A-level
BIOLOGY
7402/1

Paper 1

Mark scheme

June 2023

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2 3 6 A 7 4 0 2 / 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 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 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. Genetic material, capsid **and** attachment protein; 2. Genetic material codes for (viral) protein **OR** Capsid protects the genetic material/RNA/DNA **OR** Attachment protein bind to receptors (on cell);	2 (2 x AO1)	1. Accept 'DNA **or** RNA' (the 'or' OR '/' is needed) OR nucleic acid OR genome for 'genetic material' 1. Ignore genetic information 1. and 2. Accept glycoprotein for attachment protein 1. Accept nucleocapsid for 'capsid and nucleic acid' 1. and 2. Accept capsomeres for capsid 2. Accept DNA OR RNA OR genome for genetic material 2. Accept contains OR stores OR encloses for protects 2. Accept glycoprotein for receptor 2. Accept ECF for correct function of incorrect viral structural feature; eg reverse transcriptase produces DNA from RNA

Question	Marking Guidance	Mark	Comments
01.2	1. (Acellular) no cell(-surface) membrane **OR** Not made of cells; 2. (Non-living) have no metabolism/metabolic reactions; **OR** Cannot (independently) move/respire/replicate/ excrete **OR** (Have) no nutrition;	2 (2 x AO1)	1. Accept have no organelles/cytoplasm Ignore 'do not contain membrane-bound organelles' 1. Accept 'do not have cell structure(s)' 2. Accept correct named metabolic reaction 2. Accept reproduce for replicate

Question	Marking Guidance	Mark	Comments
01.3	Do not have bacterial structures/enzymes **OR** Do not have metabolic processes **OR** Do not have a cell wall/murein;	1 (AO1)	Accept 'do not have ribosomes' Ignore 70S OR 80S Accept named metabolic processes; for example, 'do not make protein' OR 'do not replicate' Accept peptidoglycan OR glycoprotein for cell wall

Question	Marking Guidance	Mark	Comments
02.1	1. (Alternate) monomers/glucoses are flipped/upside down/rotated (by 180°); 2. (Joined by) glycosidic bonds; 3. (Forms) straight/linear/unbranched (chains/ molecules);	3 max (3 x AO2)	Ignore they are both polysaccharides 4. Accept as an additional mark point, 'contains 1-4 linkages/bonds' 4. Reject if reference made to 1-6 5. Accept as an additional mark point, 'have β glucose' Ignore both contain C, H and O

Question	Marking Guidance	Mark	Comments
02.2	**EITHER** 1. <u>Tracheole</u> (wall) thin/one cell thick; 2. (So) rapid diffusion (into cells) **OR** (So) short diffusion pathway/distance; **OR** 3. <u>Tracheoles</u> enter/supply tissues/muscle fibres; 4. (So) diffusion direct into cells **OR** (So) short diffusion pathway/distance **OR** (So) rapid diffusion (into cells); **OR** 5. <u>Tracheoles</u> are highly branched; 6. (So) short diffusion distance/pathway **OR** (So) large surface area for (rapid) diffusion;	2 max (2 x AO1)	**Mark as pairs**, 1 and 2 OR 3 and 4 OR 5 and 6 Ignore 'liquid in tracheoles' 3. Accept touch OR push OR 'close to' for enter 3. Accept cells for tissues 5. Accept 'large number' OR 'many' for highly branched 6. Ignore SA 6. Ignore 'to volume ratio' OR ':vol'

Question	Marking Guidance	Mark	Comments
02.3	1. (Allows unbroken) water column **OR** (So) no barrier to (water) movement; 2. Cohesion from H bonds between (all) water (molecules) **OR** Cohesion from (polar) attraction between (all) water (molecules); 3. Evaporation/transpiration creates tension (in column) **OR** Water moves from xylem (into cells) creates tension **OR** (To) pull up water creates tension (in xylem);	3 (3 x AO1)	1. Accept idea of continuous flow OR stream of water 1. Ignore chain of water molecules If 1, 2 or 3 are not awarded accept a principle mark for correct reference to <u>cohesion-tension</u> causing water movement

