

INTERNATIONAL AS **Biology**

BL01 - The Diversity of Living Organisms

Mark scheme

9610

June 2018

Version/Stage: 1.0 Final

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 Assessment Writer.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of students' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

Further copies of this mark scheme are available from aqa.org.uk

Question	Marking guidance	Mark	Comments
01.1	<p>A Capsule;</p> <p>B Cell wall;</p> <p>C Cell membrane/cell-surface membrane;</p>	3	<p>Ignore slime Reject capsid</p> <p>Ignore correct material for wall (e.g. murein) Reject cellulose in relation to cell wall</p> <p>Ignore plasma membrane</p>
01.2	x 50 000;	1	Accept range between 48,000 and 52000
01.3	<p>1.Chaperone proteins bind to hydrophobic groups (on the secretory proteins);</p> <p>2. Prevent incorrect hydrophobic interactions;</p> <p>3. Allows protein to be correctly folded;</p>	2	<p>Reference to hydrophobic required only once:</p> <p>Chaperone proteins bind to hydrophobic groups preventing incorrect interactions (2 marks)</p> <p>Chaperone proteins bind to groups preventing incorrect hydrophobic interactions (2 marks)</p> <p>Accept reference to folding into appropriate tertiary structure/3D shape/example of a correct structure</p>
01.4	Bacteria do not have endoplasmic reticulum/chaperone proteins;	1	

Question	Marking guidance	Mark	Comments
02.1	1. Molecule too large (to pass between membrane/phospholipid molecules); 2. Betanin charged/polar/hydrophilic/non-lipid soluble; 3. Shape does not fit through channel proteins/pores;	2 max	Ignore any reference to water soluble Accept there are no carrier proteins for betanin
02.2	Any four from: 1. (as temperature increases) phospholipid/protein molecules gain kinetic energy and move more; 2. (as temperature increases) betanin molecules gain kinetic energy and move/diffuse faster; 3. (at higher temperatures) proteins (in the membrane) are denatured; 4. (and so) as temperature increases the permeability of the membrane increases/eventually becomes (fully) permeable; 5. Idea that betanin can move from the vacuole to the water when the membrane disrupted; 6. Idea the surface of the cells has been cut (and so betanin leaks out)	4 max	Accept converse for lower temperatures throughout. Accept disrupts/breaks/damages the membrane
02.3	1. Keeps temperature constant / controls/maintains temperature; 2. Can be set at different temperatures;	1 max	Accept because room temperature fluctuates

02.4	<p>1. The membrane is destroyed/disrupted/denatured;</p> <p>2. Maximum (amount of) pigment diffused into liquid;</p> <p>OR</p> <p>Concentration of pigment has reached equilibrium</p>	2	<p>Accept idea that membrane is already at 85°C</p> <p>Accept no further change in membrane above 85°C</p> <p>OR</p> <p>Accept idea that membrane is already fully permeable at 85°C</p>
02.5	<p>1. Idea of conditions the same except no beetroot sample/no betanin;</p> <p>2. Boiled/cooked beetroot cubes (cooled and rinsed) (instead of fresh beetroot), (all other conditions the same);</p>	1	<p>Ignore no independent variable unqualified</p>
02.6	<p>1. Keep surface area to volume ratio the same/constant;</p> <p>2. To ensure the only variable affecting rate of diffusion is temperature;</p>	2	<p>Accept idea of control for differences in surface area – i.e all have same surface area</p> <p>Accept so can compare one result with another</p>

Question	Marking guidance	Mark	Comments
03.1	To reduce/prevent bias;	1	Accept representative sample
03.2	(DNA in the mitochondria) 1. Shorter in length; 2. Circular; 3. Not associated with proteins/not in chromosomes; 4. Has no introns / has exons only	2	Accept fewer genes/different sequencing in genes Accept smaller Accept loop of DNA Accept not associated with histones;
03.3	Mark in pairs: 1. The base sequence of mRNA (of the same gene); 2. The greater the number of differences in the (mRNA base) sequence, the greater the genetic diversity; OR 3. The amino acid sequence of an (encoded) protein; 4. The greater the number of differences in the (amino acid) sequence (of a protein), the greater the genetic diversity;	2	Must be marked in pairs Accept converse Accept converse Accept valid references to immuno comparison

03.4	<p>Any one from:</p> <ol style="list-style-type: none"> 1. Develop (new) medicines/vaccinations/drugs to treat the disease/kill the flatworms; 2. Use the (current) most effective available medicine/drug to treat the (particular) flatworm causing the disease/to kill the (particular) flatworm causing the infection; 	1	
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Question	Marking guidance	Mark	Comments
04.1	Bronchiole;	1	Ignore bronchus/trachea
04.2	<p>Any four from:</p> <ol style="list-style-type: none"> 1. Less elastic recoil; 2. Harder to remove air from the alveoli (when breathing out); 3. (More carbon dioxide/less oxygen in the alveoli) so reduced concentration gradients (for diffusion/gas exchange); 4. (The walls of the alveoli are damaged/broken down) so reduced surface area (for gas exchange); 5. Link (points 2 and/or 3) to reduced rates of diffusion in the right context; 6. (Inflammation of alveoli/thicker walls) so increased diffusion distance; 	3 max	Accept less stretch (when breathing in)
04.3	Fibrous;	1	

