# AS
# BIOLOGY
# 7401/1

Paper 1

**Mark scheme**

June 2019

Version: 1.1 Final

*I96A7401I/MS*

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 Assessment Writer.

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.

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

# Level of response marking instructions

Level of response mark schemes are broken down into levels, each of which has a descriptor. The descriptor for the level shows the average performance for the level. There are marks in each level.

Before you apply the mark scheme to a student's answer read through the answer and annotate it (as instructed) to show the qualities that are being looked for. You can then apply the mark scheme.

## Step 1 Determine a level

Start at the lowest level of the mark scheme and use it as a ladder to see whether the answer meets the descriptor for that level. The descriptor for the level indicates the different qualities that might be seen in the student's answer for that level. If it meets the lowest level then go to the next one and decide if it meets this level, and so on, until you have a match between the level descriptor and the answer. With practice and familiarity you will find that for better answers you will be able to quickly skip through the lower levels of the mark scheme.

When assigning a level you should look at the overall quality of the answer and not look to pick holes in small and specific parts of the answer where the student has not performed quite as well as the rest. If the answer covers different aspects of different levels of the mark scheme you should use a best fit approach for defining the level and then use the variability of the response to help decide the mark within the level, ie if the response is predominantly level 3 with a small amount of level 4 material it would be placed in level 3 but be awarded a mark near the top of the level because of the level 4 content.

## Step 2 Determine a mark

Once you have assigned a level you need to decide on the mark. The descriptors on how to allocate marks can help with this. The exemplar materials used during standardisation will help. There will be an answer in the standardising materials which will correspond with each level of the mark scheme. This answer will have been awarded a mark by the Lead Examiner. You can compare the student's answer with the example to determine if it is the same standard, better or worse than the example. You can then use this to allocate a mark for the answer based on the Lead Examiner's mark on the example.

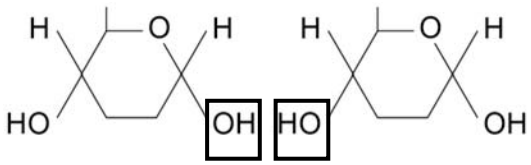
You may well need to read back through the answer as you apply the mark scheme to clarify points and assure yourself that the level and the mark are appropriate.

Indicative content in the mark scheme is provided as a guide for examiners. It is not intended to be exhaustive and you must credit other valid points. Students do not have to cover all of the points mentioned in the Indicative content to reach the highest level of the mark scheme.

An answer which contains nothing of relevance to the question must be awarded no marks.

| Question | Marking Guidance | Mark | Comments |
|---|---|---|---|
| **01.1** | **In chloroplasts**<br><br>1. DNA shorter;<br><br>2. Fewer genes;<br><br>3. DNA circular not linear;<br><br>4. Not associated with protein/histones, unlike nuclear DNA;<br><br>5. Introns absent but present in nuclear DNA; | 3 max | Must be comparative statements.<br><br>Accept alternatives in context of nuclear DNA<br><br>1. Accept smaller<br><br>3. Accept DNA in a loop not linear<br><br>3. Accept no chromosomes (in chloroplast) unlike nucleus<br><br>Ignore references to double and single stranded DNA |
| **01.2** | Deoxyribose in DNA **and** ribose in RNA; | 1 | |
| **01.3** | W = amino acid binding site **and** X = anticodon; | 1 | **W** Idea of binding site needed |
| **01.4** | 1. Triplets code for same amino acid<br><br>2. Occurs in introns /non-coding sequence; | 2 | 1. Accept: DNA/code/triplets are degenerate<br><br>1+ 2. Reject codons (as question states within genes)<br><br>2. Ignore junk DNA<br><br>2. Reject : multiple repeats |
| **TOTAL** | | **7** | |

| Question | Marking Guidance | Mark | Comments |
|---|---|---|---|
| **02.1** | (Antibodies with the) same tertiary structure<br>**OR**<br>(Antibody produced from) identical/cloned plasma cells/B cells/B lymphocytes; | 1 | Accept in context of single plasma/B cell/B lymphocyte<br>Reject: genetically identical antibody |
| **02.2** | Accept any **one** suitable use, eg<br>Targets/binds/carries drug/medicine to specific cells/antigens/receptors<br>**OR**<br>Block antigens/receptors on cells; | 1 | Accept cancer/diseased cells (as a specific cell).<br>Ignore medical diagnosis/pregnancy/ PSA/ELISA test. |
| **02.3** | 1. (First) antibody binds/attaches /complementary (in shape) to antigen;<br>2. (Second) antibody with enzyme attached is added;<br>3. (Second) antibody attaches to antigen;<br>4. (Substrate/solution added) and colour changes; | 4 | Ignore mixing of direct or indirect ELISA<br>Accept annotated diagram(s).<br>3.Accept (second) antibody attaches to (first) antibody (indirect ELISA test).<br>4. Only award if enzyme mentioned. |
| **TOTAL** | | **6** | |

