

**INTERNATIONAL AS
BIOLOGY (9610)**

BL01

Unit 1 The Diversity of Living Organisms

Mark scheme

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2 5 1 X B L 0 1 / 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.

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.

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Mark scheme instructions to examiners

1. General

The mark scheme for each question shows:

- the marks available for each part of the question
- the typical answer or answers which are expected
- extra information to help the examiner make his or her judgement and help to delineate what is acceptable or not worthy of credit.

The extra information in the 'Comments' column is aligned to the appropriate answer in the left-hand part of the mark scheme and should only be applied to that item in the mark scheme. At the beginning of a part of a question a reminder may be given, for example: where consequential marking needs to be considered in a calculation; or the answer may be on the diagram or at a different place on the script.

In general the right-hand side of the mark scheme is there to provide those extra details which confuse the main part of the mark scheme yet may be helpful in ensuring that marking is straightforward and consistent.

2. Emboldening

- 2.1 In a list of acceptable answers where more than one mark is available 'any **two** from' is used, with the number of marks emboldened. Each of the following bullet points is a potential mark.
- 2.2 A bold **and** is used to indicate that both parts of the answer are required to award the mark.
- 2.3 Alternative answers acceptable for the same mark are indicated by the use of **OR**. Different terms in the mark scheme are shown by a/; eg allow smooth/free movement.

3. Marking points

3.1 Marking of lists

This applies to questions requiring a set number of responses, but for which students have provided extra responses. The general principle to be followed in such a situation is that 'right + wrong = wrong'.

Each error/contradiction negates each correct response. So, if the number of errors/contradictions equals or exceeds the number of marks available for the question, no marks can be awarded.

However, responses considered to be neutral (often prefaced by 'Ignore' in the 'Comments' column of the mark scheme) are not penalised.

3.2 Marking procedure for calculations

Full marks can be given for a correct numerical answer, without any working shown.

However, if the answer is incorrect, mark(s) can usually be gained by correct substitution/working and this is shown in the 'Comments' column or by each stage of a longer calculation.

3.3 Interpretation of 'it'

Answers using the word 'it' should be given credit only if it is clear that the 'it' refers to the correct subject.

3.4 Errors carried forward, consequential marking and arithmetic errors

Allowances for errors carried forward are most likely to be restricted to calculation questions and should be shown by the abbreviation ECF or consequential in the mark scheme.

An arithmetic error should be penalised for one mark only unless otherwise amplified in the mark scheme. Arithmetic errors may arise from a slip in a calculation or from an incorrect transfer of a numerical value from data given in a question.

3.5 Phonetic spelling

The phonetic spelling of correct scientific terminology should be credited **unless** there is a possible confusion with another technical term.

3.6 Brackets

(.....) are used to indicate information which is not essential for the mark to be awarded but is included to help the examiner identify the sense of the answer required.

3.7 Ignore/Insufficient/Do not allow

Ignore or insufficient is used when the information given is irrelevant to the question or not enough to gain the marking point. Any further correct amplification could gain the marking point.

Do **not** allow means that this is a wrong answer which, even if the correct answer is given, will still mean that the mark is not awarded.

Question	Marking guidance	Mark	Comments
01.1	A Phosphate (group); B Nitrogenous base OR organic base;	2	A. Allow phosphoric acid B. Allow all four names of bases

Question	Marking guidance	Mark	Comments
01.2	1. histone(s); 2. exons; 3. locus/loci;	3	

Question	Marking guidance	Mark	Comments
01.3	595;;	2	Allow 1 mark for 594.69/ 594.7 / 594.6 / 594

Question	Marking guidance	Mark	Comments
01.4	DNA helicase 1. Unwinds the DNA; 2. Breaks the hydrogen bonds; DNA polymerase 3. Joins (adjacent) nucleotides together; 4. By condensation reactions OR using phosphodiester bonds;	4	2. Allow separate the two strands 2. Ignore unzips the strands 3. Ignore references of joining to template strand 3. Do not allow 'free' nucleotides being joined together, in the absence of the idea of a pre-existing strand 4. Ignore the idea of complementary nucleotide pairing 4. Do not allow forms hydrogen bonds

