



# Mark Scheme (Results)

January 2014

International GCSE

Biology (4BI0) Paper 1B

Science Double Award (4SC0) Paper 1B

Edexcel Level 1/Level 2 Certificates

Biology (KBI0) Paper 1B

Science (Double Award) (KSC0) Paper 1B

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January 2014

Publications Code UG037582

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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	<table border="1"> <thead> <tr> <th rowspan="2">Feature of organism</th> <th colspan="3">Type of organism</th> </tr> <tr> <th>Bacteria</th> <th>Fungus</th> <th>Virus</th> </tr> </thead> <tbody> <tr> <td>have a protein coat</td> <td>(x)</td> <td>(x)</td> <td>(✓)</td> </tr> <tr> <td>all are pathogens</td> <td>x</td> <td>x</td> <td>✓;</td> </tr> <tr> <td>cell walls made of chitin</td> <td>x</td> <td>✓</td> <td>x;</td> </tr> <tr> <td>contain DNA in a nucleus</td> <td>x</td> <td>✓</td> <td>x;</td> </tr> <tr> <td>respire</td> <td>✓</td> <td>✓</td> <td>x;</td> </tr> </tbody> </table>	Feature of organism	Type of organism			Bacteria	Fungus	Virus	have a protein coat	(x)	(x)	(✓)	all are pathogens	x	x	✓;	cell walls made of chitin	x	✓	x;	contain DNA in a nucleus	x	✓	x;	respire	✓	✓	x;	Tick cross hybrid = 0	4
Feature of organism	Type of organism																													
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			Total 4 Marks																											

Question number	Answer	Notes	Marks
2 (a)	1. repeated / 3 readings / 3 times / average / more than once / eq; 2. similar (pattern for red / for green); 3. anomaly ignored in calculation of average for blue light;		Max 2
(b)	measuring cylinder / syringe / scale on the side / eq;	Ignore measure volume	1
(c)	colour / wavelength of light;	Light alone = 0	1
(d)	1. mass of plant / size of plant / length of plant / amount of plant; 2. species of plant / type of plant / same plant; 3. age of plant; 4. temperature (of water) / room temperature; 5. mass/amount of sodium hydrogen carbonate / conc. of carbon dioxide / eq; 6. volume/amount of water / volume of indicator / eq; 7. light intensity / light duration / eq;	Ignore heat Same size test tube/beaker = 0 Ignore time Ignore same funnel exit	max 3
			Total 7 marks

Question number	Answer	Notes	Marks
3 (a) (i)	lung / lungs;		1
	(ii) 1. gains oxygen / oxygenated /eq; 2. loss of carbon dioxide / eq;	Ignore refs to pressure / velocity  Ignore colour change	2
	(b) prevent backflow / eq;		1
(c) (i)	0.3;		1
(ii)	3;		1
(iii)	75;; allow one mark for 0.8 / 24 / 2.4 in working		2
			Total 8 marks

Question number	Answer	Notes	Marks												
4 (a)	<table border="1"> <thead> <tr> <th>Genotype</th> <th>Alleles</th> <th>Expected number of digits per hand</th> </tr> </thead> <tbody> <tr> <td>(homozygous dominant)</td> <td>DD;</td> <td>(six)</td> </tr> <tr> <td>homozygous <u>recessive</u>;</td> <td>(dd)</td> <td>5 / five;</td> </tr> <tr> <td>(heterozygous)</td> <td>(Dd)</td> <td>6 / six;</td> </tr> </tbody> </table>	Genotype	Alleles	Expected number of digits per hand	(homozygous dominant)	DD;	(six)	homozygous <u>recessive</u> ;	(dd)	5 / five;	(heterozygous)	(Dd)	6 / six;		4
Genotype	Alleles	Expected number of digits per hand													
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(b)	<table border="1"> <thead> <tr> <th>Parent genotypes</th> <th>Probability of child with polydactyly</th> </tr> </thead> <tbody> <tr> <td>(Dd x DD)</td> <td>1.0;</td> </tr> <tr> <td>(Dd x dd)</td> <td>(0.5)</td> </tr> <tr> <td>(Dd x Dd)</td> <td>0.75;</td> </tr> </tbody> </table>	Parent genotypes	Probability of child with polydactyly	(Dd x DD)	1.0;	(Dd x dd)	(0.5)	(Dd x Dd)	0.75;		2				
Parent genotypes	Probability of child with polydactyly														
(Dd x DD)	1.0;														
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(Dd x Dd)	0.75;														
			Total 6 marks												

Question number	Answer	Notes	Marks
5	1. egg (cell) nucleus removed / enucleated / eq; 2. body cell nucleus inserted / adult cell nucleus inserted / eq; 3. electricity / electric shock; 4. cell division / mitosis; 5. <u>embryo</u> ; 6. uterus / womb ; 7. <u>surrogate</u> (mother);	Ignore fetus	5
			Total 5 marks



