

OXFORD

INTERNATIONAL
AQA EXAMINATIONS

INTERNATIONAL A-LEVEL

BIOLOGY

BL05 (9610)

Unit 5 Synoptic paper

Mark scheme

January 2021

Version: 1.0 Final



2 1 1 X B L 0 5 / M S

Mark schemes are prepared by the Lead Assessment Writer and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation events which all associates participate in and is the scheme which was used by them in this examination. The standardisation process ensures that the mark scheme covers the students' responses to questions and that every associate understands and applies it in the same correct way. As preparation for standardisation each associate analyses a number of students' scripts. Alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, associates encounter unusual answers which have not been raised they are required to refer these to the Lead Examiner.

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MARK SCHEME – INTERNATIONAL A-LEVEL BIOLOGY – BL05 – JANUARY 2021

Question	Marking guidance	Mark	Comments
01.1	Large, clear drawing of two cells with smooth lines; Cells, nuclei & brush border correct shape;	2	Not sketchy

Question	Marking guidance	Mark	Comments
01.2	39;;	2	2 marks for correct answer 1 mark if not correct to the nearest whole micrometre 1 mark for $\frac{20 \times (\text{length of cell})}{(\text{length of scale bar})}$ eg $\frac{20 \times 27}{14}$ 1 mark for omitting brush border: $36 (= \frac{20 \times 25}{14})$

Question	Marking guidance	Mark	Comments
01.3	Minimum separation for 2 points to be distinguished (as separate points);	1	

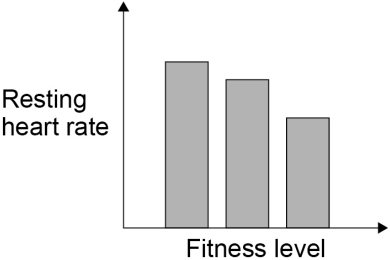
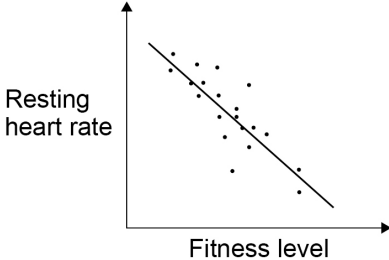
	Marking guidance	Mark	Comments
01.4	<p>Sensible hypothesis – eg:</p> <p>Mitochondria are not stained (differently from rest of cytoplasm)</p> <p>OR</p> <p>No mitochondria in the plane of the section;</p>	1	

Question	Marking guidance	Mark	Comments
1.5	11 (times);;	2	<p>Allow 1 mark for 11.3(75) / 11.0</p> <p>Allow 1 mark for 12 (from 1.5 + 1.5 + .25 + .25 per microvillus)</p> <p>Allow 1 mark for</p> <p>$\frac{(1.5 + 1.5 + 0.25) \times 28}{8}$ or $\frac{3.25 \times 28}{8}$</p>

Question	Marking guidance	Mark	Comments
01.6	<p>(Larger surface area so) more carriers / more channel proteins (for facilitated diffusion / active transport)</p> <p>OR</p> <p>More enzymes/disaccharidases to convert disaccharides to monosaccharides (for absorption);</p>	1	

Question	Marking guidance	Mark	Comments
01.7	<p>1. Glucose and galactose – use active transport (of either sugar into cell or Na⁺ out) as rate reduced with CN⁻;</p> <p>2. (Rate reduction caused by) less ATP made with cyanide;</p> <p>3. Xylose and arabinose – by diffusion since rate not affected by CN⁻;</p> <p>4. Glucose and galactose – EITHER some diffusion as still some absorption with cyanide</p> <p>OR</p> <p>insufficient cyanide added to inhibit electron transfer completely;</p> <p>5. Glucose is more dependent on active transport than galactose as rate of absorption of glucose decreases more with CN⁻;</p>	3 max	

Question	Marking guidance	Mark	Comments
02.1	<ol style="list-style-type: none"> 1. Method to determine level of fitness (of participants/volunteers); 2. Large number (≥ 10) of participants required (for each group); 3. Matching a named factor eg age/gender/ethnicity/BMI/smoking or non-smoking; 4. Definition of 'at rest' – eg just woken up or rest by sitting / lying for a set time period (eg 30 minutes); 5. Method of measuring resting pulse rate; 6. Calculate mean for each group/person; 	5 max	<ol style="list-style-type: none"> 1. Allow sensible suggestion – eg time taken to complete a standard exercise or time taken for heart rate to return to normal after a standard exercise or different training regimes over a set time period 3. Allow a control variable – eg same time since eating 5. Allow calculate mean for each individual (after several repeats);