Question	Marking Guidance	Mark	Comments
03.1	Membrane-bound organelle(s) **OR** Mitochondrion/mitochondria **OR** Vesicle(s)/lysosomes **OR** (Rough) endoplasmic reticulum **OR** Nucleus/(double) nuclear membrane/pore(s)/ nuclear envelope;	1 (AO1)	Ignore rER OR rough ER Accept '80S ribosomes' OR 'large(r) ribosomes' Reject smooth Reject nucleolus Reject cell membrane

Question	Marking Guidance	Mark	Comments
03.2	1. Modify/package/transport proteins **OR** Make/transport glycoproteins; 2. Modify/package/transport lipids **OR** Make/transport glycolipids; 3. Forms/releases vesicles/lysosomes;	2 max (2 x AO1)	Accept processes for modify 1. and 2. Accept 'adds carbohydrate to' for modify 1. Accept 'adds lipid to' for modify 1. Accept lipoprotein for glycoprotein 1 or 2. Accept chylomicron for glycoprotein/glycolipid 2. Accept phospholipid for lipid Accept additional marking point, 4. Make/transport polysaccharides, but ignore cellulose

Question	Marking Guidance	Mark	Comments
03.3	Answer key: India, Europe, East Asia, Central America, South America	1 (AO3)	

Question	Marking Guidance	Mark	Comments
03.4	Correct answer of 8.3814 million/8 381 400/8.3814 x 10^6 **OR** 8.4 million/8400000/8.4 x 10^6;	1 (AO2)	Accept any correct numerical equivalent answer

Question	Marking Guidance	Mark	Comments
03.5	1. Mutation produced <u>allele</u>; 2. Those with allele/resistance less likely to/do not get malaria/*P vivax* **OR** Those with allele/resistance survive malaria/*P vivax*; 3. (So more likely to) reproduce and pass on the allele; 4. (Over generations) allele frequency increases;	4 (2 x AO1, 2 x AO2)	Reject gene for allele only once 1. Reject 'mutation caused by infection/exposure to *P. vivax'*. 2. Accept converse; eg 'people lacking the allele die from malaria' 4. Accept description of increasing frequency of allele eg 'higher proportion', 'more common' but 'ignore increase in **number** of allele'

Question	Marking Guidance	Mark	Comments
04.1	1. Reduced surface area **OR** Fewer co-transport/carrier/channel proteins; 2. Decreases water potential in ileum/lumen **OR** Increases water potential in cells; 3. (So) water moves out of cells/into ileum by <u>osmosis</u> **OR** (So) less/no water moves into cells/out of ileum by <u>osmosis</u>;	3 (3 x AO2)	1. Ignore references to diffusion OR facilitated diffusion OR active transport 1. Ignore SA Accept gut for ileum 2. Accept Ψ for water potential 2. Ignore WP 2. Accept reduces water potential gradient 3. Accept lumen for ileum 3. Accept absorbed for moves

Question	Marking Guidance	Mark	Comments
04.2	1. Anti-toxins/antibodies cause phagocytosis/ destruction/agglutination/neutralisation (of toxin); 2. Anti-toxin/antibody prevents/reduces (chance of) diarrhoea **OR** (*C difficile*) patients with no diarrhoea have high(est) (concentration of) anti-toxin/antibody **OR** (*C difficile*) patients with diarrhoea have low(est) (concentration of) anti-toxin/antibody; 3. (Offered to *C. difficile*) patients with diarrhoea **OR** (Offered to) patients with low (concentrations of) anti-toxin/antibody;	3 (1 x AO1, 2 x AO2)	1. For 'neutralised', accept idea of preventing toxin binding/damaging cells lining the ileum. 2. and 3 Accept people for patients 2. Ignore symptoms for diarrhoea 3. Accept 'passive immunity offered' for 'antibody offered'

