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INTERNATIONAL A-LEVEL

BIOLOGY

BL05 (9610)

Unit 5 Synoptic paper

Mark scheme

January 2023

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Question	Marking guidance	Mark	Comments
01.1	Large, clear drawing with smooth lines; Correct shape of leaf and tissues; Only tissues drawn – no individual cells;	3	Not sketchy Ignore labels

Question	Marking guidance	Mark	Comments
01.2	($\times$) 8;;;	3	3 marks for correct answer 2 marks if not correct to the nearest whole number – eg $\times 8.3$ 1 mark for $\frac{40 \times 25}{2 \times 60}$ OR $\frac{40 \times 12.5}{60}$ Allow calculation from measurements on leaf - eg (for palisade): $\frac{40 \times 13}{65} = 8$

Question	Marking guidance	Mark	Comments
01.3	Exchange gases efficiently: 1. Leaf is thin / short distance - for diffusion of gases; 2. Many large air spaces – rapid diffusion (in gaseous state); 3. Cells have large exposed surface area – greater exchange of gases; 4. (Many) stomata – allow entry and exit of gases; Reduce water loss: 5. Waxy cuticle – reduces water loss / is waterproof; 6. Stomata are small / can close – to reduce water loss; OR Stomata on lower surface (only) – shaded so cooler to reduce water loss	6	1. Allow mesophyll/palisade have thin cell walls 1. & 2. Diffusion must be mentioned at least once

Question	Marking guidance	Mark	Comments
02.1	1. Variation between seeds OR some may be diseased/dead OR more representative / typical OR allow for anomalies; 2. To obtain sufficient oxygen absorption / volume change to be registered by apparatus;	2	Allow to be able to calculate a mean

Question	Marking guidance	Mark	Comments
02.2	1. Temperature change causes change in rate of respiration; 2. Temperature change causes change in volume/pressure of air in tubes;	2	Allow description – eg temperature increase increases rate (ignore just ‘more’ respiration) Allow description – eg temperature increase increases volume

Question	Marking guidance	Mark	Comments
02.3	1. CO ₂ is released in respiration; 2. (So) there would not be a decrease in volume/pressure OR would give the net effect of oxygen in – CO ₂ out;	2	Allow the liquid would not move

Question	Marking guidance	Mark	Comments
02.4	1. Any change in temperature/pressure in A = that in B ; 2. (So) same effect on both sides of U-tube and no effect on fluid movement;	2	2. Allow no effect on syringe reading

Question	Marking guidance	Mark	Comments																																								
02.5	Suitable table with units in headings only ; All data correct;	2	Allow changes in volume – ie all values subtracted from 0.92:																																								
	<table><tr><th>Time / mins</th><th>Syringe reading / cm³</th></tr><tr><td>0</td><td>0.92</td></tr><tr><td>1</td><td>0.84</td></tr><tr><td>2</td><td>0.78</td></tr><tr><td>3</td><td>0.68</td></tr><tr><td>4</td><td>0.63</td></tr><tr><td>5</td><td>0.57</td></tr><tr><td>6</td><td>0.47</td></tr><tr><td>7</td><td>0.38</td></tr><tr><td>8</td><td>0.30</td></tr></table>		Time / mins	Syringe reading / cm ³	0	0.92	1	0.84	2	0.78	3	0.68	4	0.63	5	0.57	6	0.47	7	0.38	8	0.30	<table><tr><th>Time / mins</th><th>OR Volume O₂ used / cm³</th></tr><tr><td>0</td><td>0.00</td></tr><tr><td>1</td><td>0.08</td></tr><tr><td>2</td><td>0.14</td></tr><tr><td>3</td><td>0.24</td></tr><tr><td>4</td><td>0.29</td></tr><tr><td>5</td><td>0.35</td></tr><tr><td>6</td><td>0.45</td></tr><tr><td>7</td><td>0.54</td></tr><tr><td>8</td><td>0.62</td></tr></table>	Time / mins	OR Volume O ₂ used / cm ³	0	0.00	1	0.08	2	0.14	3	0.24	4	0.29	5	0.35	6	0.45	7	0.54	8	0.62
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	Accept units formatted in other appropriate conventions																																										
	Allow horizontal table																																										
	Allow Volume for Syringe reading																																										

