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Mark Scheme (Results)

January 2017

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

Pearson Edexcel Certificate in
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)	number of food chains = 8; number of primary consumers = 4; number of organisms that belong to more than one trophic level = 3;		3
(b)	1. <u>glucose</u>; 2. respiration;	 2. Ignore energy	2
(c)(i)	muscle(s) / leg muscle / named muscle;	Ignore leg alone	1
(ii)	1. adrenaline; 2. increased <u>heart</u> rate / <u>heart</u> pumps more blood / <u>heart</u> pumps faster / eq; 3. increased breathing rate/depth / opens air passages / eq; 4. increase blood flow to muscles / vasodilation in muscles / vasoconstriction in gut / eq; 5. glycogen to glucose; 6. respiration / energy / ATP;		3 max
(d)(i)	A = <u>retina</u>; B = <u>optic</u> nerve;		2

(ii)	detect light / receive light / contains light sensitive cells / converts light into impulses / eq;		1
(iii)	<u>impulses</u> to brain;		1

Question number	Answer	Notes	Marks
2 (a)	1. obtain chickens with few/no feathers / eq; 2. breed / reproduce / eq; 3. continue process (for many generations);		3
(b)	1. egg production decreases as chickens get older; 2. decreases faster/more with chickens bred for egg production;	Allow converse for mps 1 and 2	2
(c)	1. less movement; 2. less respiration; 3. less heat loss / less energy used; 4. energy for egg production;	Ignore ref to lack of sunlight and vit D and calcium metabolism for egg shell	3 max

Question number	Answer	Notes	Marks
3 (a)	S scale linear and graph uses half the grid; L lines straight and through points; A1 axes correct way; A2 axes labelled correctly: months and g per $100cm^3$ or $g/100cm^3$; P points plotted accurately;		5
(b)(i)	(average) haemoglobin;		1
(ii)	1. used more than one person; 2. calculated an average / eq; 3. ignored anomalous results / eq;	1. ignore repeat alone / reference to taking several months	2 max
(iii)	1. age / eq; 2. gender / sex / eq; 3. body mass / eq; 4. health / stage of cancer / eq;	Ignore diet / exercise / oxygen level	2 max

(c)	1. more haemoglobin; 2. red blood cells; 3. oxygen; 4. <u>aerobic</u> respiration; 5. more energy / more ATP; 6. less lactic acid / less oxygen debt;	5. Ignore less tired	4 max
(d)	1. vein; Two from: 2. wide lumen / eq; 3. easy to see / near to surface (of skin); 4. low blood pressure; 5. thin wall / less muscular wall;	use vein because arteries have a thick wall = 1 for mp5 capillaries = 0 5. Ignore less muscle	3 max

Question number	Answer	Notes	Marks
4 (a)	50% are heterozygous = 3; show a phenotype ratio of 1:1 = 1; have a genotype ratio of 1:1 = 2;		3
(b)(i)	1. photosynthesis;		5 max
	2. (growth of) algae / plants; (ONCE)	2. plant growth due to photosynthesis/minerals	
	3. food for fish; (ONCE)	3. Allow plants/manure as food for fish	
	4. oxygen for respiration;		
	5. bacteria / fungi / decomposers / decomposition;		
	6. minerals / ions / named mineral;	6. Ignore nutrients	
	7. stated use of one named mineral;		
(ii)	1. oxygen / prevent stagnation;		2
	2. remove waste / urine / faeces;	2. Ignore manure/ disease / pollution / bacteria	
(c)	4,200 kg;;		2

		allow one mark for 6000 x 700 / 6000 x 0.7 / 4 200 000 in working	

Question number	Answer	Notes	Marks
5 (a)	1. osmosis; 2. water out; 3. dilute to concentrated solution / high conc. of <u>water</u> to low conc. of <u>water</u> / high to low water potential; 4. membrane leaves cell wall / plasmolysis / flaccid;		3 max
(b)	C plus or minus salt / range of salt concentrations; O same species of plant / same size of plant / same age of plant / same type of plant / eq; R repeat / lots of plants / group / average / eq; M1 measure mass / length / eq; M2 reference to stated time; S1 and S2 same light / same temperature / same carbon dioxide / same soil / same water / eq;;	Allow named species	6 max

Question number	Answer	Notes	Marks
6 (a)	1. correct chemical symbols used; 2. correct balance;	$CO_2 + H_2O \longrightarrow C_6H_{12}O_6 + O_2 = 1$	2
(b) (i)	1. <u>many</u> chloroplasts; 2. absorb/trap/capture light; 3. (closely) packed / found near (upper) surface / eq;	1. Ignore chlorophyll	2 max
(ii)	1. air spaces / eq; 2. <u>diffusion</u> of gas / CO_2 / O_2;		2
(iii)	1. open/close stomata/pores / change size of stomata/pores; 2. allow CO_2 in / H_2O out / O_2 out;	2. all gas and direction must be correct for the mark	2
(c) (i)	1. destarch / use up starch / eq;		2 max