Question number	Answer	Notes	Marks												
6 (a)	<table border="1"> <thead> <tr> <th></th> <th>Number</th> </tr> </thead> <tbody> <tr> <td>the number of different tertiary consumers</td> <td>(1)</td> </tr> <tr> <td>the number of trophic levels</td> <td>4;</td> </tr> <tr> <td>the number of food chains</td> <td>4;</td> </tr> <tr> <td>the number of different predators</td> <td>3;</td> </tr> <tr> <td>the number of different consumers</td> <td>7;</td> </tr> </tbody> </table>		Number	the number of different tertiary consumers	(1)	the number of trophic levels	4;	the number of food chains	4;	the number of different predators	3;	the number of different consumers	7;		4
	Number														
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Question number	Answer	Notes	Marks
6 (b) (i)	1. temperature / heat; 2. gravity; 3. moisture / dryness / water / eq;	Ignore food / predators / oxygen / smell	max 2
(ii)	difference for one mark: more in centre / less at edge; reasons for two marks: 1. less light (in centre); 2. reference to predators / humans / eq; 3. more leaf litter/food (in centre); 4. reference to named abiotic factor such as water / temperature;	Allow converse Ignore safer / shelter unqualified More leaf litter to hide from predators = 2	max 3
(iii)	square drawn;	Allow small squares inside a large square	1
			Total 10 marks

Question number	Answer	Notes	Marks
7 (a) (i)	correct reference to <u>oxygen</u> + <u>carbon dioxide</u> ;		1
(ii)	1. large (surface) area; 2. thin / eq; 3. blood supply / capillaries; 4. permeable;	Ignore thin cell <u>walls</u>	max 3

Question number	Answer	Notes	Marks
7 (b) (i)	S – scale linear; L – straight and through points; A – correct way; A – labelled (breathing rate) <u>per minute</u> / (breaths) <u>per minute</u> + °C; P – points plotted accurately;	Ignore extrapolation	5
(ii)	breathing rate higher (in warmer water) / mouth opens more often (at higher temperature) / eq;		1
(iii)	different size may need different amount of oxygen / bigger fish may need more oxygen / different size may have different breathing rates / eq;	Ignore idea of fair test	1
(iv)	1. species / type / eq; 2. age; 3. gender; 4. oxygen level / volume of water / size of tank / number of fish / source of water / light;	Ignore time / size of fish / type of tank / food	max 2
			Total 13 Marks

Question number	Answer	Notes	Marks
8 (a)	protect <u>eyes</u> / prevent blindness / eq;		1
(b)	1. diffusion; 2. high concentration to low concentration / eq;		2
(c)	1;		1
(d) (i)	surface area <u>24</u> unit <u>cm<sup>2</sup></u> ;; or surface area <u>2400</u> unit <u>mm<sup>2</sup></u> ;;	If number wrong but units cm <sup>2</sup> or mm <sup>2</sup> = 1	Max 2
(ii)	volume <u>8</u> unit <u>cm<sup>3</sup></u> ;; or volume <u>8000</u> unit <u>mm<sup>3</sup></u> ;;	If number wrong but units cm <sup>3</sup> or mm <sup>3</sup> = 1	Max 2

Question number	Answer				Notes	Marks
8 (e)		Cube A	Cube B	Cube C		3
	largest surface area	✓;				
	largest surface area to volume ratio			✓;		
	greatest proportion of cube coloured red			✓;		
(f)	1. humans/larger organisms have smaller SA:VOL ratio; 2. diffusion; 3. too slow / less efficient / therefore less (relative) penetration / eq; 4. need to move oxygen / nutrients / named substance; 5. mass flow / circulatory system / eq;					3 max
						Total 14 marks

Question number	Answer	Notes	Marks
9	C leaves from top and bottom; O same species / same tree / same age of tree / eq; R repeat / many trees / many leaves / eq; M1 METHOD OF MEASUREMENT: chlorophyll / colour / chromatography / eq; M2 METHOD OF EXTRACTION: (heat with) ethanol / crush / eq; S1+S2 same location / soil / time of year / day / mass / surface area / eq;;		6
			Total 6 marks

Question number	Answer	Notes	Marks
10 (a)	1. warmer / eq; 2. avoid sweating / avoid water loss / avoid dehydration; 3. avoid overheating / respiration produces heat / eq; 4. less food available / less water in plants / eq;		3
(b)	1. avoid the sun / avoid high temperature / avoid heat / to shade / avoid overheating / stay cool / cooler at night;  2. avoid sweating / avoid water loss / avoid dehydration;		2
(c)	1. (eating) plants / plants contain water / grass;  2. respiration;	Ignore food / other animals	1 max
(d)	1. (osmo)receptors; 2. hypothalamus; 3. pituitary gland; 4. ADH; 5. (ADH) <u>increases</u> / <u>more</u> (ADH); 6. kidney / nephron; 7. collecting duct; 8. <u>more</u> permeable; 9. reabsorption (of water) / water into blood;	Ignore less urine / less water in urine	6 max
			Total 12 marks