Question	Marking guidance	Mark	Comments
01.5	1. (DNA polymerase) has an <u>active site</u> ; 2. Only the 3' end of the polynucleotide OR Substrate, has a <u>complementary</u> shape (to the active site);	2	2. Allow 'fit' for complementary

Question	Marking guidance	Mark	Comments
02.1	1. Reduces the activation energy; 2. Puts pressure/tension/stress on <u>bonds</u> ;	2	2. Ignore bonds breaking 2. Allow enzyme holds substrates in appropriate orientation

Question	Marking guidance	Mark	Comments
02.2	Answer key: B Quaternary (structure);	1	

Question	Marking guidance	Mark	Comments
02.3	Energy is released (from hydrogen peroxide being broken down);	1	Allow the reaction is exothermic/exergonic Allow heat for energy Do not allow 'makes/generates/produces energy'

Question	Marking guidance	Mark	Comments
<p>02.4</p>	<p>(Rate of reaction is faster with crushed potato)</p> <p>1. Breaks open cells</p> <p>OR</p> <p>increases surface area;</p> <p>2. Releases enzymes</p> <p>OR</p> <p>forms more ESC;</p> <p>3. Levels off sooner because the substrate</p> <p>OR</p> <p>hydrogen peroxide, has been used up more quickly;</p>	<p>3</p>	<p>Allow converse throughout</p> <p>Allow max 2 marks if type of potato not specified</p> <p>2. Allow (crushing) causes hydrogen peroxide to enter cells faster</p> <p>2. Allow more successful collisions/binding between enzyme and substrate</p>

Question	Marking guidance	Mark	Comments
02.5	1. (Thermostatically-controlled) water bath at set/optimum temperature OR 35 °C OR explanation that includes heating, cooling and using a thermometer; 2. (Change in) temperature changes the rate of reaction OR (Changing) kinetic energy changes the rate of reaction OR (Changes) activity of the enzyme;	2	2. Allow so that only 1 variable is being investigated 2. Allow description of optimal temperature 2. Ignore optimum temperature unqualified 2. Ignore denaturation

Question	Marking guidance	Mark	Comments
02.6	Increase substrate/H ₂ O ₂ concentration OR increase size of potato OR increasing enzyme concentration OR change pH to the optimum OR use a buffer;	1	Do not allow temperature

Question	Marking guidance	Mark	Comments
02.7	1. Boil the potato; 2. <u>Same</u> volume OR concentration of hydrogen peroxide; 3. <u>Same</u> size OR mass of potato;	3	1.Ignore heat 1.Allow soak in acid/alkali Allow 1 mark for 'Use the same method/repeat the method/experiment/all other variables kept the same' if marking points 2 and 3 are not awarded

Question	Marking guidance	Mark	Comments
03.1	<p>Similarity</p> <p>1. Both have (phospholipid) bilayers / lipid / fatty acid tails / proteins;</p> <p>Difference</p> <p>2. No channel protein / carrier protein / cholesterol / glycoprotein / glycolipid;</p> <p>OR</p> <p>The proteins are not scattered / the proteins are on the outside of the membrane / proteins are in a layer;</p>	2	

Question	Marking guidance	Mark	Comments
03.2	Add a layer of oil/liquid (to the surface of the solution);	1	Allow bubble nitrogen gas through

Question	Marking guidance	Mark	Comments
03.3	(47%) 43–51%;;	2	Allow 1 mark for a correct calculation e.g. $\frac{1.9-1.0}{1.9} \times 100$

Question	Marking guidance	Mark	Comments
03.4	<p>With oxygen</p> <p>1. Occurs by active transport;</p> <p>2. (because) concentration decreases OR drops to zero (with oxygen present);</p> <p>No oxygen</p> <p>3. Occurs by (facilitated) diffusion;</p> <p>4. Concentration (only) decreases slightly</p> <p>OR</p> <p>Levels off;</p>	4	

Question	Marking guidance	Mark	Comments
04.1	1. (One/a) glycerol and three fatty acids; 2. Idea of removal of three molecules of water / three condensation reaction; 3. Ester bond(s) (formed);	3	Allow idea of three only mentioned once in marking points 1 and 2 Allow all marks in suitably labelled diagram or balanced equation