Question	Marking guidance	Mark	Comments
02.6	Graph: 1. Orientation and scales; 2. Axes labelled including units; 3. Points from results table in question 02.5 plotted correctly; 4. Line – ruled straight line of best fit;	4	y = volume and x = time Data covering > ½ of each axis Allow ‘/units’ OR ‘(units)’ OR ‘in units’ Allow ± ½-square Ignore extrapolation

Question	Marking guidance	Mark	Comments
02.7	540;;;	3	3 marks for correct answer Allow correct answer from student's graph 2 marks if not correct to 3 sf – eg 539.63... 2 marks for $\frac{(\text{Volume change}) \times 10^3 \times 60}{(\text{Time in min}) \times 8.2}$ 2 marks for incorrect order of magnitude – eg 54.0 / 0.540 2 marks if per minute – eg 8.99 1 mark for correct slope from graph in 02.6 – eg 0.07375 or $\frac{0.59}{8}$

Question	Marking guidance	Mark	Comments
02.8	(Straight) line with steeper slope ;	1	Allow description – eg takes less time for volume to decrease Allow rate increases / faster oxygen consumption

Question	Marking guidance	Mark	Comments
02.9	(Repeat method of previous experiment) with <u>same</u> batch of seeds (but with water instead of KOH); (With water) results show (Vol O₂ in – Vol CO₂ out); - Definition of RQ = $\frac{\text{Volume CO}_2}{\text{Volume O}_2}$; - Substitute value for Volume O₂ from previous experiment in mp2 and mp3;	4	2. New vol change – previous vol change = vol CO ₂

Question	Marking guidance	Mark	Comments
03.1	DNA replication; So both daughter cells receive all the genetic information / the same genetic information / the same genes/chromosomes / all of the chromosomes / all the DNA;	2	Allow DNA synthesis Ignore 'DNA doubles'

Question	Marking guidance	Mark	Comments
03.2	G ₁ ;	1	

Question	Marking guidance	Mark	Comments
03.3	To replace cells damaged by digestion / by (digestive) enzymes;	1	Allow abrasion by food

Question	Marking guidance	Mark	Comments
04.1	1. Overcome bias / expectation of doctors / patients OR prevent doctors treating patients differently; 2. To see ‘real’ effect of drug OR to give valid results	2	Allow not just psychosomatic effect; Reject reference to ‘accuracy’ Ignore more representative / more reliable / other factors unqualified

Question	Marking guidance	Mark	Comments
04.2	Some patients not treated / not helped OR may cause harm to those given placebo OR patients on new drug may suffer side effects OR new drug may not be safe;	1	

Question	Marking guidance	Mark	Comments
04.3	1. Calculate SD/SE of each mean and compare with placebo; 2. Calculate 95% confidence limits / do t-test;	2	

Question	Marking guidance	Mark	Comments												
05.1	<table border="1"> <tr> <th colspan="4">Expected total number of dogs of each colour</th></tr> <tr> <th>Black</th><th>Blue</th><th>Brown</th><th>Lilac</th></tr> <tr> <td>9</td><td>3</td><td>9</td><td>3</td></tr> </table>	Expected total number of dogs of each colour				Black	Blue	Brown	Lilac	9	3	9	3	1	
Expected total number of dogs of each colour															
Black	Blue	Brown	Lilac												
9	3	9	3												