Question	Marking Guidance	Mark	Comments
04.3	1. Peptide bonds hydrolysed; 2. Endopeptidase(s) break internal (peptide) bonds; 3. Exopeptidase(s) break terminal (peptide) bonds; 4. (Membrane-bound) dipeptidase(s) break dipeptides to amino acids;	3 max (3 x AO1)	Ignore named structures in the digestive system 2. Accept 'bonds within' OR 'bonds in middle' for internal 3. Accept 'external bonds' OR 'bonds at ends' OR 'penultimate bonds' for terminal 2., 3. and 4. Accept 'act on' OR 'affect' OR 'hydrolyse' for break 4. Accept between 2 amino acids for dipeptides Ignore stomach acid

Question	Marking Guidance	Mark	Comments
05.1	1. Wash hands with soap **OR** Disinfect surfaces; 2. Use sterile pipette/syringe (to transfer bacteria); 3. (Remove bottle lid and) flame neck of bottle; 4. Lift lid of (agar) plate at an angle; 5. Work close to upward air movement; 6. Use sterile spreader; 7. Place pipette/spreader into disinfectant (immediately after use);	3 max (3 x AO1)	1. Ignore sterilise hands OR surfaces 1. Accept sanitise for disinfect 1. Accept antiseptic /antimicrobial/alcohol (wipes) 1. and 7 Accept a named type of disinfectant 2. Reject loop 2. Accept use unopened pipette/ syringe for sterile 4. Accept lift lid slightly OR keep lid over plate 4. Ignore 'work quickly with lid off' 5 Reject 'air movements sterilise air' 5 Accept 'convection current' for 'upward air movement' 6. Accept loop for spreader 6. Examples of sterilising technique eg, flame OR 'dip in alcohol and flame' OR 'dip in disinfectant and rinse (in sterile water)'

Question	Marking Guidance	Mark	Comments
05.2	Correct answer in range of 1.768 to 1.8 **OR** 2 = **2 marks** Accept for **1 mark**, evidence of 28/28.26/28.3 (correct calculation, π x 3^2) **OR** 28.27433 (correct calculation using π value on calculator) **OR** 0.4423 (correct calculation using diameter rather than radius) **OR** 1.76 (correct calculation but incorrectly rounded);	2 (2 x AO3)	A common correct answer for 2 marks is 1.77 Accept correct rounding of figures

Question	Marking Guidance	Mark	Comments
05.3	(Positive control) 1. Antimicrobial/ antibacterial (solution) **OR** Antibiotic **OR** Antiseptic/disinfectant; (Negative control) 2. (Sterile) water **OR** Oil (without cinnamon);	2 (2 x AO3)	If not specified, accept the first answer as being for the positive control 1. Accept named antimicrobial/antibacterial/ antibiotic/antiseptic/disinfectant

Question	Marking Guidance	Mark	Comments
05.4	<table><tr><td>Median for all cultures</td><td>16</td><td>12</td></tr><tr><td>Mean for all cultures</td><td>17</td><td>13</td></tr></table> All four numbers correct;	1 (AO2)	Accept 16.6 **and** 13.4 as the mean values (in this order)

Question	Marking Guidance	Mark	Comments
05.5	1. (Mean ± 2SD) 12.2 to 21.8 **and** 8.6 to 17.4 **OR** (Mean ± 2SD) 11.8 to 21.4 **and** 9(.0) to 17.8 **OR** (Mean ± 1.96 SD) 12.3 to 21.7 **and** 8.7 to 17.3 **OR** (Mean ± 1.96 SD) 11.9 to 21.3 **and** 9.1 to 17.7; 2. (SD) overlap so difference (likely to be) due to chance **OR** (SD) overlap so (likely) no significant difference (in means);	2 (2 x AO3)	1. Accept ECF for 1 mark, correct SDs calculated using incorrect means in 05.4 2. Accept ECF for 1 mark, correct explanation based on correct SDs calculated from incorrect means in 05.4 2. Reject results are due to chance OR results are significant

Question	Marking Guidance	Mark	Comments
06.1	(Genome) 1. Complete set of genes in a cell **OR** (All) the DNA in a cell **OR** (All) the genes/alleles/genetic material in a cell **OR** The total number of DNA bases in a cell; (Proteome) 2. (Full) range of proteins that a cell **can produce** **OR** (Full) range of proteins **coded for** by the cell's DNA/genome;	2 (2 x AO1)	1. Reject 'all the DNA/genes within a species/population' 1 and 2. Accept organism for cell 2. For 'full range' accept 'complete set' OR all 2. Do not accept 'number of proteins' unqualified 2. Ignore 'range of proteins that a species/population can produce'

