

OXFORD AQA

INTERNATIONAL QUALIFICATIONS

INTERNATIONAL A-LEVEL **BIOLOGY (9610)**

BL03

Unit 3 Populations and Genes

Mark scheme

June 2025

Version: 1.0 Final



2 5 6 X B L 0 3 / 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	Glycolysis	1	

Question	Marking guidance	Mark	Comments															
01.2	<table border="1"> <thead> <tr> <th>Molecules each stage produces or uses</th> <th>Stage 1 Glucose → Pyruvate</th> <th>Stage 2 Pyruvate → Ethanol</th> </tr> </thead> <tbody> <tr> <td>Produces reduced NAD</td> <td>✓</td> <td></td> </tr> <tr> <td>Uses reduced NAD</td> <td></td> <td>✓</td> </tr> <tr> <td>Produces ATP</td> <td>✓</td> <td></td> </tr> <tr> <td>Uses ATP</td> <td>✓</td> <td></td> </tr> </tbody> </table>	Molecules each stage produces or uses	Stage 1 Glucose → Pyruvate	Stage 2 Pyruvate → Ethanol	Produces reduced NAD	✓		Uses reduced NAD		✓	Produces ATP	✓		Uses ATP	✓		2	2 or 3 correct rows = 1 mark
	Molecules each stage produces or uses	Stage 1 Glucose → Pyruvate	Stage 2 Pyruvate → Ethanol															
	Produces reduced NAD	✓																
	Uses reduced NAD		✓															
	Produces ATP	✓																
Uses ATP	✓																	

Question	Marking guidance	Mark	Comments
01.3	1. NAD is regenerated; 2. Glycolysis/Stage 1 continues; 3. ATP can still be produced (from glycolysis);	3	3. Do not allow energy produced

Question	Marking guidance	Mark	Comments
01.4	1. (Ethanol produced in yeast and) lactate/lactic acid in muscle; 2. Carbon dioxide not produced in muscle;	2	

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Question	Marking guidance	Mark	Comments
02.1	1. (Pigments) absorb light and electrons excited; 2. (Energy from excited electrons) used to generate ATP OR (Energy from excited electrons) used for photophosphorylation OR (Electrons) used to reduce NADP;	2	2. Do not allow energy generated/produced Allow electrons used to produce NADPH Do not allow NAD or NADH

Question	Marking guidance	Mark	Comments
02.2	1. Protons for reduction (of NADP) OR Protons to produce ATP; 2. Electrons to (replace those lost from) pigment OR Electrons to electron transfer chain OR Electrons to produce ATP;	2	1. Do not allow NAD Allow for one mark provides protons and electrons if neither marking point awarded

Question	Marking guidance	Mark	Comments
02.3	Sulfur/S;	1	Allow S ₂

Question	Marking guidance	Mark	Comments
02.4	1. (Absorb different wavelengths so) not competing for light; 2. (So) both can photosynthesise OR Idea that both can survive (in same habitat);	2	

Question	Marking guidance	Mark	Comments
03.1	Less competition for named resource OR Less damage to plants (from pathogens/pests) so increased growth/photosynthesis;	1	Named resource eg light, water, minerals/named mineral

Question	Marking guidance	Mark	Comments
03.2	<p>Advantages:</p> <ol style="list-style-type: none"> 1. Predatory mites specific to red mites; 2. (Predatory mites reproduce so) less pesticide needed or no need to reapply; 3. No resistance to pesticide develops; 4. Environmental benefits eg no accumulation of chemicals; 5. Less plant disease so higher yield <p>OR</p> <p>Less damage to crop so higher yield;</p> <p>Disadvantages:</p> <ol style="list-style-type: none"> 6. May take longer (to control red mites than using pesticide); 7. Predatory mites may become pests <p>OR</p> <p>Predatory mites have no natural predator</p> <p>OR</p> <p>Predatory mites may disrupt food chain;</p> <ol style="list-style-type: none"> 8. No information comparing cost of intercropping versus using chemicals; 9. Allelopathic plants compete with trees for other (named) resources <p>OR</p> <p>Allelochemicals might inhibit growth of crop</p> <p>OR</p> <p>Allelochemicals might attract other species that feed on fruit trees;</p>	3 max	Must have at least one advantage and one disadvantage for max marks