Question	Marking guidance	Mark	Comments															
05.2	P genotypes: BbNn and bbNn; <table><tr><td>Male gametes</td><td>BN</td><td>Bn</td><td>bN</td><td>bn</td></tr><tr><td>Female gametes</td><td>bN</td><td>bN</td><td>bbNN</td><td>bbNn</td></tr><tr><td></td><td>bn</td><td>BbNn</td><td>Bbnn</td><td>bbnn</td></tr></table> ;; Genotypes correctly assigned to phenotypes: Black: BbNN + (2)BbNn Blue: Bbnn Brown: bbNN + (2)bbNn Lilac: bbnn;	Male gametes	BN	Bn	bN	bn	Female gametes	bN	bN	bbNN	bbNn		bn	BbNn	Bbnn	bbnn	4	All 6 gametes correct from stated parental dihybrid genotypes = 1 mark All 8 genotypes correctly derived from stated gametes = 1 mark
Male gametes	BN	Bn	bN	bn														
Female gametes	bN	bN	bbNN	bbNn														
	bn	BbNn	Bbnn	bbnn														

Question	Marking guidance	Mark	Comments
05.3	Method step 1: Cross male & female blue; Results step 1: blue and lilac offspring; Method step 2: Test cross: blue offspring x lilac; Results step 2: If purebred: all blue offspring AND If not purebred: some lilac offspring; Method step 3: If result in step 2 is all blue then repeat several times & if always get only blue offspring, then breed from these dogs;	5	

Question	Marking guidance	Mark	Comments
06.1	1. Description of negative feedback as departure from norm / set point triggering mechanisms to restore the norm; 2. Via the blood (and tissue fluid); 3. Role of receptors, effectors and a coordination system; + Any three examples from: 4. Blood glucose concentration – role of insulin to lower; 5. Blood glucose concentration – role of glucagon / adrenaline to raise; 6. Blood carbon dioxide concentration – via heart rate and breathing rate; 7. Any other valid example	6 max	3. Accept endocrine / nervous coordination 6. Accept via gas exchange / kidney 7. Accept Temperature regulation: description of vasodilation / vasoconstriction / sweating Accept blood pH - via kidneys / lungs Accept blood water potential - via kidney Accept blood pressure – via carotid (sinus) / aorta

Question	Marking guidance	Mark	Comments
06.2	1. Use set volumes/concentrations of H_2O_2 and catalase solution; 2. Suitable range of pH values (with different buffers); 3. At constant temperature in a water bath; 4. Equilibration (in water bath) before mixing catalase and H_2O_2; 5. Method of collecting oxygen; 6. Measure volume of oxygen released in a set time OR Measure time taken for release of a set volume of oxygen; 7. Repetitions and calculation of mean (for each pH); 8. Plot a line graph of (mean) rate / time taken / vol. oxygen vs pH; 9. To find optimum pH – repeat with intermediate pH values around the peak value;	7 max	1. Allow eg same number of potato cylinder slices 2. eg pH 3 – 10 3. Allow a temperature in the range 20 – 37 °C 5. eg displacement of water or use of gas syringe 7. At least 3 repeats 8. Accept a sketch graph

Question	Marking guidance	Mark	Comments
06.3	1. Hydrolysis OR breakage of glycosidic bonds; 2. In the mouth: salivary amylase; 3. In the duodenum: pancreatic amylase; 4. Starch → maltose; 5. In the ileum: membrane-bound disaccharidase(s); 6. Disaccharide → monosaccharide;	5 max	1. Allow description – breakdown by reaction with water 2. Allow amylase in saliva 3. Allow amylase from the pancreas (If unqualified, allow ‘amylase’ once only) 5. Allow named example – eg maltase / sucrase / lactase 6. Allow named example – eg maltose → glucose (by maltase) sucrose → glucose + fructose (by sucrase) lactose → glucose + galactose (by lactase) Allow small intestine for duodenum/ileum throughout

Question	Marking guidance	Mark	Comments
06	<u>Quality of written communication</u> These are awarded for correct use of scientific terms and the ability to present a clear, logical account. They are not awarded for spelling, punctuation and grammar. <u>2 marks</u> for an answer in which technical terms are used correctly throughout and the accounts are presented clearly and logically. <u>1 mark</u> for an answer in which most technical terms are used correctly and most of the accounts are presented clearly and logically. <u>0 marks</u> for an answer in which few technical terms are used correctly or the accounts are seldom presented clearly and logically.	2	Award mark for overall performance in 06.1, 06.2 and 06.3