<p>04.4</p>	<p>Any two from:</p> <ol style="list-style-type: none"> 1. Idea of specific active site <u>shape</u>; 2. Only the proteins in the elastic tissue <u>complementary</u> shape (to active site); 3. Enzyme-substrate/E-S complexes only formed between protein in the elastic tissue and elastase; 	<p>2 max</p>	<p>Accept active site tertiary/3D structure Accept idea of specific substrate shape</p> <p>Accept converse about other molecules Accept only the proteins in the elastic tissue <u>fit</u> shape of active site;</p> <p>Must be in context of other molecules not forming these Accept idea that only a specific substrate can bind</p>
<p>04.5</p>	$ \begin{array}{c} \text{CH}_3 \\ \\ \text{H}_2\text{N}-\text{C}-\text{COOH} \\ \\ \text{H} \end{array} $	<p>1</p>	<p>allow $^+\text{H}_3\text{N}$ instead of H_2N allow COO^- instead of COOH</p>

Question	Marking guidance	Mark	Comments
05.1	β / <u>Beta</u> glucose;	1	Accept b/B Reject any reference to alpha/ α
05.2	1. Add Benedict's (reagent) <u>and</u> heat/warm; 2. Red/orange/yellow/green (colour);	2	Reject Add HCl Accept brown, reject other colours
05.3	1.0×10^{-3} ;	1	Accept 0.97×10^{-3} Accept 9.7×10^{-4}

<p>05.4</p>	<p>1. Line graph with rate on y axis and time in hours/days on x-axis and linear scales and correct units on both axes;</p> <p>2. Rates correctly plotted;</p> <p>3. Line connecting points/(smooth) line of best fit and no extrapolation;</p>	<p>3</p>	<p>ecf from 05.3 ± 1 mm Allow if 05.3 is left blank</p> <p>Reject a ruled straight line of best fit Ignore sensible/minimal extrapolation</p> <p>If incorrect graph is plotted (e.g. concentration instead of rate) award 1 mark (as long as MP2 <u>and</u> MP3 have both been achieved)</p>
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<p>05.5</p>	<p>Any three from:</p> <ol style="list-style-type: none"> 1. (Steep decrease) <u>and</u> then a less rapid/more gradual decrease; 2. High (initial) rate of reaction/hydrolysis (at 12 hours) as large amount of cellulose/substrate for cellulase; 3. Decreased/rate of reaction as cellulose has been hydrolysed/less substrate/fewer E-S complexes form; 4. (Hydrolysis of) glycosidic bonds; 	<p>3 max</p>	<p>Accept idea of steep decrease initially <u>and</u> then slowing down</p>
<p>05.6</p>	<ol style="list-style-type: none"> 1. Forms long / straight / unbranched chains (of β glucose); 2. Forming (micro) fibrils/(macro) fibrils / (many) hydrogen bonds between chains; 3. Provide rigidity/strength/support; 	<p>3</p>	<p>Ignore reference to alpha glucose</p> <p>Reject if any extra wrong function is stated - eg supports the cell and is partially permeable.</p>

Question	Marking guidance	Mark	Comments
06.1	Any one from: 1. Time in buffer solution; 2. Temperature; 3. All pieces taken from the same apple/same variety/type of apple;	1 max	Ignore time if unqualified Ignore volume of buffer solution
06.2	Prevents air/oxygen reaching the apple (tissue) or prevents any (further) change in colour;	1	
06.3	1. Can compare pieces of apple at different pHs to the standard; 2. So that there is more consistency/less subjectivity about the end point/point at which timing is stopped;	2	Accept idea that all have to reach the same shade of brown Accept any reference to the difficulty of judging the degree of 'brownness' Ignore more reliable / accurate / valid / a control unless suitably qualified
06.4	Time taken to turn brown decreases (from pH 4) up to pH 7 then increases up to pH 8;	1	Ignore It works fastest at pH7