Question	Marking guidance	Mark	Comments																
04.2	<table border="1"> <thead> <tr> <th>Lipid letter from Figure 8 (A–C)</th> <th>Number of carbon atoms</th> <th>Contains carbon–carbon double bonds Tick (✓) if present</th> <th>Melting point / °C</th> </tr> </thead> <tbody> <tr> <td>C</td> <td>39</td> <td></td> <td>162.0</td> </tr> <tr> <td>A</td> <td>18</td> <td></td> <td>69.0</td> </tr> <tr> <td>B</td> <td>16</td> <td>✓</td> <td>–0.1</td> </tr> </tbody> </table> <p>Mark as a column;;;</p>	Lipid letter from Figure 8 (A–C)	Number of carbon atoms	Contains carbon–carbon double bonds Tick (✓) if present	Melting point / °C	C	39		162.0	A	18		69.0	B	16	✓	–0.1	3	If column 1 incorrect then ecf for other columns 2 and 3 Award 1 mark if column 3 correct but column 1 empty
Lipid letter from Figure 8 (A–C)	Number of carbon atoms	Contains carbon–carbon double bonds Tick (✓) if present	Melting point / °C																
C	39		162.0																
A	18		69.0																
B	16	✓	–0.1																

Question	Marking guidance	Mark	Comments
04.3	Double bonds cause the molecule to bend/kink and therefore they cannot pack together so closely;	1	Allow idea of fewer/weaker intermolecular forces

Question	Marking guidance	Mark	Comments
04.4	All fatty acids contain C=O double bonds OR double bond in carboxyl group;	1	Allow may contain P=O bonds

Question	Marking guidance	Mark	Comments
04.5	1. Add ethanol, shake/mix and <u>then</u> add to water; 2. White/milky/emulsion;	2	1. Allow mixing to happen after water 1. Allow 'alcohol OR named alcohol' 1. Reject heated 1. Reject ethanal/ethonal 2. Ignore cloudy 2. Reject precipitate

Question	Marking guidance	Mark	Comments
05.1	Vol = 47.7;; 1 mark for wrong number of decimal places/incorrect rounding e.g. 47.69/47.6 SA = 1.3 : 1;	3	Penalise wrong number of decimal places only once Allow 1 mark for alternative value of SA:vol if Vol incorrect eg (63.6/Vol) : 1 Do not allow 1 : 1 or 1.33:1 etc

Question	Marking guidance	Mark	Comments
05.2	Mark in pairs: 1 and 2 OR 3 and 4 OR 5 and 6 1. Temperature; 2. Because a higher temperature gives faster diffusion / increases kinetic energy/ faster movement of molecules; OR 3. Viscosity OR density OR concentration of agar; 4. Diffusion is slower if viscosity OR density OR concentration is higher; OR 5. Concentration of HCl; 6. Faster diffusion if concentration gradient steeper;	2	Allow converse 2. Ignore temperature affects rate of diffusion

Question	Marking guidance	Mark	Comments
05.3	<p>1. Spheres could touch sides of beaker</p> <p>OR</p> <p>not completely be in contact with HCl</p> <p>OR</p> <p>the beakers were not shaken during the experiment which would decrease the diffusion gradient and slow the rate of diffusion as the experiment progresses;</p> <p>2. End point difficult to judge/difficult to distinguish red and orange OR difficult to see into centre of agar;</p> <p>3. Difficult to cut agar precisely OR make perfect sphere;</p> <p>4. Concentration of HCl could vary/change;</p> <p>5. Temperature could vary/change;</p>	2 max	<p>4. Allow has not been controlled/kept the same</p> <p>4. Allow pH could vary/change</p> <p>5. Allow has not been controlled/kept the same</p>

Question	Marking guidance	Mark	Comments
05.4	<p>1. Cells can be different shapes;</p> <p>2. Cells have cell (surface) membrane OR organelles OR cell wall;</p> <p>3. Processes in cells maintain a concentration gradient;</p> <p>4. Cells are smaller than the spheres;</p> <p>5. Cytoplasm etc may be more viscous than agar;</p>	2 max	<p>2. Allow reference to proteins in the cell membranes</p> <p>2. Ignore references to active transport</p> <p>3. Allow substances can be used in living cells</p> <p>4. Allow cells have larger SA:Vol</p> <p>Ignore agar is not alive unless reason other than just diffusion given</p>