Question	Marking Guidance	Mark	Comments
06.2	1. Can not identify/distinguish species; 2. (Optical) microscope resolution is low; 3. Flagella (are fragile so) broken/damaged/missing **OR** Artefacts misinterpreted/mistaken for flagella; 4. (Flagella) difficult to stain **so** not visible; 5. (Flagella) at an angle **so** not visible; 6. Not all bacteria have flagella;	3 max (3 x AO3)	2. Ignore magnification 4. Ignore difficult to stain unqualified 5. Accept 'out of plane' for 'at an angle'

Question	Marking Guidance	Mark	Comments
06.3	DNA/mRNA/RNA <u>base</u> sequencing **OR** Amino acid sequencing **OR** Use of electron microscopes with greater resolution **OR** Use of electron microscopes **and** improved staining/preparation;	1 (AO1)	Accept genome sequencing Ignore detail OR magnification for resolution Accept abbreviations TEM OR SEM in this instance

Question	Marking Guidance	Mark	Comments
06.4	Correct answer of 19 565 (from measurement of 45mm) **OR** 20 000 (from measurement of 46mm) **OR** 20 435 (from measurement of 47mm) = **2 marks**;; Accept for **1 mark**, evidence of 45 000 OR 46 000 OR 47 000 (correct image size in μm) **OR** ÷ 2.3 (correct use of equation);	2 (2 x AO2)	Accept answers that round correctly to those shown Accept division by 2.3 x 10^{-3} OR 0.0023

Question	Marking Guidance	Mark	Comments
07.1	1. Less (oxygen) loaded at high pO_2 (compared with no CO) **OR** Maximum Hb saturation is 50% (oxygen); 2. (At low pO_2) Hb has higher affinity (for oxygen); 3. Hb has more oxygen at low pO_2 **OR** Hb unloads less oxygen at low pO_2;	3 (1 x AO2, 2 x AO3)	Ignore references to 'binding sites occupied by CO' 1. Accept 'in lungs' for 'high pO_2' 1. Accept 'levels (off)' OR 'plateau at 50%' for maximum 1 Accept 'only 50%' for 'maximum (of) 50%' 3. Accept 'in (respiring) cells/tissues' for 'low pO_2/cells' 3. Ignore 'more loading of oxygen at low pO_2' 3. Accept 'less readily' for less

Question	Marking Guidance	Mark	Comments
07.2	(For scientists' suggestion) 1. Children exposed (to CO) for 8 hours; (Against scientists' suggestion) 2. Children exposed (to CO) for 1 hour **OR** Adults exposed (to CO) for 1 hour **and** 8 hours; (But) 3. Maths model may not be accurate **OR** Maths model did not use people; 4. (Recommendation for people) only at rest **OR** Unknown effects of exercise (on CO uptake); 5. (People vary in) size/age/ethnicity **OR** Different sex; 6. No statistical test to show if differences are significant; 7. Unknown effects on CO exposure for people with respiratory disease **OR** Unknown effects on CO exposure for smokers; 8. Might not be able to reduce CO (concentration) in air below 10(mg m^{-3});	3 max (3 x AO3)	Award 3 max only if answer contains MP1 OR MP2 3. Accept '(based on) invalid assumptions' for 'may not be accurate' 3. Accept test OR experiment OR investigation for 'maths model' 5. Accept gender 6. Accept no SDs to show if differences are significant 7. Accept any named respiratory disorder; eg asthma OR coronary heart disease

Question	Marking Guidance	Mark	Comments
08.1	1. 2 nuclei (in cells) **OR** Cells (stopped) at telophase; 2. Cytokinesis prevented **OR** Stopped (new) cell membrane forming **OR** Stopped cytoplasm dividing;	2 (2 x AO3)	2. Accept cell membrane not dividing/splitting/ pinching (in the cell)

