) (i) | 1. beef increases;<br><br>2. fish slow/constant/steady/little change <u>and</u> then increase rapidly / eq;<br><br>3. more beef than fish at start;<br><br>4. more fish than beef at end / fish overtakes beef; | <br><br>2. must have slow and then rapid | <br><br><br><br>Max 3 |
| (ii) | 13 x 6 = 78 / range between 72 and 84;; | allow one mark for x 6 in working | 2 |
| (b) | 1. <u>digestion</u> / <u>digested</u> / <u>digest</u>;<br><br>2. protease / pepsin;<br><br>3. hydrochloric acid / HCl;<br><br>4. low pH / pH 2 / optimum pH;<br><br>5. amino acids / peptides; | 1. ignore breakdown allow physical or chemical digestion<br>2. ignore enzyme<br><br>digestive enzyme = 1<br>4. ignore best pH | <br><br><br><br>Max 4 |

<table>
<tr><th>Question number</th><th>Answer</th><th>Notes</th><th>Marks</th></tr>
<tr><td>(c)</td><td>
<table>
<tr><th>Protein molecule</th><th>Function of protein molecule</th><th>Place where protein molecule is made</th></tr>
<tr><td>(haemoglobin)</td><td>transport oxygen / carries oxygen / bind to oxygen;</td><td>(red blood cells)</td></tr>
<tr><td>amylase / carbohydrase;</td><td>(digest starch)</td><td>(salivary gland)</td></tr>
<tr><td>(insulin)</td><td>lower <u>blood</u> glucose / glucose to glycogen / cells absorb glucose;</td><td>pancreas;</td></tr>
<tr><td>antibody;</td><td>(binds to antigens on pathogens)</td><td>white blood cell / lymphocyte;</td></tr>
</table>
</td><td>ignore control ideas<br><br>allow blood sugar</td><td>6</td></tr>
</table>

Total 15 marks

| Question number | Answer | Notes | Marks |
|---|---|---|---|
| 3 (a) (i) | burning fossil fuels / biomass / plants / wood<br>or<br>factories / industry / power stations<br>or<br>exhaust fumes / car/petrol/diesel engines<br>or<br>fertiliser / denitrification / decomposition of manure / sewage treatment; | | Max 1 |
| (ii) | water <u>vapour</u> / CFCs / Ozone ; | | 1 |

| | | | |
|---|---|---|---|
| (b)(i) | 94.3 ÷ 590.3 = 16.0 / 15.97;;<br>ignore negative sign | allow one mark for 15.975 / 15.9749 / 15.97493 / 15.974928<br><br>allow one mark for 94.3 or ÷ 590.3 in working<br>(15.9 Not correct but look for working mark) | 2 |
| (ii) | 1. planting of trees / less deforestation / eq;<br><br>2. less burning of fossil fuels / eq;<br><br>3. fewer cars / public transport / more efficient cars / hybrid cars / electric cars / cycling / walk more / eq;<br><br>4. legislation;<br><br>5. renewable energy / wind farms / wave energy / solar energy / low power lighting / nuclear fuels / eq; | 3. ignore catalytic converters / carbon neutral<br><br>4. eg congestion charge<br>5. ignore less electricity / less energy | Max 3 |

| | | | |
|---|---|---|---|
| (iii) | 1. decreased by 2.5 (million tonnes) / decrease is more than half / 2.1 is less than half / decreased from 4.6 to 2.1 / eq;<br><br>2. large decrease between 1990 and 2005 / eq;<br><br>3. small decrease between 2005 and 2010 / eq; | | Max 2 |

| Question number | Answer | Notes | Marks |
|---|---|---|---|
| (c) | 1. reduce greenhouse effect / less heat reflected / less heat re-radiated / less heat trapped;<br><br>2. less global warming / less temperature rise;<br><br>3. less ice caps melt / rise in sea level / flooding;<br><br>4. less habitat destruction / less coral destruction / eq;<br><br>5. less death / extinction / affect food chain;<br><br>6. less migration / change in distribution;<br><br>7. less climate change / less extreme weather / less desertification / drought / soil erosion / eq; | 4. ignore loss of home | Max 5 |