Question	Marking guidance	Mark	Comments
03.3	1. W has no significant effect; 2. X significantly increases (mean) seedling length; 3. Y and Z both significantly decrease (mean) seedling length; OR Z decreases seedling length significantly more than Y ; 4. (Idea of) non overlapping error bars to show significant difference OR overlapping error bars to show no significant difference;	4	Allow max two marks if significance not referred to in marking points 1 - 3 4. Do not allow 'results significant'

Question	Marking guidance	Mark	Comments
03.4	Any one from: 1. Cost of (allelopathic) plants OR number of (allelopathic) plants needed OR effect on yield (from not growing crop in whole field); 2. If plant works outside (as only tested in lab); 3. If intercropping works on pests (of crop) OR if chemicals attract other pests; 4. Effect of using (allelopathic) plant for longer time (as only tested for one week); 5. If it works on other crops (as only tested on lettuce); 6. Safety/toxicity of chemicals (produced by plant);	1	

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Question	Marking guidance	Mark	Comments
04.1	Aa;	1	

Question	Marking guidance	Mark	Comments
04.2	<p>1. Individuals 3 and 4 (with VWD) have 8/child without VWD</p> <p>OR</p> <p>If recessive, then all offspring of individuals 3 and 4 would have VWD;</p> <p>2. Both parents must also have the recessive allele</p> <p>OR</p> <p>Both parents are heterozygous;</p>	2	2. Ignore carriers

Question	Marking guidance	Mark	Comments
04.3	<p>1. Individual 1 (with VWD) has 6/daughter without VWD;</p> <p>2. If X-linked, 1 passes (allele) on X chromosome to 6;</p> <p>OR</p> <p>3. Individual 2 (without VWD) has 5/son with VWD;</p> <p>4. If X-linked, 2 passes (allele) on X chromosome to 5;</p> <p>OR</p> <p>5. Individual 1 (with VWD) has 5/son with VWD;</p> <p>6. If X-linked, 1 would not pass (allele) on X chromosome to 5</p> <p>or 1 passes Y chromosome to 5;</p>	2 max	Mark as pairs 1 and 2 OR 3 and 4 OR 5 and 6

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Question	Marking guidance	Mark	Comments
04.4	1. Parent genotypes (aa and Aa) and correctly derived offspring genotypes; 2. Offspring phenotypes and ratio 1 VWD : 1 normal levels of VWF;	2	1. Ignore X and Y chromosomes 2. Ignore sex of offspring

Question	Marking guidance	Mark	Comments
04.5	$2.7(0912) \times 10^6$;;;	3	Allow correct answer to any number of decimal places eg $2.71 \times 10^6 = 3$ marks $2\ 709\ 120 = 2$ marks (correct answer not in standard form) $1.36 \times 10^6 = 2$ marks (1 - 0.004 used as q^2) 0.007968 or $7.968 \times 10^{-3} = 1$ mark (2pq) 2pq identified as heterozygotes = 1 mark

Question	Marking guidance	Mark	Comments
04.6	<p>Might apply</p> <p>1. Large population;</p> <p>Might not apply</p> <p>2. Mutations arise</p> <p>OR</p> <p>Population is not isolated</p> <p>OR</p> <p>There is allele flow into/out of the population</p> <p>OR</p> <p>Selection occurs</p> <p>OR</p> <p>Selective disadvantage</p> <p>OR</p> <p>Mating is not random;</p>	2	

Question	Marking guidance	Mark	Comments
04.7	<p>Change to structure of VWF</p> <p>OR</p> <p>Mutation (in gene for VWF)</p> <p>OR</p> <p>Immune system destroys VWF;</p>	1	

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Question	Marking guidance	Mark	Comments
05.1	1. Bubbles not caught (in leaves); 2. To see bubbles rising to surface;	2	

Question	Marking guidance	Mark	Comments
05.2	1. (So) rates of photosynthesis at different light intensities can be compared; 2. Higher concentration of hydrogen carbonate, then higher rate of photosynthesis or more bubbles produced; 3. Longer piece of pondweed then more leaves/cells/chloroplasts and more bubbles produced;	3	2. and 3. Allow converse