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<tr>
<td></td>
<td>2. respiration;

3. prevent photosynthesis;</td>
<td></td>
<td></td>
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<tr>
<td>(ii)</td>
<td>1. water bath / eq;

2. extinguish flame / avoid naked flame / turn Bunsen off / do not heat directly;

3. ethanol is flammable / eq;</td>
<td></td>
<td>2 max</td>
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<tr>
<td>(iii)</td>
<td>blue black / black / blue;</td>
<td></td>
<td>1</td>
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<tr>
<td>(iv)</td>
<td>leaf in dark / leaf covered / omit step 2;</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>(d)</td>
<td>
<table>
<tr><th>Mineral ion</th><th>Biological molecule produced</th></tr>
<tr><td>(magnesium)</td><td>chlorophyll;</td></tr>
<tr><td>nitrate / sulphate / ammonium / eq;</td><td>(protein)</td></tr>
</table>
</td>
<td>Ignore chloroplasts

Allow correct symbols</td>
<td>2</td>
</tr>
</table>

Question number	Answer	Notes	Marks
7 (a) (i)	A <u>receptor</u>; B motor neurone; C relay neurone / intermediate neurone / interneuron; D sensory neurone;		4
(ii)	1. unconscious / involuntary / automatic / no brain involvement; 2. fast (response) / eq; 3. prevents damage / avoid harm / move finger off pin / eq;		2 max
(b) (i)	1. chemicals involved / eq; 2. receptors involved / eq; 3. effectors involved / eq;	eg 1. accept neurotransmitters/adrenaline/ auxin	2 max
(ii)	1. (animal) electrical/impulses / (plant) chemical/hormone; 2. (animal) fast / (plant) slow; 3. (animal) stimulus and response distant / (plant) stimulus and response close; 4. (animal) muscle contraction / (plant) growth response;	2. Ignore short and long term effect	2 max

Question number	Answer	Notes	Marks
8 (a) (i)	photosynthesis;		1
(ii)	B and E;	Must be both letters **only**	1
(b) (i)	1. reduce use of fossil fuel / coal / oil / eq; 2. use nuclear / wind / sun / eq; 3. plant trees / reduce deforestation / grow more plants / eq; 4. use public transport / cycle / trains / use fewer cars / electric cars;	Ignore electricity / recycling / fewer factories	2 max
(ii)	1. greenhouse gas / greenhouse effect / trapping infrared / trapping heat; 2. global warming / increase in temperature / eq; 3. melting ice caps / rising sea levels / flooding / eq; 4. drought / climate change / extreme weather / storms / eq; 5. loss of habitat / acidification / desertification; 6. extinction / food chain disruption / less biodiversity / eq; 7. migration / change in distribution / spread of disease / spread of pests / eq;		6 max

Question number	Answer	Notes	Marks
9 (a)	movement of particles/ions/molecules/gases/ from high concentration to low concentration / eq;	Ignore substance	1
(b) (i)	1.4 / 1.43 / 1.43 recurring;;	Allow one mark for 4.3 ÷ 3	2
(ii)	1. as dye concentration increases diameter/ diffusion increases; 2. rate of increase reduces/levels at higher concentrations;	eg. 0.1 to 0.2 increases by 0.8 but 0.2 to 0.4 increases by only 0.3;	2
(iii)	1. higher dye concentration means more molecules/particles; 2. higher concentration gradient / eq;		2
(c)	1. volume of dye / number of dye drops / mass of dye / same dye; 2. depth of agar / size of wells / amount of jelly / concentration of agar; 3. temperature;	Ignore time / pH / size of plate	2 max

Question number	Answer	Notes	Marks
10	penis; sperm / eq; egg / ovum / ova; fallopian (tube) / oviduct; zygote; mitosis; embryo; uterus / womb; twice / double / two times; diploid;		10

Question number	Answer	Notes	Marks
11 (a) (i)	glycogen;		1
(ii)	hyphae / hypha;		1
(b)	1. (low fat) less risk of artery blockage / heart disease / obesity / overweight / eq OR myelin / insulation / energy / eq; 2. (high protein) cell manufacture / growth / repair / eq;		2
(c)	restriction to cut/remove DNA / eq; ligase to join/seal/insert/paste DNA / eq;		2

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