

INTERNATIONAL AS BIOLOGY (9610) BL01

Unit 1 The Diversity of Living Organisms

Mark scheme

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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

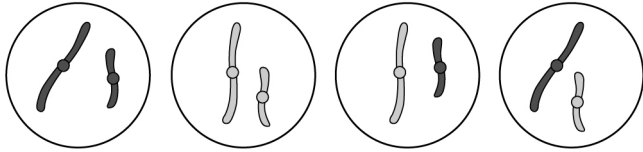
Ignore or insufficient is used when the information given is irrelevant to the question or not enough to gain the marking point. Any further correct amplification could gain the marking point.

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	1. Has same genes at the same loci; 2. Chromosomes that are the same size/shape;	2	

Question	Marking guidance	Mark	Comments
01.2	1. Independent segregation (of homologous chromosomes); 2. Random fusion of (haploid) gametes; 3. Mutation;	2	1. Allow 'random' for 'independent' 1. Allow 'assortment' for 'segregation' 2. Allow random fertilisation 3. Allow example of a mutagen

Question	Marking guidance	Mark	Comments
01.3	(Figure 1) has gone through (DNA) replication/s-phase OR (Figure 1) the chromatids have not separated yet OR The cell in Figure 2 is not dividing;	1	Allow idea of not doing meiosis

Question	Marking guidance	Mark	Comments
01.4	<p>All 4 possible outcomes are shown;;</p> 	2	Allow one mark for one large and one small chromosome in each cell/gamete

Question	Marking guidance	Mark	Comments
01.5	<p>1. Halves the chromosome number;</p> <p>2. Diploid number is restored at fertilisation</p> <p>OR</p> <p>Prevents the chromosome number doubling;</p>	2	<p>Allow idea of variation in offspring affects survival</p> <p>1. Allow creates haploid cells</p> <p>2. Allow 'normal/original/usual' etc for diploid</p>

Question	Marking guidance	Mark	Comments
02.1	<p>1. Breaks the hydrogen bonds;</p> <p>2. One DNA strand acts as a template;</p> <p>3. (Free) (RNA) nucleotides attach to the DNA strand;</p> <p>4. By complementary base pairing;</p> <p>5. Uracil pairs with adenine and guanine pairs with cytosine;</p> <p>6. RNA polymerase;</p> <p>7. Forms bonds between</p> <p>OR</p> <p>joins adjacent nucleotides;</p>	5 max	<p>1. Do not allow hydrolysis of hydrogen bonds</p> <p>1. Allow separates the strands</p> <p>1. Allow use of DNA helicase or RNA polymerase to break H bonds</p> <p>3. Allow nucleotides join/line up with.</p> <p>3. Ignore 'attracted to'</p> <p>7. Do not allow reference to hydrogen bonds or complementary base pairings</p> <p>7. Allow forms phosphodiester bonds</p>

Question	Marking guidance	Mark	Comments
02.2	1. To remove introns; 2. Would cause non-functional proteins;	2	1. Allow non-coding sequence for intron 2. Allow so that no incorrect amino acids are included

Question	Marking guidance	Mark	Comments
02.3	1. TAC; 2. UAC;	2	

Question	Marking guidance	Mark	Comments
02.4	In any order: Ribose; Phosphate (group);	2	Allow phosphoric acid

Question	Marking guidance	Mark	Comments
02.5	Methionine, asparagine, serine;	2	Allow any order for two marks Allow one mark for two correct amino acids

Question	Marking guidance	Mark	Comments
03.1	(Cut) away from oneself OR (Downwards) onto a tile/hard surface;	1	

Question	Marking guidance	Mark	Comments
03.2	D = 1.5 : 1;;	2	Allow one mark for 96 and 64 Allow one mark for 6/4 or 3/2

Question	Marking guidance	Mark	Comments
03.3	Any three from: 1. Concentration of agar; 2. Concentration of acid; 3. Concentration/volume of phenolphthalein; 4. (Same) temperature;	3 max	Do not allow size/volume of cube 1. Allow using the same agar preparation 2. Allow pH of acid 3. Ignore amount

Question	Marking guidance	Mark	Comments
03.4	Any two from: 1. Units should only be in the column heading; 2. All values should be to same decimal place; 3. Column headings should be informative;	2 max	2. Ignore ref to significant figures