<p>06.5</p>	<p>Reduced activity of PPO means less melanin produced and so the apple turns brown more slowly/the rate of browning is lower;</p> <p>SC is similar shape to substrate / phenol / oxygen;</p> <p>So SC attaches to active site;</p> <p>SC binds to another site on enzyme and causing a change in the shape of the active site and so substrate cannot bind/is no longer complementary/ no E-S complexes form;</p>	<p>3 max</p>	<p>Accept SC is a competitive inhibitor</p> <p>Accept less oxygen can bind / fewer E-S complexes form</p>
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Question	Marking guidance	Mark	Comments
07.1	All/the complete set of DNA/genes/genetic material in a cell/organism/species/person/human/individual;	1	Accept: the haploid set of chromosomes of an organism
07.2	1. DNA that is non coding/does not code for a polypeptide protein; 2. Introns <u>within</u> a gene; 3. (Non-coding) multiple repeats (of base sequences) <u>between</u> genes;	2 max	Accept introns within <u>pre</u> -mRNA Accept correct description of an intron Accept non-coding length of DNA within a gene for 2 marks Ignore reference to introns here
07.3	0.8 nm;;	2	Any answer with 8 – eg 80, 800 score 1 mark Accept $1.0 \times 10^9 / 12.5 \times 10^8 = 8.0$ for 1 mark Accept $8.0 / 10 = 0.8\text{nm}$ for 2 marks

<p>07.4</p>	<ol style="list-style-type: none"> 1. DNA strands separate; 2. Each/one strand of old DNA acts as template; 3. New (DNA) stand consists of one old <u>and</u> one new strand; 4. Suitable ref. to H-bonding between bases; 5. New (DNA) chain will incorporate *T(-nucleotides) (from solution); 6. Correct reference to DNA polymerase in joining (adjacent) <u>nucleotides</u> together (to form new strand); 	<p>4</p>	<p>Accept idea that hydrogen bonds are broken</p> <p>Accept idea that bonds between the (complementary) bases are broken</p> <p>Accept reference to semi-conservative (replication)</p> <p>Accept correct reference to complementary base pairing</p> <p>Reject any reference to DNA polymerase forming hydrogen bonds between complementary bases</p>
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Question	Marking guidance	Mark	Comments																
08.1	<table border="1" data-bbox="465 343 949 869"> <tr> <td>Classification taxon</td> <td><i>Phosphaenus hemipterus</i></td> </tr> <tr> <td>Kingdom:</td> <td><u><i>Animalia</i></u></td> </tr> <tr> <td>Phylum</td> <td><u><i>Arthropoda</i></u></td> </tr> <tr> <td>Class</td> <td><u><i>Insecta</i></u></td> </tr> <tr> <td>Order</td> <td><u><i>Coleoptera</i></u></td> </tr> <tr> <td>Family</td> <td><u><i>Lampyridae</i></u></td> </tr> <tr> <td>Genus</td> <td><i>Phosphaenus</i></td> </tr> <tr> <td>Species</td> <td><i>Hemipterus/ heipterus</i></td> </tr> </table>	Classification taxon	<i>Phosphaenus hemipterus</i>	Kingdom:	<u><i>Animalia</i></u>	Phylum	<u><i>Arthropoda</i></u>	Class	<u><i>Insecta</i></u>	Order	<u><i>Coleoptera</i></u>	Family	<u><i>Lampyridae</i></u>	Genus	<i>Phosphaenus</i>	Species	<i>Hemipterus/ heipterus</i>	2	Award 1 mark for each correct column
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Genus	<i>Phosphaenus</i>																		
Species	<i>Hemipterus/ heipterus</i>																		

<p>08.2</p>	<p>1. (Most common/modal) flash length longest in <i>P.hemipterus</i>/shortest in <i>P. pyralis</i>;</p> <p>2. <i>P. castus</i> has largest spread of data/flash lengths;</p> <p>3. Overlap in data between <i>P. pyralis</i> and <i>P.castus</i>/no overlap in the data between <i>P. hemipterus</i> and any other species;</p> <p>4. Data normally distributed for all the species;</p>	<p>2 max</p>	<p>Accept correct reference to the number/order of flash lengths between the species</p> <p>Accept largest variety in mean flash lengths/standard deviation</p> <p>Accept some <i>P.pyralis</i> and <i>P. castus</i> males have the same flash length</p> <p>Accept the number of most common/modal flash length highest in <i>P.castus</i></p>
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08.3	5%;	1	
08.4	<p>1. These males are more likely to accidentally mate/form hybrids with females of a different species;</p> <p>2. Hybrids are inviable/sterile/non-fertile (so alleles can't be passed on);</p>	2	<p>Accept converse – i.e. males less likely to mate with females of their own species</p> <p>Idea that less fertile offspring are produced is insufficient</p>
08.5	<p>1. Smaller groups are placed within larger groups;</p> <p>2. No overlap between groups;</p>	2	<p>Accept idea of groups within groups</p> <p>Accept smaller groups have more features in common / converse</p> <p>Accept idea that features of larger groups are common to all smaller groups</p> <p>Accept idea of groups within group with no overlap for 2 marks</p>

<p>08.6</p>	<p>1. <i>Photinus pyralis</i> and <i>Photinus castus</i>;</p> <p>And any two from:</p> <p>2. Idea of more complementary base pairing between closely related/correctly named species;</p> <p>3. More hydrogen bonds forming;</p> <p>4. More heat/energy needed to break (the hybridised) strands apart;</p>	<p>3 max</p>	<p>One mark must come from marking point 1</p> <p>Only two marks from marking points 2,3, 4</p>
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