Question number	Answer	Notes	Marks
11 (a)	1. source of food / source of nutrients / eq; 2. smell / eq;		1 max
(b)	1. Cheviot and East Friesian (chosen); 2. (parent sheep with) bare legs <u>and</u> (parent sheep with) bare backsides; 3. cross / breed / mate / eq; 4. <u>select/choose/use</u> offspring with bare legs <u>and</u> bare back side; 5. repeat / many generations / eq;		4 max
(c)	1. farmer / humans / you (choose parents) / eq; 2. faster process / eq; 3. does not affect survival / no survival of fittest / no competition / adaptations may not improve survival / eq;	Allow converse	2
(d)	1. kills/harms other organisms / not specific / eq; 2. affect <u>food chain</u> / bioaccumulation / eq; 3. resistance;	Ignore pollution / harm to sheep or crops or meat or wool or humans  Ignore immune  Ignore cost / reapplication	2 max
			Total 9 marks

Question number	Answer	Notes	Marks																		
12 (a)	1. large (petals); 2. coloured / bright / white (petals) / eq; 3. scent / smell; 4. <u>nectar</u> / <u>nectary</u> ;		3 max																		
(b)	<table border="1"> <thead> <tr> <th></th> <th>In flowering plants</th> <th>In mammals</th> </tr> </thead> <tbody> <tr> <td>female gametes are made in the</td> <td>ovule;</td> <td>ovary;</td> </tr> <tr> <td>male gametes are made in the</td> <td>anther</td> <td>testes;</td> </tr> <tr> <td>gametes are brought together by</td> <td>pollination</td> <td>copulation;</td> </tr> <tr> <td>fertilisation takes place in the</td> <td>ovule</td> <td>fallopian tube;</td> </tr> <tr> <td>embryo develops in the</td> <td>seed</td> <td>uterus;</td> </tr> </tbody> </table>		In flowering plants	In mammals	female gametes are made in the	ovule;	ovary;	male gametes are made in the	anther	testes;	gametes are brought together by	pollination	copulation;	fertilisation takes place in the	ovule	fallopian tube;	embryo develops in the	seed	uterus;		5
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Question number	Answer	Notes	Marks
12 (c)	1. used in growth / used in repair / used in asexual reproduction / eq; 2. no genetic variation / clones / genetically identical cells produced / exact genetic copies of cells / eq; 3. chromosome number stays the same / eq; 4. one round of division / 2 cells produced; 5. diploid cells produced / not used to make gametes;	Allow converse answers for meiosis	3 max
(d)	1. same <u>colour</u> / no <u>colour</u> variation / same phenotype / look the same / all identical / same characteristics / eq; 2. no genetic variation / clones / alleles the same; 3. quicker production; 4. production all year round;	Ignore more produced / profit	2 max
			Total 13 Marks

Question number	Answer			Notes	Marks																		
13 (a) (i)	removal/loss/cutting down of trees/ forest / eq;				1																		
	(ii) idea of more CO <sub>2</sub> / eq; (less) photosynthesis; idea of less O <sub>2</sub> / eq;				3																		
(b)	<table border="1"> <thead> <tr> <th>Gas</th> <th>Source</th> <th>Effect on the environment</th> </tr> </thead> <tbody> <tr> <td>methane</td> <td>(cattle farming)</td> <td>greenhouse effect / global warming / eq;</td> </tr> <tr> <td>(water vapour)</td> <td>(combustion)</td> <td>greenhouse effect / global warming / eq;</td> </tr> <tr> <td>sulphur dioxide / nitrogen oxides;</td> <td>(burning fossil fuels)</td> <td>(causes acid rain)</td> </tr> <tr> <td>carbon monoxide;</td> <td>(incomplete combustion)</td> <td>(affects transport of oxygen in blood)</td> </tr> <tr> <td>(CFC)</td> <td>(refrigerators and air conditioning units)</td> <td>affect ozone layer / greenhouse effect / global warming / eq;</td> </tr> </tbody> </table>			Gas	Source	Effect on the environment	methane	(cattle farming)	greenhouse effect / global warming / eq;	(water vapour)	(combustion)	greenhouse effect / global warming / eq;	sulphur dioxide / nitrogen oxides;	(burning fossil fuels)	(causes acid rain)	carbon monoxide;	(incomplete combustion)	(affects transport of oxygen in blood)	(CFC)	(refrigerators and air conditioning units)	affect ozone layer / greenhouse effect / global warming / eq;	<p>Allow increase in temperature</p> <p>Ignore rain</p> <p>Ignore carbon dioxide</p>	5 max
Gas	Source	Effect on the environment																					
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					Total 9 marks																		

Question number	Answer	Notes	Marks
14 (a)	(yeast) glucose ONLY;  alcohol/ethanol + carbon dioxide (+ energy) ONLY;	Allow if $C_6H_{12}O_6$  Allow $C_2H_5OH$ and $CO_2$	2
(b)	limewater; (clear to) cloudy / (clear to) milky / eq;  or  hydrogen carbonate indicator; (orange to) yellow / eq;		2 max
			Total 4 marks

**Total for Paper: 120 Marks**

