

Mark Scheme (Results)

Summer 2016

Pearson Edexcel International GCSE
Biology (4BIO) Paper 1B
Science Double Award (4SCO) Paper 1B

Pearson Edexcel Level 1/Level 2 Certificate
Biology (KBIO) Paper 1B
Science (Double Award) (KSCO) 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; 2. chloroplasts; 3. vacuole;	ignore cellulose ignore chlorophyll	3
(b)(i)	A receptor; (B sensory neurone) C relay / intermediate / association / inter; D motor; E effector / muscle;	ignore sense organ reject receptor neurone	4
(ii)	synapse(s) / synaptic cleft / synaptic gap;		1
(c)	0.0075 / 7.5×10^{-3} ;;	allow one mark for number \div 120 in working	2

Total 10 marks

Question number	Answer	Notes	Marks
2 (a) (i)	1. beef increases; 2. fish slow/constant/steady/little change <u>and</u> then increase rapidly / eq; 3. more beef than fish at start; 4. more fish than beef at end / fish overtakes beef;	2. must have slow and then rapid	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> ; 2. protease / pepsin; 3. hydrochloric acid / HCl; 4. low pH / pH 2 / optimum pH; 5. amino acids / peptides;	1. ignore breakdown allow physical or chemical digestion 2. ignore enzyme digestive enzyme = 1 4. ignore best pH	Max 4

Question number	Answer			Notes	Marks															
(c)	<table border="1"> <tr> <td data-bbox="373 415 602 548">Protein molecule</td> <td data-bbox="611 415 905 548">Function of protein molecule</td> <td data-bbox="905 415 1142 548">Place where protein molecule is made</td> </tr> <tr> <td data-bbox="373 548 602 651">(haemoglobin)</td> <td data-bbox="611 548 905 651">transport oxygen / carries oxygen / bind to oxygen;</td> <td data-bbox="905 548 1142 651">(red blood cells)</td> </tr> <tr> <td data-bbox="373 651 602 716">amylase / carbohydrase;</td> <td data-bbox="611 651 905 716">(digest starch)</td> <td data-bbox="905 651 1142 716">(salivary gland)</td> </tr> <tr> <td data-bbox="373 716 602 850">(insulin)</td> <td data-bbox="611 716 905 850">lower <u>blood</u> glucose / glucose to glycogen / cells absorb glucose;</td> <td data-bbox="905 716 1142 850">pancreas;</td> </tr> <tr> <td data-bbox="373 850 602 954">antibody;</td> <td data-bbox="611 850 905 954">(binds to antigens on pathogens)</td> <td data-bbox="905 850 1142 954">white blood cell / lymphocyte;</td> </tr> </table>	Protein molecule	Function of protein molecule	Place where protein molecule is made	(haemoglobin)	transport oxygen / carries oxygen / bind to oxygen;	(red blood cells)	amylase / carbohydrase;	(digest starch)	(salivary gland)	(insulin)	lower <u>blood</u> glucose / glucose to glycogen / cells absorb glucose;	pancreas;	antibody;	(binds to antigens on pathogens)	white blood cell / lymphocyte;			<p>ignore control ideas</p> <p>allow blood sugar</p>	6
Protein molecule	Function of protein molecule	Place where protein molecule is made																		
(haemoglobin)	transport oxygen / carries oxygen / bind to oxygen;	(red blood cells)																		
amylase / carbohydrase;	(digest starch)	(salivary gland)																		
(insulin)	lower <u>blood</u> glucose / glucose to glycogen / cells absorb glucose;	pancreas;																		
antibody;	(binds to antigens on pathogens)	white blood cell / lymphocyte;																		

Total 15 marks

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

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

(iii)	<ol style="list-style-type: none">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;2. large decrease between 1990 and 2005 / eq;3. small decrease between 2005 and 2010 / eq;		Max 2
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Question number	Answer	Notes	Marks
(c)	1. reduce <u>greenhouse effect</u> / less heat reflected / less heat re-radiated / less heat trapped; 2. less global warming / less temperature rise; 3. less ice caps melt / rise in sea level / flooding; 4. less habitat destruction / less coral destruction / eq; 5. less death / extinction / affect food chain; 6. less migration / change in distribution; 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; B pupil;		2
(ii)	1. sclera / sclerotic; 2. optic nerve; 3. lens / cornea;		3
(c) (i)	number/amount/group/all of organisms of same <u>species</u> ;	allow correct binomial name of a species ignore type	1

(c)(ii)	<ol style="list-style-type: none"> 1. <u>variation / variety</u>; 2. <u>mutation</u>; 3. (white snails) <u>survive / survival / survival of the fittest</u>; 4. not seen/camouflaged / not eaten / not killed; 5. reproduce / breed; 6. pass on gene/allele/DNA (for light shell) to offspring; 	<p>allow converse for black snails</p> <p>ignore do not die</p>	<p>Max 5</p>
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Total 13 marks

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

Total 6 marks

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

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

Total 15 marks

Question number	Answer	Notes	Marks
7	1. identical; 2. explant; 3. sterile; 4. microorganisms / fungi / bacteria / microbes / viruses / pathogens; 5. growth / nutrient / culture; 6. carbohydrate / sugar / sucrose / glucose / starch; 7. chlorophyll / chloroplast; 8. <u>nitrate</u> ; 9. large(r) / great / high / many / more / mass / big / eq; 10. any / different;	2. ignore cutting 3. ignore clean 4. ignore disease / infection 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; 2. adrenalin(e); 3. increase in heart rate / eq;	allow reference to autonomic system	Max 2
(iv)	1. intensity / amount / type of exercise / eq; 2. diet; 3. fitness / health / eq; 4. gender; 5. age / mass;	ignore temperature	Max 2

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

Total 11 marks

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

Total 6 marks

Question number	Answer	Notes	Marks
10 (a) (i)	P oviduct / fallopian tube; Q ovary; R uterus / womb; S vagina;	allow ovaries 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; 2. maintained / remains / eq; 3. breakdown / loss / shedding / eq; 4. not broken down if pregnant / egg fertilised / egg implanted / eq;	allow vascularisation	Max 3
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Question number	Answer	Notes	Marks
(c)	1. ovulation may vary within one woman / ovulate on different day each month / length of cycle varies / cycle can be irregular / ovulate early / ovulate late / error in calculating days / hard to tell when ovulation occurs / eq; 2. sperm survive;		2
(d)	1. <u>secondary</u> sexual characteristics; 2. start menstruation / ovulation / periods / eq; 3. hips widen; 4. growth of breasts; 5. growth of pubic hair / body hair; 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; 2. male is XY / heterogametic / sperm are X or Y;	allow sperm are X and Y allow converse	Max 2
(b)	1. produces four cells / has two cell divisions; 2. produces haploid cells; 3. halves the chromosome number; 4. produces <u>genetic</u> variation / cells not <u>genetically</u> identical / eq; 5. produces gametes / sex cells / involved in sexual reproduction / eq; 6. takes place in gonads / ovaries / testes / sex organs;	allow converse for mitosis 3. ignore 23 chromosomes	Max 4

Total 6 marks