Question	Marking guidance	Mark	Comments
<p>05.5</p>	<p>1. Large organisms have a low surface area to volume ratio OR long diffusion distances for transport; 2. (Low SA:Vol means) slow diffusion OR uptake OR absorption (of oxygen) OR Slow rate of diffusion;</p>	<p>2</p>	<p>1. Allow higher metabolic rate / more ATP / more energy needed 1. Ignore need more oxygen / more respiration 2. Allow the converse e.g. adaptations increase the rate of diffusion OR uptake of oxygen OR increase the surface area</p>

Question	Marking guidance	Mark	Comments
<p>05.6</p>	<p>Specialist gaseous exchange surface feature qualified e.g. Many capillaries/good blood supply Circulatory system Ventilation system Many alveoli/alveoli with increase surface area Alveoli with thin walls to decrease diffusion distance Many gill filaments Oxygen transport via haemoglobin</p>	<p>1</p>	<p>Allow any other relevant examples involving specialist gas exchange systems</p>

Question	Marking guidance	Mark	Comments
06.1	<u>Intraspecific</u> (variation);	1	Reject interspecific

Question	Marking guidance	Mark	Comments
06.2	1.(different) genetic factors; 2.(different) environmental factors; 3.(different) combination of genetic and environmental factors;	1	Allow appropriate examples e.g. mutation, crossing over, random fertilisation, sunlight, diet etc

Question	Marking guidance	Mark	Comments
06.3	1.SD is spread of (67% of the) data around the mean; 2. Range is difference between highest and lowest values OR range could include anomalies/outliers/extreme values;	2	1. Allow variation around the mean 1. Must contain the idea of data on either side of the mean

Question	Marking guidance	Mark	Comments
06.4	<p>For:</p> <ol style="list-style-type: none"> 1. Difference (in mean delay time) between D and B/C may be significant/not due to chance/real (because) no overlap in standard deviations (between D and B/C); 2. Mean of D is a higher than all of the four other species; 3. Parrots all the same age/sex so can make a valid comparison/idea or controlling variables; <p>Against:</p> <ol style="list-style-type: none"> 4. No significant difference (in mean delay time) between D and A (because) overlap in standard deviations; 5. Sample size is small so may not be representative; 6. Parrots all the same age/sex so may not apply to all parrots; 7. Species D has a large SD OR large variation (so mean unreliable); 8. Only 4 species of parrot so not representative of all parrots; 9. No statistical test performed; 	4 max	For full marks must have points from both for and against <ol style="list-style-type: none"> 1. Allow no overlap in <u>error</u> bars 4. Allow overlap in <u>error</u> bars 5. Sample size is small so that variation may be just due to chance 7. Ignore idea that A also has large SD

Question	Marking guidance	Mark	Comments
07.1	Camouflaged OR inaccessible in trees;	1	Allow idea of looking like leaves if qualified Ignore ref to speed/size/rarity

Question	Marking guidance	Mark	Comments
07.2	<ul style="list-style-type: none"> • Domain • Kingdom • Phylum • Class • Order 	2	1 mark for 3 or 4 correct, in any sequence

Question	Marking guidance	Mark	Comments
07.3	Different morphology/behaviour/eq;	1	Allow they are a different shape/have different physical characteristics etc Ignore size

Question	Marking guidance	Mark	Comments
07.4	They must be the same species if their offspring is fertile;	1	Allow converse e.g. if they don't produce fertile offspring they are not the same species

Question	Marking guidance	Mark	Comments
07.5	Share (more) recent common ancestor (than with <i>Phyllium</i>) OR more closely related with other members of Nanophyllum;	1	

Question	Marking guidance	Mark	Comments
07.6	Binomial;	1	Allow Linnaean

Question	Marking guidance	Mark	Comments
07.7	1. <u>DNA</u> hybridisation; 2. Compare/sequence (of) mRNA/mRNA sequencing; 3. Compare/sequence (of) amino acid/amino acid sequencing (of encoded proteins); 4. Immunological features/test/comparison; 5. Ecological <u>niche</u> ; 6. Courtship behaviour/displays; 7. Morphology;	3 max	4. Immunology 4. Allow description 7. Ignore colour/size/shape