Total 14 mark

| Question number | Answer | Notes | Marks |
|---|---|---|---|
| 4 (a) (i) | thistle; | | 1 |
| (ii) | song thrush; | | 1 |
| (b) (i) | A iris / cornea;<br>B pupil; | | 2 |
| (ii) | 1. sclera / sclerotic;<br>2. optic nerve;<br>3. lens / cornea; | | 3 |
| (c) (i) | number/amount/group/all of organisms of same <u>species</u>; | allow correct binomial name of a species<br><br>ignore type | 1 |

| | | | |
|---|---|---|---|
| (c)(ii) | 1. variation / variety;<br><br>2. mutation;<br><br>3. (white snails) survive / survival / survival of the fittest;<br><br>4. not seen/camouflaged / not eaten / not killed;<br><br>5. reproduce / breed;<br><br>6. pass on gene/allele/DNA (for light shell) to offspring; | allow converse for black snails<br><br>ignore do not die | Max 5 |

Total 13 marks

| Question number | Answer | Notes | Marks |
|---|---|---|---|
| 5 | C different temperatures / range of temperatures;<br><br>O same species / same age of egg / same donor / eq;<br><br>R repeat / lots of eggs / eq;<br><br>M1 count / number that survive / number that divide / percentage survival / number alive / count viable eggs / eq;<br><br>M2 leave for same stated time / measure time they survive;<br><br>S1 same volume solution / same concentration of solution / same nutrients in solution / same type of solution / eq;<br><br>S2 same oxygen / sterile / pH / eq; | ignore see which survived the best<br>M1 and M2 must indicate quantitative measurement<br><br>ignore same nutrient solution / same amount<br><br>ignore light intensity | Max 6 |

Total 6 marks

| Question number | Answer | Notes | Marks |
|---|---|---|---|
| 6 (a)(i) | 1. allows diffusion / evaporation / transpiration / loss of water;<br><br>2. creates transpiration pull / transpiration stream / water pulled up / water drawn up;<br><br>3. osmosis;<br><br>4. water absorbed by root; | | Max 2 |
| (ii) | 1. oxygen <u>out</u> + carbon dioxide <u>in</u>;<br><br>2. diffusion;<br><br>3. photosynthesis | ignore reference to respiration<br><br>$CO_2$ and $O_2$ to enter and leave = 1<br>$O_2$ and $CO_2$ to enter and leave = 0<br>$CO_2$ and $O_2$ to enter or leave = 0 | Max 2 |

| | | | |
|---|---|---|---|
| (b)(i) | S scale linear and at least half of both axes;<br><br>L lines straight, neat and through points;<br><br>A axes correct way round;<br><br>P points plotted accurately;<br><br>U units stomatal pore µm and rate of transpiration mg / $m^2$ / s;<br><br>K key still air and moving air; | bar chart no L and no P<br>non-linear scale no P<br>if no plot for 0,0 no P but allow L<br><br>P allow within one square | 6 |
| (ii) | 1. transpiration increases in both / eq;<br><br>2. levels off in still air / continues to increase in moving air / more increase in moving air / eq; | | 2 |
| (iii) | 1. takes water away / blows water away / less water outside / eq;<br><br>2. increases / maintains gradient;<br><br>3. (increases) diffusion; | maintains diffusion gradient = 2 marks | 3 |

Total 15 marks

| Question number | Answer | Notes | Marks |
|---|---|---|---|
| 7 | 1. identical;<br><br>2. explant;<br><br>3. sterile;<br><br>4. microorganisms / fungi / bacteria / microbes / viruses / pathogens;<br><br>5. growth / nutrient / culture;<br><br>6. carbohydrate / sugar / sucrose / glucose / starch;<br><br>7. chlorophyll / chloroplast;<br><br>8. <u>nitrate</u>;<br><br>9. large(r) / great / high / many / more / mass / big / eq;<br><br>10. any / different; | <br><br>2. ignore cutting<br><br>3. ignore clean<br><br>4. ignore disease / infection<br><br>5. ignore agar / jelly | 10 |