Question	Marking guidance	Mark	Comments
02.2	<p style="text-align: center;">Either or</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  </div> <div style="text-align: center;">  </div> </div> <p>Reason:</p> <p>Bar chart since categories / fitness is a categoric variable / separate groups</p> <p>OR</p> <p>Scatter graph since (looking for correlation between) continuous variables;</p>	3	<p>Graph must be appropriate for method in 02.1</p> <p>2 marks for graph:</p> <p>Plot of resting heart rate vs. fitness level;</p> <p>Bar graph or scatter graph plotted;</p> <p>Reason must be appropriate for the sketch graph</p>

Question	Marking guidance	Mark	Comments
02.3	t-test / standard error and 95% confidence limits; To see if there is a significant difference between means/groups; OR Spearman rank / correlation coefficient; To see if there is a (negative) correlation between HR and fitness level;	2	Test must be appropriate to method in 02.1 or graph in 02.2 Allow to test whether any difference is due to chance or to find the probability that any difference is due to chance

Question	Marking guidance	Mark	Comments
03.1	Random fertilisation OR Only see expected/representative/reliable/valid ratios if large numbers; Allows use of a statistical test;	2	Allow converse re. small numbers Allow reduces effect of chance variation/anomaly Reject accurate/precise

Question	Marking guidance	Mark	Comments
03.2	<ol style="list-style-type: none"> 1. Tip of abdomen is rounded; 2. Tip of abdomen has larger black region; 3. Male abdomen has 3 stripes but female has 5; 4. Male has shorter abdomen; 	2 max	Allow equivalent alternative terminology 3. Allow male abdomen has 2 stripes but female has 4 3. Allow female abdomen has more stripes

Question	Marking guidance	Mark	Comments																	
03.3	<table border="1"> <thead> <tr> <th rowspan="2">Phenotype of fly</th> <th colspan="2">Number of flies</th> </tr> <tr> <th>Experiment 1</th> <th>Experiment 2</th> </tr> </thead> <tbody> <tr> <td>Red-eyed male</td> <td>13</td> <td></td> </tr> <tr> <td>Red-eyed female</td> <td>11</td> <td>10</td> </tr> <tr> <td>White-eyed male</td> <td></td> <td>16</td> </tr> <tr> <td>White-eyed female</td> <td></td> <td></td> </tr> </tbody> </table>	Phenotype of fly	Number of flies		Experiment 1	Experiment 2	Red-eyed male	13		Red-eyed female	11	10	White-eyed male		16	White-eyed female			2	All 4 correct: 2 marks 2 or 3 correct: 1 mark 0 or 1 correct: 0 marks
Phenotype of fly	Number of flies																			
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Question	Marking guidance	Mark	Comments												
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Experiment 1	Experiment 2														
P genotypes: X^rY and X^RX^R	X^RY and X^rX^r														
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Phenotypes: Red-eyed female Red-eyed male	Red-eyed female White-eyed male														
Ratio: 1 : 1	1 : 1														

Question	Marking guidance	Mark	Comments
03.5	<p>Yes, because:</p> <ol style="list-style-type: none"> 1. With 1 degree of freedom; 2. Closest to $\chi^2 = 1.38$ is $\chi^2 = 2.71$ for $P = 0.10 / P > 0.05$ <p>or $\chi^2 <$ critical value of 3.84;</p> <ol style="list-style-type: none"> 3. (So) expect this divergence from expected result due to chance <p>or (So) this divergence from expected result is not significant</p> <p>or (So) accept null hypothesis;</p>	3	

Question	Marking guidance	Mark	Comments
03.6	<ol style="list-style-type: none"> 1. Cross with white-eyed male; 2. If female is homozygous → all red-eyed offspring (males & females) <p>OR No white-eyed flies;</p> <ol style="list-style-type: none"> 3. If female is heterozygous → red-eyed males & females and white-eyed males & females <p>OR See (some) white-eyed flies;</p>	3	

Question	Marking guidance	Mark	Comments
04.4	1. Option 1 would need higher dosage / treatment for longer time; 2. (Which would cause) inhibition of DNA replication / cell division in other parts of the body / in healthy cells; 3. (Which would lead to) damage / lack of repair in other body cells; 4. Early removal of tumour reduces chance of metastasis and formation of secondary tumours;	3 max	1. Accept converse argument re. option 2 2. Accept examples – eg skin / elsewhere in gut 3. Ignore side effects/damage/harm if unqualified 4. Allow reduces chance of tumour/cells spreading to other parts of the body

Question	Marking guidance	Mark	Comments
05.1	1. (Place quadrat) randomly; 2. Method for achieving randomness; 3. Standardised technique for sampling; 4. Suitable number of repeats;	4	1. Allow transect 2. eg random coordinates / at set intervals (if transect) 3. Allow description – eg disturb stones in quadrat for 30 s with net just downstream 4. eg ≥ 3 Allow many/several

Question	Marking guidance	Mark	Comments
05.2	2.72;;	2	Allow 2 marks for 2.7162.... Allow 1 mark for $\frac{155 \times 154}{(2 \times 1) + (8 \times 7) + (55 \times 54) + (75 \times 74) + (15 \times 14)}$ Allow 1 mark for 2.71 or 2.7162....