Question	Marking guidance	Mark	Comments
05.3	Any two from: <ul style="list-style-type: none"> • Bubbles do not only contain oxygen • Some oxygen dissolves in water or is used in respiration • Size of bubbles varies • Bubbles may be too fast/small to count • Heat from lamp changes temperature • Student needs to allow time for pondweed to equilibrate;; 	2	

Question	Marking guidance	Mark	Comments
05.4	1. Add unit (for distance in column heading); 2. Record data to a consistent number of decimal places;	2	

Question	Marking guidance	Mark	Comments
05.5	1. Suitable scale and axes labelled; 2. All points plotted correctly; 3. Line of best fit;	3	x-axis: Relative light intensity / m^{-2} or $1/d^2 / \text{m}^{-2}$ y-axis: Mean number of bubbles in 1 minute or Mean number of bubbles per minute 2. Allow a tolerance of $\pm \frac{1}{2}$ small square 3. Do not allow point to point 3. Ignore extrapolation to 0

Question	Marking guidance	Mark	Comments
05.6	1. Light intensity is limiting factor up to 44; 2. Another (named) factor limiting between 44 and 100;	2	

Question	Marking guidance	Mark	Comments
05.7	Spearman (rank) and looking for correlation/relationship;	1	Allow other named correlation test eg Pearson

Question	Marking guidance	Mark	Comments
06.1	<p>1. Leaching causes increased concentration of nitrates/phosphates from chicken waste;</p> <p>2. (Green colour due to increased) growth of algae/plants</p> <p>OR</p> <p>(Green colour due to) algal bloom;</p>	2	<p>1. Allow 'run-off' for leaching</p> <p>1. Allow 'eutrophication' for increased concentration of nitrates/phosphates</p> <p>1. Allow other nitrogen-containing compounds eg ammonium ions</p>

Question	Marking guidance	Mark	Comments
06.2	<p>414 960</p> <p>OR</p> <p>4.1496×10^5;;</p>	2	<p>419 109 / 419 110 / 419 109.6 = 1 mark (used 10.1 flocks per year)</p> <p>420 723 = 1 mark (used 10.138... flocks per year)</p> <p>41496 = 1 mark (number of chickens in barn per flock)</p> <p>21840 / 22058 = 1 mark (number of flocks per year x area of barn)</p>

Question	Marking guidance	Mark	Comments
06.3	<ol style="list-style-type: none"> 1. Standard indoor and/or fast-growing breed can produce more chickens per year; 2. More food with slow-growing; 3. (3.5 times) more cannot walk properly than slow-growing; 4. Worse quality of life for fast-growing as less space; 5. More deaths in fast-growing than slow-growing; 6. Standard indoor less movement so less energy loss; 7. No information about start-up cost or selling price; 	4 max	Allow converse for marking points 1 – 5

Question	Marking guidance	Mark	Comments
07.1	1. (Initial colonisation by) pioneer species; 2. (Pioneer species) change the environment/abiotic factors/conditions; 3. (Environment becomes) less hostile for new species OR more suitable for new species OR less suitable for previous species; 4. Pioneer/previous species outcompeted; 5. (Change to environment causes) increase in biodiversity; 6. (To) <u>climax community</u> ;	5 max	1. Allow correct examples of pioneer species eg lichen 2. Allow example of change eg forms soil/humus/organic matter

Question	Marking guidance	Mark	Comments
07.2	<p>Abiotic:</p> <ol style="list-style-type: none"> 1. Temperature – increased metabolic rate; 2. Light – greater rate of photosynthesis; 3. pH – closer to optimum for enzymes; 4. Water availability – used for eg photosynthesis; 5. Named ions/nitrates/phosphates – used for synthesis of biological molecules for plant growth; <p>Biotic:</p> <ol style="list-style-type: none"> 6. Less (inter/intraspecific) competition – more resources; 7. Less predation/hunting – more survive (to reproduce) 8. Less/no pathogens/parasites – more survive (to reproduce); 9. More pollination/seed dispersal by animals – more offspring; 10. More food available – more survive (to reproduce); 	6 max	

Question	Marking guidance	Mark	Comments
07.3	1. Variation due to mutations OR Mutation leads to new alleles; 2. Selection pressures (from environment); 3. (Organisms with selective advantage) more likely to survive and reproduce; 4. (Survivors) pass on favourable alleles OR frequency of favourable alleles increases/changes;	4	2. Allow example of selection pressure eg predation, disease, competition for resources