AQA

AS
BIOLOGY
7401/1

Paper 1

Mark scheme

June 2024

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 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.

No student should be disadvantaged on the basis of their gender identity and/or how they refer to the gender identity of others in their exam responses.

A consistent use of 'they/them' as a singular and pronouns beyond 'she/her' or 'he/him' will be credited in exam responses in line with existing mark scheme criteria.

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

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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 total marks available for 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 or, in discursive answers, to give an overview of the area in which a mark or marks may be awarded.

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 <u>not</u> 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.

<table>
<tr><th>Question</th><th>Marking Guidance</th><th>Mark</th><th>Comments</th></tr>
<tr><td>01.1</td><td>1. (A) Trachea;
2. (B) <u>External</u> intercostal (muscle);</td><td>2
(2 x AO1)</td><td>1. Accept cartilage</td></tr>
<tr><th>Question</th><th>Marking Guidance</th><th>Mark</th><th>Comments</th></tr>
<tr><td>01.2</td><td>3 correct = 2 marks;;
2 correct = 1 mark;
1 correct = 0 marks
<table>
<tr><th>Box</th><th>Statement</th></tr>
<tr><td>F</td><td>represents the diffusion of oxygen</td></tr>
<tr><td>D</td><td>represents the transport of a gas mixture</td></tr>
<tr><td>C</td><td>represents blood moving at the highest pressure</td></tr>
</table></td><td>2
(2 x AO1)</td><td></td></tr>
<tr><th>Question</th><th>Marking Guidance</th><th>Mark</th><th>Comments</th></tr>
<tr><td>01.3</td><td>1. (Epithelium is) single cell layer
OR
(Epithelium contains) thin/flat cells
OR
Epithelium is thin;
2. (So) short diffusion pathway/distance;</td><td>2
(2 x AO1)</td><td>Ignore reference to surface area
1. Accept one cell thick
1. Accept “has squamous epithelium”</td></tr>
</table>

<table>
<tr><th>Question</th><th>Marking Guidance</th><th>Mark</th><th>Comments</th></tr>
<tr><td>02.1</td><td>1. Amylase;
2. Glycosidic;
3. Peptide;
4. Amino acid(s);
<table><tr><th>Biological molecule</th><th>Enzyme</th><th>Name of bond hydrolysed</th><th>Product of digestion</th></tr><tr><td></td><td>Amylase</td><td>Glycosidic</td><td></td></tr><tr><td></td><td></td><td>Peptide</td><td>Amino acid(s)</td></tr></table></td><td>4
(4 x AO1)</td><td>3. Reject dipeptide/ polypeptide bond</td></tr>
<tr><th>Question</th><th>Marking Guidance</th><th>Mark</th><th>Comments</th></tr>
<tr><td>02.2</td><td>1. Add biuret (solution);
2. Purple (colour produced);</td><td>2
(2 x AO1)</td><td>1. Reject burette or Beirut
1. Reject heat
1. Accept a description of the biuret test: eg copper sulfate and sodium hydroxide or $CuSO_4$ + NaOH or alkaline copper sulfate
2. Accept lilac/violet/mauve for purple</td></tr>
<tr><th>Question</th><th>Marking Guidance</th><th>Mark</th><th>Comments</th></tr>
<tr><td>02.3</td><td>1. (Positive because) enzymes are protein;
2. (Because) enzymes not used up (in reactions)
OR
(Because) enzymes still present;</td><td>2
(2 x AO2)</td><td>Accept correct answer in any order
2. Accept enzymes reused for enzymes not used up
2. Presence of enzyme after reaction must be implied</td></tr>
</table>

Question	Marking Guidance	Mark	Comments
02.4	Correct answer of 1.30 = **2 marks**;; Evidence of correct rearranged equation, for example Maximum rate of reaction = k_{cat} *x* Enzyme concentration= **1 mark** **OR** Evidence of 1 or 1.298 or 1.29 or 1.3 (correct answer but incorrect significant figures) = **1 mark;**	2 (2 x AO2)	

