OXFORD
INTERNATIONAL
AQA EXAMINATIONS

INTERNATIONAL AS
BIOLOGY
BL01

Unit 1 – The Diversity of Living Organisms

Mark scheme

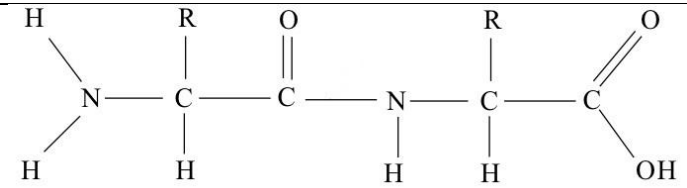
January 2019

Version: 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	Peptide bond between C-N correctly drawn; -OH group from one amino acid and –H from other amino acid correctly removed;	2	 Diagram above gets 2 marks Allow H_2N- / H_3^+N- Allow –COOH / -COO^- C=O and N-H bonds can both be either way around Award one mark If only one error in the diagram
01.2	14;	2	Allow 1 mark max if 'total number of peptide bonds given' is shown as 21 (even if correct answer of 14 is given) Award one mark for the following: (70x20) ÷ 100 **or** (70x21) ÷ 100 / 14.7
01.3	1. Add Biuret (reagent); 2. Goes purple / mauve / lilac / violet;	2	1. Allow 'add sodium hydroxide / NaOH and (then) copper sulphate / $CuSO_4$' 1. Allow (carry out) Biuret test Reject MP1 if 'solution heated' or for mention of other incorrect reagents 2. Reject blue / pink.
01.4	'Quaternary structure' box (ticked);	1	

01.5	1 Sequence / order of amino acid changes; 2 Tertiary structure changes / folds / coils in a different way / bonds form in different positions; 3 Named bond affected e.g. hydrogen / ionic / disulphide / hydrophobic;	3	2. Allow active site changes shape 3. Reject peptide bonds or other incorrect named bonds Allow for 2 marks 'different hydrogen / ionic / disulphide / hydrophobic bonds form'

Question	Marking guidance	Mark	Comments
02.1	0.133 / 0.130;; If correct answer (0.133) given but measurements from graph out of range only award one mark 0 minutes = 7.2 – 7.3 arbitrary units 30 minutes = 3.3 – 3.4 arbitrary units	2	Allow the following for one mark: (7.3 – 3.3) ÷ 30 (7.2-3.3) ÷ 30 0.13 (7.1 – 3.3) ÷ 30 0.127 Allow ecf from misreading points on the graph
02.2	1. (Potassium ions) absorbed by diffusion in **B**; 2. (Cells have) no energy / ATP available in **B** or (cells have) energy / ATP available in **A;** 3. (Potassium ions) absorbed by active transport in **A** or no active transport in **B**;	3 max	1. Accept the idea that some active transport can occur as some ATP might already have been available in **B** 2. Reject energy made / produced Accept descriptions of **A** and **B** e.g. flask with the inhibitor for **B** If no other marks awarded allow idea that active transport requires energy / ATP but diffusion does not for one mark.
02.3	1. (Absorption by) diffusion no longer occurs; 2. As no concentration / diffusion gradient;	2	Allow facilitated diffusion / movement of ions equal in both directions Allow equilibrium reached

Question	Marking guidance	Mark	Comments
02.4	1. (Malonate) fits into / binds to / blocks active site of enzyme; 2. (Malonate) competes with substrate / less/no succinate/substrate can bind to the active site;	2	1. (Malonate) is complementary to active site of enzyme 2. Allow (Malonate) is a competitive inhibitor 2. Allow fewer enzyme-substrate complexes formed It = Malonate Substrate = Succinate Enzyme = Succinate dehydrogenase

