AQA

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BIOLOGY
7401/1

Paper 1

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 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.

Question	Marking Guidance	Mark	Comments
01.1	1. Hydrogen (bonds); 2. Phosphodiester (bonds);	2	2. Accept ester/covalent bond

Question	Marking Guidance	Mark	Comments
01.2	Correct answer for 2 marks = 1861.5 (nm);; If answer incorrect, accept for 1 mark: 1095 (correct use of standard form, correct division by 4) **OR** 1489/1489.2 (correct method but incorrect number of base pairs (5))	2	Accept 1861/1862 Accept answer of 1860 given to 3 sig. figs. (consistent with data in question) for 2 marks Accept answer of 1490 given to 3 sig. figs. (consistent with data in question) for 1 mark

Question	Marking Guidance	Mark	Comments
01.3	1. tRNA is 'clover leaf shape', mRNA is linear; 2. tRNA has hydrogen bonds, mRNA does not; 3. tRNA has an amino acid binding site, mRNA does not; 4. tRNA has anticodon, mRNA has codon;	2	Must be a comparison 1. Reject tRNA is double stranded 1. Accept tRNA is folded for tRNA is 'clover leaf shaped' 3. Accept 'CCA end' for amino acid binding site

Question	Marking Guidance	Mark	Comments
01.4	1. mRNA fewer nucleotides **OR** Pre-mRNA more nucleotides **OR** mRNA has no introns/has (only) exons **OR** Pre-mRNA has (exons and) introns; 2. (Because of) splicing;	2	1. Accept mRNA is shorter OR pre-mRNA is longer

TOTAL		**8**	

Question	Marking Guidance	Mark	Comments
02.1	1. A = Attachment protein; 2. B = Capsid **OR** Capsomere **OR** Protein;	2	1. Accept gp41 /gp140 /gp120/CD4/ glycoprotein 1. Accept antigen 1. Ignore receptor protein

Question	Marking Guidance	Mark	Comments
02.2	1. Attachment proteins attach to receptors on helper T cell/lymphocyte; 2. Nucleic acid/RNA enters cell; 3. Reverse transcriptase converts RNA to DNA; 4. Viral protein/capsid/enzymes produced; 5. Virus (particles) assembled and released (from cell);	4 max	

TOTAL		**6**	

Question	Marking Guidance	Mark	Comments
03.1	1. Resolution (too) low; 2. Because wavelength of light is (too) long;	2	

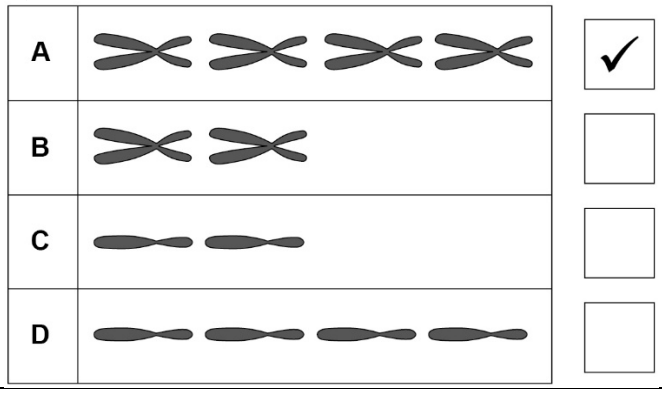
Question	Marking Guidance	Mark	Comments
03.2	1. Lysosomes; 2. Fuse with vesicle; 3. (Releases) hydrolytic enzymes;	3	2. Accept phagosome for vesicle 3. Accept lysozymes for "hydrolytic enzymes" Accept 'Ribosomes/ Rough endoplasmic reticulum form hydrolytic enzymes = 2 marks Accept 'Golgi body forms lysosomes' = 2 marks Accept 'Golgi body / ribosomes / rough endoplasmic reticulum' for 1 mark if no other mark awarded.

Question	Marking Guidance	Mark	Comments
03.3	Correct answer for 2 marks = 32;; Accept for 1 mark, 29 000 (correct conversion to μm) **OR** 32.2 (correct answer but incorrect significant figures) **OR** $\text{Actual} = \frac{\text{Image}}{\text{Magnification}}$ **OR** An incorrect answer that shows division by 900	2	

Question	Marking Guidance	Mark	Comments
03.4	1. Large(r) cells have small(er) surface area to volume ratio; 2. (Takes) longer for oxygen to <u>diffuse</u> (to mitochondria) **OR** Less/no oxygen <u>diffuses</u> (to mitochondria) **OR** <u>Diffusion</u> distance/pathway is long(er);	2	Accept converse for all marking points.

TOTAL		**9**	

Question	Marking Guidance	Mark	Comments
04.1	1. Chromosomes (are) becoming visible/distinct; 2. Because (still) condensing; **OR** 3. Chromosomes (arranged) at random/not lined up; 4. Because no spindle (activity); **OR** Because not attached to spindle fibres;	2	Link marking points - 1 and 2 3 and 4 1 and 2. Accept 'chromosomes are condensed' for 2 marks. 2. Accept shorten or thicken for 'condensed'

Question	Marking Guidance	Mark	Comments
04.2	A;  	1	

Question	Marking Guidance	Mark	Comments
04.3	Locus/loci;	1	

Question	Marking Guidance	Mark	Comments
04.4	1. (Because) base/nucleotide sequence; 2. (In) triplet(s); 3. (Determines) order/sequence of amino acid sequence/primary structure (in polypeptide);	3	