Question	Marking Guidance	Mark	Comments
03.1	1. (Virus) attachment protein attaches to (cell) receptors; 2. (Viral) nucleic acid enters into cell; 3. (Viral) nucleic acid replicated (in cell) **OR** (Viral) reverse transcriptase produces DNA from RNA; 4. (Viral) protein is produced; 5. (Viral components) assembled and released (from cell);	4 max (4 x AO1)	2. and 3. Accept DNA or RNA or genetic material for nucleic acid 2. and 3. Ignore genetic information 2. Accept inserted or injected or 'taken up by' or 'moves into' or 'released into' for enters 4. Accept capsid or capsomere for protein

Question	Marking Guidance	Mark	Comments
03.2	Virus (replication has) killed bacteria/cells (in clear zones);	1 (1 x AO2)	Accept lysed or destroyed or burst for killed

Question	Marking Guidance	Mark	Comments
03.3	Clear zones increase (in size) **OR** More clear zones (form) **OR** Clear zones merge **OR** One big clear zone;	1 (1 x AO2)	Accept area for zone Ignore references to cloudiness

Question	Marking Guidance	Mark	Comments
03.4	1. Cytokinesis **OR** Telophase; 2. Division of cytoplasm **OR** Pinching of cell(-surface) membrane **OR** New cell(-surface) membrane forming **OR** Chromosomes are not visible;	2 (2 x AO1)	1. Ignore mitosis 2. Ignore reference to nucleus/nuclei or any named organelle 2. Accept separating or splitting for division 2. Accept a description of pinching eg inward movement of cell membrane 2. Accept chromosomes are not condensed or uncondensed or less distinct or long and thin or uncoiled for not visible

<table>
<tr><th>Question</th><th>Marking Guidance</th><th>Mark</th><th>Comments</th></tr>
<tr><td>04.1</td><td>1, 2 and 3. Mark in rows;;;

<table>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td>Prokaryote cell</td><td>Nucleus</td><td>Chloroplast</td></tr>
<tr><td></td><td>✓</td><td></td><td>✓</td></tr>
<tr><td></td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td></td><td></td><td>✓</td><td></td></tr>
</table></td><td>3
(3 x AO1)</td><td></td></tr>
</table>

<table>
<tr><th>Question</th><th>Marking Guidance</th><th>Mark</th><th>Comments</th></tr>
<tr><td>04.2</td><td>1. and 2. Correct calculated answer of 20(%) = 2 marks;;

1. and 2. incorrect calculated answer but evidence of 0.72 / 720 000 and 0.18 / 180 000(correct readings from the Figure) = 1 mark

OR

0.9 / 900 000 (correct total number of deaths) = 1 mark

OR

Correct calculation using incorrect graph readings = 1 mark

OR

0.2 (correct answer but not expressed as a percentage) = 1 mark;

(Incorrect mathematics step)

3. Used 0.72 not 0.9 (as denominator)

OR

0.9 was not the denominator

OR

0.72 was the denominator = 1 mark;</td><td>3
(3 x AO3)</td><td>3. Accept used 0.72 if 0.9 is also shown as the denominator in the calculation

3. Accept divided by for denominator

3. Accept the incorrect calculation shown e.g. 0.18 ÷ 0.72

3. Accept description of incorrect method e.g. ‘The associated not the total is used’</td></tr>
</table>

Question	Marking Guidance	Mark	Comments
04.3	Vaccinate more people to reach herd immunity against bacteria that cause diseases common in human populations.	1 (1 x AO3)	

05.1	1. Use a grid **OR** Divide area into squares/sections/plots; 2. Method of obtaining random coordinates/numbers; 3. Use same method of measurement (of the plants each time); 4. Repeat a large number of times **OR** Measure a large number of plants; 5. (Find the) sum of heights and divide by number of plants; 6. Calculate a running mean until number becomes (fairly) constant;	5 max (5 x AO1)	1. Accept use tape measures for 'use a grid' 2. Accept calculator/computer/ random numbers table/generator for method 3. Accept descriptions of measurements eg from soil/ground to highest leaf or to top of plant or to (shoot) tip or to highest part/bit 4. Accept ≥ 10 for large number 4. Accept many/multiple but ignore several 5. Accept total for sum 5. Accept measurements for heights or plants 5. Accept a word equation eg $\frac{\textit{Height total}}{\textit{Number of plants}}$