Question	Marking guidance	Mark	Comments
03.1	5.9×10^{12} ;	1	
03.2	(Red blood cell) values are very large;	1	Allow idea of red blood cells being present in a very large quantity Allow idea of too many zeros / could lose count Allow easier to compare
03.3	1. (All same) sex / gender; 2. (All same) age (group); 3. (All same) ethnicity; 4. (Same / similar) body mass / BMI 5. (All) healthy; 6. (All eat same / similar) diet;	2 max	For 1 – 4 idea of same **or** balanced 2. Allow no children / children have different red blood cell counts from adults 5. Allow other factors such as no drugs / no smokers / no other medications
03.4	1. (More red blood cells means) More haemoglobin; 2. So (haemoglobin) can load / pick up / bind more oxygen (in the lungs) **or** So haemoglobin can carry / transport more oxygen (to cells / tissues);	2	2. Allow increase in oxygen uptake (in the lungs) 'More' needed only once to gain 2 marks e.g. allow 'more haemoglobin to combine / transport oxygen' for two marks Allow 'more oxyhaemoglobin (can form)' for two marks

Question	Marking guidance	Mark	Comments
03.5	1. (Haemoglobin) has lower affinity for oxygen; 2. At the same partial pressure (of oxygen); 3. (Haemoglobin) releases / dissociates more oxygen; Or (Haemoglobin) releases / dissociates oxygen (more) easily; 4. To (aerobically) respiring cells / tissues;	4	1. Allow description of low affinity e.g. 'haemoglobin is less saturated with oxygen' 2. Allow numerical examples to illustrate point e.g. at 6kPa 3. Allow release oxygen quickly 4. Idea of (more) cellular respiration
03.6	(In muscle cells) oxygen unloads from haemoglobin **and** binds to myoglobin.	1	Allow at partial pressures when haemoglobin dissociates myoglobin takes up oxygen Allow myoglobin acts as an oxygen store

Question	Marking guidance	Mark	Comments
04.1	The number of (different) species in a community;	1	Instead of community allow: area / habitat / ecosystem
04.2	2.94 (times greater);;; If candidate states 'approximately 3 times greater' allow for two marks if evidence of 2.94 in working out. If only state 'approximately 3 times greater' with no working out = no marks	3	Allow 2.9 (times greater) for 2 marks Allow calculation of 7.85 ÷ 2.67 for 2 marks Allow calculation of 38 220 ÷ 14 308 for 1 mark Allow (index of diversity of barley field =) 2.67 for one mark Allow ecf for answer from error in dominator e.g. 7.85 ÷ 2.58 = 3.04 (incorrect answer) = one mark
04.3	1. Greater <u>variety</u> of plants / insects; 2. Idea of greater variety of food / more food source<u>s</u> (for insects / birds); 3. More habitats (for insects / birds);	3	1. Allow more plants / insect species 1. Allow greater plant / insect <u>diversity</u> 2. Ignore more plants / insects 3. Allow more niches 3. Allow more nesting sites

Question	Marking guidance	Mark	Comments
05.1	5 cm^3 (1.0 mol dm^{-3}) sucrose solution <u>and</u> 20 cm^3 (distilled) water;	1	
05.2	Water / solution on the outside would increase the mass / weight of the potato cylinders;	1	Allow idea that student only wants to measure change in mass due to water entering / leaving potato tissue
05.3	1. Cylinders same length; 2. Cylinders cut from same potato; 3. (Cylinders and solutions kept at same) temperature; 4. (Cylinders kept in same) volume of sucrose solution;	2 max	1. Allow same size / surface area / starting mass 2. Allow from the same variety of potato Ignore references to pH of solution
05.4	$\frac{(\text{final mass} - \text{start mass})}{\text{start mass}} \times 100$ **OR** [(final mass ÷ start mass) x 100] – 100 ;	1	
05.5	To allow comparison (of potato cylinders) / (Potato cylinders had) different starting masses;	1	
05.6	1 Plot a graph with concentration (of sucrose) of on the x-axis and percentage change (in mass) on the y-axis; 2 Find concentration where percentage change in mass is 0 / find concentration where line crosses x-axis / find x-axis intercept;	2	1. Allow idea of repeating experiment with concentrations between 0.2 and 0.4 mol dm^{-3}

Question	Marking guidance	Mark	Comments
05.7	1 Water has entered (potato tissue) by osmosis / diffusion / (potato tissue) has gained water by osmosis / diffusion; 2 Water potential of solution is higher than that of potato tissue / water potential of solution is less negative than that of potato tissue;	2	2 Accept ψ for water potential 2 Accept converse 2 Must be comparative statement – greater/higher/more 2 Allow solute potential/ ψ_s / osmotic potential instead of water potential 2. Ignore references to water concentration 2. Allow references to solution being hypotonic or potato cells / tissue as hypertonic