Question	Marking Guidance	Mark	Comments
08.2	1. (MiTMAB) binds (to dynamin) other than the active site; 2. Changes the shape of (dynamin) active site **OR** Changes the tertiary structure (of dynamin/ enzyme); 3. Not <u>complementary</u> so substrate does not bind (to active site) **OR** Not <u>complementary</u> so no/fewer enzyme-substrate complexes (form);	3 (1 x AO1, 2 x AO2)	1. Accept (MiTMAB) binds to dynamin at an allosteric OR inhibitor site 2. Accept denature for 'change in shape' 3. Accept ES complex in this instance 3. Ignore ESC 3. Accept fit OR attach for bind

Question	Marking Guidance	Mark	Comments
08.3	1. (At) lowest concentrations (all) dynamin is not inhibited **OR** (At) lowest concentrations (MiTMAB) does not cause cell death/inhibit cytokinesis; 2. (As MiTMAB) concentration increases more dynamin is inhibited/inactive **OR** (As MiTMAB) concentration increases cell death increases **OR** (As MiTMAB) concentration increases cytokinesis decreases **OR** No change in cell number at 2000 (μg dm^{-3}) **OR** No change in cell number at 0.0 (on y axis); 3. (At) highest (MiTMAB) concentrations all dynamin is inhibited **OR** (At) highest concentrations (MiTMAB) causes cell death **OR** (At) highest concentrations (MiTMAB) inhibits cytokinesis;	3 (3 x AO2)	1. Accept graph readings in range 30 to 70 for lowest; 1. Accept 'has no effect' for 'cause cell death/inhibit cytokinesis' 1. and 3. Accept 'prevents inhibition of cell death' for 'causes cell death' 1, 2 and 3. Accept 'cell replication' OR mitosis for cytokinesis 3. Accept graph readings >2000 to 8000 for highest

Question	Marking Guidance	Mark	Comments
08.4	Correct answer in range 19.3 to 19.7 = **2 marks**;; Accept for **1 mark** evidence of 70 **and** 2000 (correct readings from the graph) / 30 **and** 2000 (correct readings from the graph) **OR** 1930 (correct increase in MiTMAB, 70 to 2000) / 1970 (correct increase in MiTMAB, 30 to 2000) **OR** Division by 100/multiplication by 0.01 (correct conversion to mass in 0.01 dm^3);	2 (2 x AO2)	Correct answer 19.3 (is obtained from 70 and 2000) 19.7 (is obtained from 30 and 2000) Accept for 1 mark, any value in range 30 to 70 **and** 2000 Accept for 1 mark, any value in the range 1930 to 1970

Question	Marking Guidance	Mark	Comments
09.1	1. Antigen (at T and substrate); 2. Enzyme-substrate complex (produces a line/colour change) **OR** Enzyme (binds) with substrate (produces line/colour change);	2 (2 x AO2)	1. Reject antigen in blood 2. Accept colourless dye for substrate 2. Accept ES complex in this instance

Question	Marking Guidance	Mark	Comments
09.2	Blood/sample has moved/diffused (above T in the test);	1 (AO3)	Accept Blood/sample and anti-human antibody have moved (in the test)

Question	Marking Guidance	Mark	Comments
09.3	1. (Cancer/fused cells) divide/replicate rapidly/uncontrollably; 2. B cells produce (monoclonal) antibody;	2 (2 x AO2)	1. Accept mitosis OR reproduce for divide 1. Accept hybridoma for 'fused cell' 2. Accept 'plasma cells' OR 'memory cells' for 'B cells' 2. Accept secrete OR make for produce

Question	Marking Guidance	Mark	Comments
09.4	Harmful **but** not killed **OR** Harmful **but** only used once **OR** Harmful **but** stops human suffering **OR** Harmful **but** produces (useful) medicine/drugs **OR** Not harmed **but** injected (with a substance);	1 (AO3)	Must have idea 'for' **and** idea 'against' Accept stressed OR exploited OR mistreated OR abused for harmed Accept illness OR infection OR death for suffering