Question	Marking Guidance	Mark	Comments
05.2	1. Plant height **and** /cm in first column **and** Frequency (density), in second column; 2. Non-overlapping class intervals between 60 and 120; eg 60 ≤ × < 70 **OR** 60 – 69, 70 – 79 etc **OR** 60 – 69.9, 70 – 79.9 etc **OR** 59.5 – 69.0, 69.5 – 79 etc	2 (2 x AO2)	1. Accept *M. sylvestris* for plant 1. Accept length for height 1. Accept mm or m for cm 1. Accept number for frequency 2. Accept unequal class widths if frequency density used in heading 2. Accept correct figures in either column 2. Figures given must match units in heading, eg 600 if heading shows / mm or 0.6 if heading shows /m 2. Accept fewer or more than 6 rows of data **if** data covers a range between 60 and 120 2. Ignore any numbers in the frequency column

Question	Marking Guidance	Mark	Comments
05.3	Correct answer of 2.11 = **2 marks;;** Incorrect answer that shows correct total in numerator 1561250 = **1 mark** **OR** Correct total in denominator 741250 = **1 mark;**	2 (2 x AO1)	For 2 marks, accept 2.1(0623946) or any correct rounding eg 2.1 or 2.106 etc

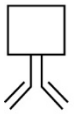
Question	Marking Guidance	Mark	Comments
05.4	(In relation to wild flower fields) 1. More **plant** species **OR** Larger **plant** (index of bio)diversity; 2. (So) more variety of food/nectar/pollen **OR** (So) more (types of) habitat/niche **OR** (So) more/better protection from predators;	2 (2 x AO2)	Accept the converse in the context of wheat fields 1. Accept more types/variety of plants 1. Accept greater species richness of plants 2. Ignore more/better food but accept more food sources 2. Ignore more shelter 2. Ignore more homes 2. Accept 'types of' for 'variety of' 2. Accept 'fewer predators' for 'more protection'

Question	Marking Guidance	Mark	Comments
06.1	1. (In) DNA; 2. (In) RNA; 3. (In) ATP/ADP; 4. Phosphorylation; 5. (In) phospholipids;	2 max (2 x AO1)	1. and 2. If neither DNA or RNA named allow 1 mark for nucleotide/nucleic acid/phosphodiester bond/sugar-phosphate backbone 1, 2 and 3. Accept any other correct biological compound containing phosphate; eg (in)RuBP or GP or triose phosphate or NAD 4. Accept binds with substance to make it more reactive

Question	Marking Guidance	Mark	Comments
06.2	1. Increased (plasma) acidity **OR** Decreased (plasma) pH; 2. Denatures (protein) **OR** Changes (protein) tertiary structure **OR** Changes active site (shape) **OR** Changes antigen-binding site (shape);	2 (2 x AO1)	2. Accept description of bond changes, eg 'disrupts hydrogen/ ionic bonds' for 'changes in tertiary structure'

Question	Marking Guidance	Mark	Comments
06.3	1. Equal positive and negative (in both); 2. Higher (ion concentration) in cytoplasm;	2 (2 x AO2)	Accept answers in either order Ignore reference to sodium ions 1. Accept no overall charge or no net charge 2. Ignore more ions in cytoplasm

Question	Marking Guidance	Mark	Comments
06.4	1. (Sodium) ions move in (to cells) by <u>facilitated</u> diffusion down a concentration gradient; 2. (Sodium) ions move out (of cells) by active transport against a concentration gradient;	2 (2 x AO2)	1. Accept a description of the concentration gradient, eg from high (concentration) to low (concentration) 2. Accept a description of transport against a gradient, eg from low (concentration) to high (concentration)

Question	Marking Guidance	Mark	Comments
07.1	1. 'Y'-shaped (antibody) linked to rectangle with exposed arms of 'Y'; For example  2. Disulfide bridge/bond **OR** Antigen binding site **OR** Variable region **OR** Non variable/constant region **OR** Light chain **OR** Heavy chain **OR** Hinge region **OR** Polypeptide;	2 (2 x AO1)	1. Accept 'Y' shape with 4 chains touching anywhere on the 'constant' region of the antibody.