TOTAL		**7**	

Question	Marking Guidance	Mark	Comments
05.1	1. Helix/coiled/branched so compact; 2. Polymer of glucose so easily hydrolysed; 3. Branched so more ends for faster hydrolysis; 4. Glucose (polymer) so provides respiratory substrate for energy (release); 5. Insoluble so not (easily) lost (from cell) **OR** Insoluble so does not affect water potential/osmosis;	4 max	1. Accept description of 'compact', eg many glucoses packed closely/densely/tightly

Question	Marking Guidance	Mark	Comments
05.2	Endo(peptidase);	1	Correct spelling

Question	Marking Guidance	Mark	Comments
05.3	3;	1	

Question	Marking Guidance	Mark	Comments
05.4	1. (6 amino acids in length) 1; 2. (20 amino acids in length) 2;	2	Accept for 1 mark, 55 ($2 \times 5 + 3 \times 15$) if no other mark awarded.

TOTAL		**8**	

Question	Marking Guidance	Mark	Comments
06.1	1. Renal vein; 2. Vena cava to right atrium; 3. Right ventricle to pulmonary artery;	3	

Question	Marking Guidance	Mark	Comments
06.2	1. Vein; 2. Wide(r) lumen **OR** Thinner wall;	2	

Question	Marking Guidance	Mark	Comments
06.3	1. (Plasma) proteins remain; 2. (Creates) water potential gradient **OR** Reduces water potential (of blood); 3. Water moves (to blood) by osmosis; 4. Returns (to blood) by lymphatic system;	4	1. Accept albumin/globulins/fibrinogen for (plasma) protein

TOTAL		**9**	

Question	Marking Guidance	Mark	Comments
07.1	Correct answer for 2 marks = 2.7;; Accept for 1 mark, 79 × 78/6162 in numerator (value of $N(N-1)$) **OR** 2286 in denominator (value of $\Sigma n(n-1)$) **OR** 22, 41, 14, 2 (correct readings of bar chart for all species) **OR** 0.37 – 0.38 (correct calculation using correct numerator and incorrect figures from bar chart: 22, 63, 77, 79)	2	

Question	Marking Guidance	Mark	Comments
07.2	1. Same number of (different) species (in both plots) **OR** (Both plots) have 4 species;	1	

Question	Marking Guidance	Mark	Comments
07.3	1. Determine the area of plot 1. 2. Calculate (total) area of meadow; 3. Divide area of meadow by area of plot; 4. Multiply by number of beetles (per plot)/41;	4	4. Accept multiply by incorrect figure taken from figure (eg 43)

TOTAL		**7**	

Question	Marking Guidance	Mark	Comments
08.1	1. Name of solution/independent variable in first column; 2. Same number of decimal places in final/column on right **OR** 1.3 not 1.29 **OR** 0.72 not 0.7;	2	Ignore headings lack detail Ignore units required Ignore percentage change required 2. Accept same degree of precision

Question	Marking Guidance	Mark	Comments
08.2	1. (Warmer water/water at 30 $^{\circ}$ C) has more kinetic energy; 2. More/quicker osmosis **OR** Large(r) difference in mass (in time available);	2	

Question	Marking Guidance	Mark	Comments
08.3	(No) 1. Egg mass increased; 2. Water moves in by osmosis; 3. (So) egg water potential lower (than vinegar water potential) **OR** Vinegar water potential higher (than egg water potential);	3	3. Accept ψ/WP for water potential 3. Accept less negative for "higher" **OR** "more negative" for lower

Question	Marking Guidance	Mark	Comments
08.4	Independent variable 1. Concentration of (sugar) solution; Determining water potential 2. Plot calibration curve **OR** Graph of ratio against concentration (of sugar); 3. Interpolate from ratio of 1; 4. Change concentration into water potential;	4	1. Accept water potential/dilution for "concentration" 2. Ignore unqualified "plot graph" 3. Accept description of interpolation 4. Accept for example, descriptions using a table/graph to find water potential

TOTAL		**11**	

Question	Marking Guidance	Mark	Comments
09.1	Rough endoplasmic reticulum/ribosomes **and** Golgi (apparatus/vesicles);	1	Ignore nucleus Reject rER for rough endoplasmic reticulum.

Question	Marking Guidance	Mark	Comments
09.2	1. More red blood cells **OR** More haemoglobin **OR** More oxygen transport; 2. More (aerobic) respiration/ATP produced so exercise longer/harder **OR** Less lactic acid/less anaerobic respiration so exercise longer/harder;	2	

Question	Marking Guidance	Mark	Comments
09.3	1. (Human) EPO/antigen displayed on antigen-presenting cells/phagocytes/B cells (in mice); 2. (Specific) helper T cell stimulates B cell to divide/clone; 3. Plasma cells produce/release/secrete antibody;	3	

Question	Marking Guidance	Mark	Comments
09.4	1. (Anti-human EPO antibody) attaches/binds to EPO/antigen (in plastic well); 2. (Anti-mouse antibody) attaches/binds to anti-human antibody; 3. Substrate is added, enzyme causes colour change/product (is positive result);	3	2. Reject enzyme attaches/binds to anti-human EPO antibody

Question	Marking Guidance	Mark	Comments
09.5	Ethics of/welfare issues with using mice/goats/animals;	1	Reference to animals must be qualified, so ignore "use of animals"

TOTAL		**10**	