Total 10 marks

| Question number | Answer | Notes | Marks |
|---|---|---|---|
| 8 (a) (i) | 136 / 136.1;; | allow one mark for ÷ 20 in working | 2 |
| (ii) | Thomas; | | 1 |
| (iii) | 1. nervous / excited / anticipation / thinking about exercise / worried / anxious;<br>2. adrenalin(e);<br>3. increase in heart rate / eq; | allow reference to autonomic system | Max 2 |
| (iv) | 1. intensity / amount / type of exercise / eq;<br>2. diet;<br>3. fitness / health / eq;<br>4. gender;<br>5. age / mass; | ignore temperature | Max 2 |

| Question number | Answer | Notes | Marks |
|---|---|---|---|
| 8 (b) | 1. heart is larger / has more muscle / stronger / grows / eq;<br><br>2. due to exercise / training / eq;<br><br>3. pumps more blood in each beat / eq;<br><br>4. low rate delivers same volume (in given time) / fewer beats deliver same volume / eq;<br><br>5. provides (more) oxygen;<br><br>6. (aerobic) respiration; | reject reference to anaerobic | Max 4 |

Total 11 marks

<table>
<tr><th>Question number</th><th>Answer</th><th>Notes</th><th>Marks</th></tr>
<tr><td>9 (a)</td><td>
<table>
<tr><th rowspan="2">Group</th><th colspan="4">Feature</th></tr>
<tr><th>Cell wall</th><th>Plasmid</th><th>Cytoplasm</th><th>Nucleus</th></tr>
<tr><td>bacteria</td><td>✓</td><td>✓</td><td>(✓)</td><td>×</td></tr>
<tr><td>fungi</td><td>✓;</td><td>×;</td><td>✓</td><td>(✓)</td></tr>
<tr><td>protoctists</td><td>(×)</td><td>(×)</td><td>✓;</td><td>✓;</td></tr>
</table>
</td><td>one mark for each correct column<br><br>hybrid cross tick = 0<br><br>empty box = 0</td><td>4</td></tr>
<tr><td>(b) (i)</td><td>virus / eq;</td><td>allow named virus<br>allow prion<br>allow nematodes<br>allow helminths</td><td>1</td></tr>
<tr><td>(ii)</td><td>malaria / dysentery / sleeping sickness / giardiasis / toxoplasmosis / eq;</td><td></td><td>1</td></tr>
</table>

Total 6 marks

| Question number | Answer | Notes | Marks |
|---|---|---|---|
| 10 (a) (i) | P oviduct / fallopian tube;<br><br>Q ovary;<br><br>R uterus / womb;<br><br>S vagina; | <br><br>allow ovaries<br><br>allow uterine wall / uterine lining | 4 |
| (b) (i) | O from oestrogen peak to trough; | | 1 |
| (ii) | M from start until oestrogen line levels at start of cycle / from where progesterone peaks to end of cycle | | 1 |

| | | | |
|---|---|---|---|
| (iii) | 1. grows / thickens / build up / repaired / eq;<br><br>2. maintained / remains / eq;<br><br>3. breakdown / loss / shedding / eq;<br><br>4. not broken down if pregnant / egg fertilised / egg implanted / eq; | allow vascularisation | Max 3 |

| Question number | Answer | Notes | Marks |
|---|---|---|---|
| (c) | 1. ovulation may vary within one woman /<br>ovulate on different day each month /<br>length of cycle varies / cycle can be irregular /<br>ovulate early / ovulate late /<br>error in calculating days /<br>hard to tell when ovulation occurs / eq;<br><br>2. sperm survive; | | 2 |
| (d) | 1. <u>secondary</u> sexual characteristics;<br><br>2. start menstruation / ovulation / periods / eq;<br><br>3. hips widen;<br><br>4. growth of breasts;<br><br>5. growth of pubic hair / body hair;<br><br>6. change distribution of fat; | 5. ignore ref to hair alone | Max 3 |

Total 14 marks

| Question number | Answer | Notes | Marks |
|---|---|---|---|
| 11 (a) | 1. male / father;<br><br>2. male is XY / heterogametic / sperm are X or Y; | <br><br>allow sperm are X and Y<br>allow converse | Max 2 |
| (b) | 1. produces four cells / has two cell divisions;<br><br>2. produces haploid cells;<br><br>3. halves the chromosome number;<br><br>4. produces genetic variation / cells not genetically identical / eq;<br><br>5. produces gametes / sex cells / involved in sexual reproduction / eq;<br><br>6. takes place in gonads / ovaries / testes / sex organs; | allow converse for mitosis<br><br><br>3. ignore 23 chromosomes | Max 4 |

Total 6 marks

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