Question	Marking Guidance	Mark	Comments
07.2	('Effective' ideas) 1. (ADC) removed (tumours) in 32/group 1 (patients) **OR** (ADC) is (cancer) cure in 32/group 1 (patients); 2. (ADC) reduced (the size of tumours) in 40/group 2 **OR** (ADC) reduced (the size of tumours) 72/group1 and group 2; ('Not effective' ideas) 3. Unknown effect (of ADC) in <u>28</u> patients **OR** (Suspect ADC) did not work in <u>28</u> patients; 4. Unknown effect (on tumours) after 3 months **OR** Don't know if (tumours) continue decreasing (in size) after 3 months **OR** Don't know if (tumours) grow (again) after 3 months; 5. No (information from a) control (group of patients) **OR** No placebo (drug used) **OR** No antibody alone (used); 6. (Only) small sample size;	4 max (4 x AO3)	For **four marks**, at least 'one effective' idea and at least one 'not effective' idea Accept people for patients 1. Accept not detectable or destroyed or digested for removed 2. Accept positive effect or is effective or works against for reduced 5. Accept a description of placebo, eg non-active drug 5. Ignore fake drug for placebo 6. Ignore references to gender or age or other health issues

Question	Marking Guidance	Mark	Comments
08.1	1. (Inhibitor) binds (to enzyme) away from active site **OR** (Inhibitor) does not bind to active site; 2. Changing (enzyme) tertiary structure **OR** Changing active site (shape); 3. No/fewer enzyme-substrate complexes (form) **OR** Enzyme-substrate not complementary;	3 (3 x AO1)	Ignore inhibitor not similar or not same shape as substrate 1. Accept binds to allosteric (binding) site for does not bind to active site 3. Accept a description of enzyme-substrate complex, eg so no/fewer substrate molecules fit/bind/enter (the active site) 3. Accept no/fewer E-S complexes

Question	Marking Guidance	Mark	Comments
08.2	1. (Independent) Time (of measurement/test /sample taken); 2. (Dependent) Casein concentration;	2 (2 x AO2)	

Question	Marking Guidance	Mark	Comments
08.3	1. and 2. Correct answer of 20–30 = **2 marks**;; Tangent drawn touching (2, 35) with incorrect calculation = **1 mark** **OR** 17.5 (for incorrect method with correct reading at 2 minutes (35) and division by correct time, (2)) = **1 mark**;	2 (2 x AO2)	

Question	Marking Guidance	Mark	Comments
08.4	1. Curve drawn entirely to the left of the curve given; 2. Similar shaped curve from (0, 180) to intersect x axis between (0, 0) and (6, 0);	2 (2 x AO3)	

Question	Marking Guidance	Mark	Comments
09.1	(Has) phosphate **OR** (Has) deoxyribose **OR** (Has) hydrogen bonds;	1 (1 x AO2)	Ignore the number of hydrogen bonds Accept both contain a pyrimidine/single ring (structure) Accept 'H bonds'

Question	Marking Guidance	Mark	Comments
09.2	Correct answer of 8×10^{-6} **OR** 8.3×10^{-6} = **2 marks**;; Incorrect answer of 0.000 008 3 (correct answer but not in standard form) = **1 mark** **OR** 8.3×10^{-8} (correct division using correct number of G-C pairs, and in standard form, but not shown as a percentage) = **1 mark** **OR** Correct answer in incorrect standard form; eg 83×10^{-7} = **1 mark** **OR** 1.2×10^{9} (correct number of G-C pairs in the genome in standard form) = **1 mark;**	2 (2 x AO2)	Accept any number of decimal places that round to 8.3

Question	Marking Guidance	Mark	Comments
09.3	1. Substitution (mutation occurred): 2. (Only) one nucleotide/base pair is changed (in a gene) **OR** (Only) one (DNA) triplet/codon changed; 3. Same amino acid (coded for); 4. (Because) DNA/genetic code is degenerate; 5. (So) tertiary structure is not changed; 6. (Change) could be in an intron; 7. Removed during splicing;	4 max (4 x AO2)	3. Reject same amino acid is produced 3. Accept one amino acid changed 4. Accept a description of degenerate code 3 and 4 can be awarded together, e.g 'different codons/ triplets code for the same amino acid' = MP3 and MP4

Question	Marking Guidance	Mark	Comments
09.4	1. No (functional) enzyme/**X**; 2. (So) more/faster cell cycles; 3. More(frequent) DNA replication **OR** DNA replication not delayed; 4. (So) mutations (more likely to) occur in DNA replication;	3 max (3 x AO2)	2. Ignore 'cell cycle isn't slowed down' on its own 3. Accept 'faster DNA replication'