Question	Marking guidance	Mark	Comments
05.3	1. At site P – decay of organic matter by (saprophytic) microorganisms uses oxygen; 2. (Oxygen used for) (aerobic) <u>respiration</u> ; 3. At site Q – either more oxygen enters water from the air or oxygen produced by photosynthesis in plants/algae; 4. (Sufficient oxygen) for (aerobic) <u>respiration</u> of animals;	3 max	Ignore reference to toxins in sewage Allow suitable reference to oxygen for aerobic respiration ONCE ONLY – in either mp2 or mp4 Allow converse for site P

Question	Marking guidance	Mark	Comments
06.1	<p>Turgor / described –</p> <p>1. for support;</p> <p>2. opening and closure of stomata;</p> <p>Solvent –</p> <p>3. transport of ions and organic molecules;</p> <p>4. medium for chemical reactions;</p> <p>Hydrolysis –</p> <p>5. eg for mobilising (stored) food / digestion;</p> <p>6. eg of ATP for active transport / synthesis;</p> <p>Photosynthesis –</p> <p>7. light-dependent reaction / photolysis of water;</p> <p>8. production of reduced NADP / ATP;</p> <p>Cooling</p> <p>9. – by evaporation;</p> <p>Tissue fluid in mammals re. homeostasis</p> <p>10. eg temperature / water potential;</p>	6 max	<p>Allow other relevant points</p> <p>3. Allow named example – eg nitrate / other named ion / glucose / sucrose / carbon dioxide / urea</p> <p>3. Allow waste substances</p>

Question	Marking guidance	Mark	Comments
<p>06.2</p>	<p>1. Catalysts – lowering of activation energy;</p> <p>2. – so reactions occur at moderate temperatures;</p> <p>3. Enzymes are proteins – specific 3-D shape of active site;</p> <p>4. Complementarity / fit / forming specific enzyme-substrate complex;</p> <p>5. So each type of reaction has a different enzyme</p> <p>OR Each type of enzyme only combines with one type of substrate;</p> <p>6. Example – condensation reactions – eg protein synthesis / DNA synthesis / RNA synthesis / RuBisCO;</p> <p>OR – hydrolysis reactions – eg digestion;</p>	<p>6</p>	<p>Allow one mark for a named example of enzyme action</p> <p>Allow any alternative valid point</p> <p>eg 2nd example of a named type of reaction</p> <p>OR Role of competitive inhibition</p> <p>OR Role of noncompetitive inhibition to regulate metabolic pathways</p> <p>OR Use of coenzymes – eg NAD(P) / coenzyme A;</p>

Question	Marking guidance	Mark	Comments
06.3	1. Grind equal masses of new variety, waxy & non-waxy grains; 2. Suspend in equal volumes of water / buffer; 3. Add same volume of same concentration α -amylase to each; 4. At constant temperature in a water bath; 5. At intervals remove same-size samples and test for reducing sugars with same volume of Benedict's; 6. Compare intensity of coloration; 7. Plot graph of intensity vs time (3 lines on common axes); 8. More red/orange precipitate if non-waxy / converse for waxy; 9. Repetition and calculation of mean (intensity for each type of grain);	6 max	5. or test at end after a set time or test with same volume of iodine 6. Allow eg use of colorimeter 8. (For iodine test) blue-black for waxy or brown/yellow for non-waxy

Question	Marking guidance	Mark	Comments
<p>06</p>	<p><u>Quality of written communication</u></p> <p>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.</p> <p><u>2 marks</u> for</p> <p>an answer in which technical terms are used correctly throughout and the accounts are presented clearly and logically.</p> <p><u>1 mark</u> for</p> <p>an answer in which most technical terms are used correctly and most of the accounts are presented clearly and logically.</p> <p><u>0 marks</u> for</p> <p>an answer in which few technical terms are used correctly or the accounts are seldom presented clearly and logically.</p>	<p>2</p>	<p>Award mark for overall performance in 06.1, 06.2 and 06.3</p>