Question	Marking Guidance	Mark	Comments
09.5	1. Better than current at detecting early but not as good as lab-based; 2. New/current test better than lab-based from 5 days **OR** New test as good as current from 5 days; 3. New test and lab-based better **total** (of) positives than current **OR** New test **total** (of) positives not (quite) as good as lab-based; 4. New test (likely to be) quicker; 5. New test (likely to be) cheaper; 6. Limited/inaccessible labs **OR** Limited training of people to use labs;	3 max (3 x AO3)	Max 2 from 4, 5 and 6 Accept ELISA test for new test 1, 2 and 3 Accept correct comparative figures from Table 3 OR calculations (some examples in table below) 1. and 2. Accept higher proportion for better 1. Accept reference to day(s) in range of 1 to 4 days for early 1. Accept identifies OR finds OR spots for detects 1. and 2. Accept 'more accurate' OR 'identifies more' OR 'finds more' OR 'detects more' OR 'is more successful' OR 'is more effective' for "better than" and the converse of these statements for "not as good as" 2. Accept after 4 days 4. Accept 'more efficient' for quicker

Time after onset of symptoms / days	Number of positive results / % (combined with earlier result(s))		
	Lab-based test	**Current test**	**New test**
1–2	71	0	43
3–4	74 (73)	16 (12)	63 (58)
5–7	44 (66)	78 (29)	78 (63)

Question	Marking Guidance	Mark	Comments
09.6	1. Increases water potential of blood/capillary **OR** Decreases water potential of tissue fluid; 2. (So) less <u>water</u> returns to blood/capillaries (by osmosis) **OR** (So) more <u>water</u> leaves blood/capillaries (by osmosis);	2 (2 x AO2)	1. Accept Ψ for water potential 1 Ignore WP 1. Accept reduces water potential gradient 2. Ignore tissue fluid 2. Accept 'no' for less

Question	Marking Guidance	Mark	Comments
10.1	1. Amino acids joined by peptide bond(s); 2. (By) condensation reaction(s); 3. Secondary structure is formed by hydrogen bonding; 4. Tertiary structure formed by interactions (between R groups); 5. Quaternary structure contains >1 <u>polypeptide</u> **OR** Quaternary structure formed by interactions/bonds between <u>polypeptides</u>;	5 (5 x AO1)	3. Accept alpha helix OR β-pleated sheet for 'secondary structure' 4. Accept 3° for tertiary 4. and 5. Accept for 'interactions', hydrogen bonds OR disulfide bridges OR ionic bonds OR hydrophobic OR hydrophilic interactions 5. Ignore peptide

Question	Marking Guidance	Mark	Comments
10.2	1. Polymer of nucleotides; 2. (Nucleotide) consists of deoxyribose, phosphate and an organic/nitrogenous base; 3. Phosphodiester bonds (between nucleotides); 4. DNA double helix held by H bonds **OR** 2 strands held by H bonds; 5. (Hydrogen bonds/pairing) between adenine, thymine **and** cytosine, guanine; 6. DNA is associated with histones/proteins; 7. (During mitosis/when visible) chromosome consists of two chromatids joined at a centromere;	6 max (6 x AO1)	1. Accept 'polynucleotide' 2. Accept 'phosphoric acid' for phosphate 5. Ignore bases identified with letters (A, T, G, C) 5. Reject adenosine and cysteine Accept correctly annotated diagram(s) for equivalent marking points

Question	Marking Guidance	Mark	Comments
10.3	1. Independent segregation of homologous Chromosomes/pairs; 2. Crossing over between homologous chromosomes/pairs; 3. Random fertilisation of gametes; 4. (Produces) new combinations of <u>alleles</u>;	4 (4 x AO1)	If no marks awarded accept one principle mark 'Meiosis producing cells that are genetically different (from one another)' 1. For 'independent' accept 'random' 1. For 'segregation' accept 'assortment' 2. Accept 'within bivalent' for 'between homologous pair' 3. Ignore 'random mating' 3. Accept 'random fusion' for 'random fertilisation' Accept as an additional mark point 5. (Produces) new combinations of maternal and paternal chromosomes Ignore reference to epigenetics