Question	Marking guidance	Mark	Comments
03.5	1597(s);	1	Allow correct answer if given in the table

Question	Marking guidance	Mark	Comments
03.6	1. The change in colour is subjective; 2. Use a colour standard OR colour chart;	2	1. Allow the end point is difficult to see 2. Allow doing it in front of a white background 2. Allow colorimeter

Question	Marking guidance	Mark	Comments
04.1	<p>1. All organisms respire</p> <p>OR</p> <p>All/most have cytochrome c;</p> <p>2. (The amino acid sequence of) cytochrome c varies between species/genera</p> <p>OR</p> <p>Members of same species/genus have same/similar (sequences of amino acids in) cytochrome c</p> <p>OR</p> <p>Differences (in the sequence) can be used to estimate how long-ago species/genera shared a common ancestor</p> <p>OR</p> <p>The greater the difference (in amino acid sequence), the less likely insects are to be the same species/genus/converse;</p>	2	2.Allow correct reference to relatedness instead of classification

Question	Marking guidance	Mark	Comments
04.2	<p>1. (DNA/gene) has longer base sequence than the amino acid sequence</p> <p>OR</p> <p>DNA/gene contains introns;</p> <p>2. Same amino acid may be coded for by different triplets</p> <p>OR</p> <p>genetic code is degenerate;</p>	2	<p>1. Allow the DNA contains non-coding regions</p> <p>2. Allow codons</p>

Question	Marking guidance	Mark	Comments
04.3	<p>1. Difficult to catch all the insects</p> <p>OR</p> <p>Insects can move (up/down) river</p> <p>OR</p> <p>Idea of not enough time to count all the insects</p> <p>OR</p> <p>Too many insects to catch them all;</p>	1	<p>Allow examples eg insects under rocks /in plants</p> <p>Ignore sample size is too small</p>

Question	Marking guidance	Mark	Comments
04.4	Nectopsyche exquisita and Nectopsyche candida	1	Allow <i>N. exquisita</i> and <i>N. candida</i>

Question	Marking guidance	Mark	Comments
04.5	Correct answer 3.28 = 2 marks ;; Answer of 0.3 = 1 mark OR Evidence of 452 = 1 mark	2	Allow 3 or 3.3 or 3.278

Question	Marking guidance	Mark	Comments
04.6	1. 300 m and 600 m have the same (number of different) species present; 2. (But) 300 m has fewer individuals in (most) species; 3. 300 m has one dominant species/unequal distribution;	3	1. Allow both have 9 species present 3. Allow 300m has a lower species evenness/relative abundance

Question	Marking guidance	Mark	Comments
04.7	As heavy metal ion concentration decreases, the index of diversity increases;	1	Ignore 'there is a negative correlation' unqualified

Question	Marking guidance	Mark	Comments
04.8	<p>1. Bind to the active site and so substrate can't bind</p> <p>OR</p> <p>Change the shape of the active site and so substrate can't bind</p> <p>OR</p> <p>Act as a competitive inhibitor</p> <p>OR</p> <p>Act as a non-competitive inhibitor;</p> <p>2. Heavy metal ions causes death/decreased reproduction of some species more than others (hence the change in biodiversity);</p>	2	<p>2. Allow general idea of death/decreased reproduction of organisms/species</p> <p>2. Ignore reference to population decreasing unqualified</p>

Question	Marking guidance	Mark	Comments
04.9	<p>Any two from:</p> <p>1. Heat pollution from factory waste;</p> <p>2. Sewage/organic waste;</p> <p>3. Fertilisers/named ions;</p> <p>4. Toxic waste/named example eg cyanide / chromium;</p> <p>5. Overfishing;</p> <p>6. Dredging/physical destruction of habitat;</p> <p>7. Introduction of non-native species;</p>	2 max	<p>3. Allow eutrophication</p> <p>4. Ignore pollution/waste/rubbish unqualified</p> <p>4. Allow acid rain</p> <p>6. Allow building dams</p>

Question	Marking guidance	Mark	Comments
05.1	Using water to break (a chemical bond within) a molecule;	1	Do not allow break a H bond Allow insertion/addition of water to break a (covalent) bond