Question	Marking guidance	Mark	Comments
06.1	Taxon;	1	Allow taxa / taxonomic group Do not allow taxonomy
06.2	Domain;	1	
06.3	1. Considerable variation within a species; 2. Interbreeding may not be possible;	2	1. Accept description e.g. large difference in size 1. Ignore references to colour or other irrelevant features 2. Accept reason why interbreeding may not be possible e.g. difficulty giving birth 2. Accept 'cannot mate' 2. Allow some species do not reproduce sexually
06.4	Pro: 1. (because) amino acid (sequence) most similar; Con: 2. only compared 22 amino acids / did not compare all (104) amino acids; 3. might not be the same 3 amino acids that are different; 4. (Amino acid sequence) compared to human cytochrome c not each other; 5. Degeneracy of genetic code **so** different number of base differences (more or less) 6. Cytochrome c is only one protein **so** other proteins might vary more or less;	3	1. Allow same number of differences (in amino acid sequence) Must have at least one pro and one con for max marks

Question	Marking guidance	Mark	Comments
07.1	Molecule A = tRNA or transfer RNA; Part X = Anticodon;	2	
07.2	TACGGCATGGCT;	1	
07.3	Methionine, Proline, Tyrosine, Arginine;	1	This order only Accept abbreviations to: Met, Pro, Tyr, Arg
07.4	1. (Genetic) Code is degenerate / amino acids coded for by more than one triplet; 2. Different codon but same amino acid / different codon but still alanine;	2	Allow 'alanine is coded for by GCC and GCU' for two marks

<table>
<tr><th>Question</th><th>Marking guidance</th><th>Mark</th><th>Comments</th></tr>
<tr><td>07.5</td><td>
<table>
<tr><th rowspan="2">Statement</th><th colspan="3">Process</th></tr>
<tr><th>DNA replication</th><th>Transcription</th><th>Translation</th></tr>
<tr><td>DNA double helix unwinds</td><td>✓</td><td>✓</td><td></td></tr>
<tr><td>A polynucleotide chain is formed</td><td>✓</td><td>✓</td><td></td></tr>
<tr><td>Peptide bonds are formed</td><td></td><td></td><td>✓</td></tr>
</table>
</td><td>3</td><td>One mark for each correct row

Cross in box = Blank

If all rows incorrect allow one mark for each correct column with a maximum of 2 marks</td></tr>
<tr><td>07.6</td><td>1. (No respiration so) no ATP produced;

2. ATP needed to form peptide bond;

3. ATP needed to activate the amino acid / ATP needed to attach amino acid to tRNA;</td><td>3</td><td>1. Reject no energy produced
1. Allow no energy released

2. Accept converse – no ATP no peptide bonds

3. Accept converse – no ATP no amino acid activation

3. Accept transfer RNA

If no marks awarded allow one mark for ‘protein synthesis / translation requires energy / ATP’</td></tr>
</table>

Question	Marking guidance	Mark	Comments
08.1	(Idea of) minimum <u>distance</u> between two objects for them to appear as separate objects;	1	Ignore 'the ability to distinguish 2 points'
08.2	1 (Electron microscopes) use (a beam of) electrons; 2 (Electrons) have a shorter wavelength / higher frequency;	2	2 Must be a comparative statement 2. Only allow TEM / SEM has a shorter wavelength if MP1 has been awarded
08.3	2000;	1	
08.4	(Electro) magnet;	1	

08.5	1. (Optical microscope because) electron microscope images not colour / optical microscopes images are in colour OR membrane properties altered in TEM / SEM OR Specimen needs to be alive ; 2. (TEM because) shows internal structure of organelles / optical microscope magnification/resolution not high enough OR TEM has high enough magnification or sufficient resolution; 3. (Optical microscope because) electron microscopes cannot view living cells; 4. (SEM because) shows surface structure / gives 3D image;	4	

08.6	(Structures that are) not part of the natural specimen / produced as a result of specimen preparation;	1	