Question	Marking guidance	Mark	Comments
05.2	110–440;	1	Allow 331 or 330

Question	Marking guidance	Mark	Comments
05.3	1. pH kept constant using a buffer; 2. Temperature kept constant using a water bath; 3. Volume of DNase kept constant using a measuring cylinder/pipette; 4. Reactivity of enzyme kept constant by using the same batch of enzyme; 5. Light intensity by using the same instrument/colorimeter/bulb	2 max	Allow for one mark 2 correct variables but no description 2. Allow description using a thermometer 3. Ignore concentration 5.Allow idea of maintaining set distance from light source 5.Allow reference to zeroing/calibrating colorimeter

Question	Marking guidance	Mark	Comments
05.4	Any two from: 1.To calculate a reliable mean; 2. To identify anomalies OR reduce the effect of anomalies; 3. To allow a statistical test;	2	1. Allow repeatable/representative/valid mean 1. Ignore calculate an accurate mean 2. Ignore eliminates anomalies

Question	Marking guidance	Mark	Comments
05.5	0.6;	1	

Question	Marking guidance	Mark	Comments
05.6	1. Initial rate is maximum rate OR mean rate would be slower; 2. (Eventually) substrate level becomes the limiting factor OR Substrate starts to run out OR Substate decreases;	2	Allow converse For two marks allow 'rate decreases as substrate is used up/decreases

Question	Marking guidance	Mark	Comments
05.7	<p>1. Increases at first because more enzyme-substrate complexes formed</p> <p>OR</p> <p>More active sites occupied;</p> <p>2. Levels off because all enzyme molecules involved in enzyme-substrate complexes (at a given time)</p> <p>OR</p> <p>Levels off because no free active sites (at a given time)</p> <p>OR</p> <p>Levels off because enzyme (concentration) is limiting factor;</p>	2	<p>1. Allow idea of substrate/DNA being the limiting factor</p> <p>2. Do not allow enzymes are used up</p>

Question	Marking guidance	Mark	Comments
05.8	<p>1. RNA is not complementary to the <u>active site</u>;</p> <p>2. Due to different pentose sugar;</p>	2	<p>1. Allow RNA doesn't fit <u>active site</u></p> <p>2. Allow because it contains uracil (not thymine)</p> <p>Ignore because it is single stranded</p>

Question	Marking guidance	Mark	Comments
05.9	<p>1. DNA used in experiment was single stranded</p> <p>OR</p> <p>DNA in cells is double stranded;</p> <p>2. The DNA used in the experiment was 440 bases long and DNA in cells is longer;</p> <p>3. DNA/DNase concentration could be lower in a cell;</p> <p>4. Temperature might lower/not optimal in a cell;</p> <p>5. pH might not be optimal</p> <p>6. The DNA in the experiment is not joined to histones;</p> <p>7. Other molecules interfere with the DNA;</p> <p>8. DNase made in cytoplasm but DNA found in nucleus;</p>	3 max	<p>5. Allow pH might be different in a cell</p>

Question	Marking guidance	Mark	Comments
06.1	1. Many lamellae/filaments so a large surface area; 2. Thin lamellae/walls of capillaries so a short <u>diffusion</u> pathway/distance; 3. Many capillaries so large surface area; 4. Water/blood flow so maintains a concentration gradient;	3 max	4. Allow reference to counter-current flow for maintaining the gradient over the whole length of the lamella 4. Allow reference to maximising concentration gradients

Question	Marking guidance	Mark	Comments
06.2	1. Increased kinetic energy; 2. More (successful) collisions OR More E-S complex made;	2	1. Allow idea of molecules moving faster 2. Ignore faster enzyme rate

Question	Marking guidance	Mark	Comments
06.3	1. (Lower concentration gradient so) slower rate of diffusion (into fish); 2. Less respiration/ATP/energy available to build polymers/biomass/tissues OR . Less respiration/ATP/energy for cell division;	2	2. Ignore growth

Question	Marking guidance	Mark	Comments
06.4	1. Fish being caught before they reproduce so decrease in population numbers; 2. (Idea of) effect of fewer fish on ecosystem;	2	1. Allow idea of being able to trap other small species 2. Allow fewer fish so less food for other species/organisms 2. Allow fewer fish so some species less predated on (by the fish and increase in numbers) 2. Allow less fish to feed on predators of other species so more predation (fewer of the other species)

Question	Marking guidance	Mark	Comments
06.5	(Idea of) catch fewer fish OR (Idea of) protecting breeding grounds/season;	1	