| Question | Marking Guidance | Mark | Comments |
|---|---|---|---|
| **03.1** |  | 1 | Accept a box drawn around any OH and H from another OH<br>OR<br>Accept one box around two OHs |
| **03.2** | 1. Filter **and** dry (the precipitate);<br>2. Find mass/weight; | 2 | 1. Accept: correct reference to evaporation **after** filtration |
| **03.3** | 1. **A** = glucose **and** B = maltose;<br>2. Because **more** sugar/precipitate **after** hydrolysis/maltase action; | 2 | 2. Accept 'higher concentration of sugar' for 'more sugar'<br>2. Accept 'break down' for hydrolysis |
| **03.4** | 1. Quantitative<br>**OR**<br>(Colour change is) subjective;<br>2. Standardises (the) method; | 1 max | 1. Accept: accurate/ precise |
| **03.5** | 16.67 – 17 = 2 marks;;<br>(cumulative percentage error of both measuring vessels)<br>If incorrect final answer, accept for 1 mark:<br>0.167 – 0.17 (not a percentage)<br>**OR**<br>evidence of<br>$\frac{1}{15} + \frac{0.5}{5}$<br>(correct understanding, but not calculated) | 2 | $\frac{1}{15} + \frac{0.5}{5} \times 100$<br>Ignore: ± (plus or minus) in answer |
| **TOTAL** | | **8** | |

| Question | Marking Guidance | Mark | Comments |
|---|---|---|---|
| **04.1** | 3.8; | 1 | Accept figures that round down to 3.8 ie (3.81 to 3.84)<br>Ignore : number of decimal places. |
| **04.2** | 1. (Index of diversity also) measures abundance / number / population (size) of **each** species;<br>2. (So useful because) may be many of some species<br>**OR**<br>(So useful because) may be few of other species; | 2 | 1. Ignore "total number of species" unqualified<br>1. Accept: every species for each species. |
| **04.3** | 1. Movement of (floating) object over known distance **and** over given time<br>**OR**<br>Time to fill container of known volume<br>**OR**<br>Use of data logging device; | 1 | Accept : digital device eg (digital) flow meter |
| **04.4** | 1. Less food/prey at site 1;<br>2. (So more) mayfly starve;<br>**OR**<br>3. Less oxygen at site 1;<br>4. (So) less respiration/ATP/energy (for mayflies);<br>**OR**<br>5. More predators/Anglers' Curse at site 1;<br>6. (So more) mayfly killed/eaten/removed;<br>**OR**<br>7. More competition at site 1;<br>8. (So more) mayfly starve; | 2 | Mark in paired statements.<br>Accept converse statements in context of site 2. e.g.<br>1. More food/prey in site 2.<br>2. (So) mayfly grow/ survive/reproduce. |
| **04.5** | Same size of area (sampled)<br>**OR**<br>Same size net/mesh<br>**OR**<br>Same sampling time<br>**OR**<br>Samples taken at same time of day/on same day; | 1 | Accept use of quadrat<br>Accept any other valid reason |
| **TOTAL** | | **7** | |

| Question | Marking Guidance | Mark | Comments |
|---|---|---|---|
| **05.1** | Row 2; | 1 | |
| **05.2** | **D** – Granum/grana/thylakoid(s);<br>**E** – starch/lipid; | 2 | Accept oil for E |
| **05.3** | 1. Light has long(er) wavelength;<br>2. (So) low(er) resolution; | 2 | Accept converse in context of electron microscope<br>1. Ignore: optical microscope has long(er) wavelength.<br>2. Accept poor resolution<br>2. Ignore: weaker resolution<br>2. Ignore references to magnification<br>2. Accept correct references to values for resolution. E.g optical 0.2µm – 0.3 µm |
| **05.4** | (70S) Ribosome; | 1 | Reject: (80S) Ribosome |
| **05.5** | Correct answer of 7455 = 2 marks;;<br>Accept for 1 mark answers in range:<br>7717.5 to 7718 (44.1% of 17500)<br>If incorrect answer, accept for 1 mark working shows an attempt to subtract 262.5 | 2 | |

| | | | |
|---|---|---|---|
| **05.6** | 1. (Ice) cold to prevent/reduce enzyme activity;<br>2. Buffered to prevent denaturing of enzyme/protein;<br>3. Same water potential/Ψ to prevent lysis/bursting (of organelle); | 3 | For 1, 2 and 3 reject context of cell<br>2. Accept description of buffer.<br>2. Accept: prevent change of tertiary structure.<br>3. Accept: isotonic for same water potential.<br>3. Reject: references to turgor or plasmolysis or crenation. |
| **TOTAL** | | **11** | |

| Question | Marking Guidance | Mark | Comments |
|---|---|---|---|
| **06.1** | F = Filament **and**<br>G = (Secondary) lamella(e)/(gill) plate; | 1 | Reject gill arch<br>Accept primary lamella(e) for F |
| **06.2** | 1. Water **and** blood flow in opposite directions;<br>2. Maintains diffusion/concentration gradient of oxygen<br>**OR**<br>Oxygen concentration always higher (in water);<br>3. (Diffusion) along length of lamellae/filament/gill/capillary; | 3 | 2. Accept: converse for carbon dioxide<br>2. Accept: equilibrium not reached<br>3. Accept: all/whole of lamellae/filament//gill/capillary |
| **06.3** | 1. (Oxygen) decreases as depth increases to 750m, then (with further depth it) increases;<br>2. *(A. fimbria)* present in water with low/lower oxygen (concentration)<br>**OR**<br>*(A. fimbria)* present in wide range of oxygen (concentrations); | 2 | 1. Accept for 750m any value in range (730m – 790m).<br>2. Accept converse e.g. *A. fimbria* not present in water with high oxygen (concentration). |
| **06.4** | 1. (Generally) lower the oxygen concentration, the higher ratio/(gill) surface area to body mass;<br>2. Supplies (enough) oxygen for respiration; | 2 | |
| **TOTAL** | | **8** | |

| Question | Marking Guidance | Mark | Comments |
|---|---|---|---|
| **07.1** | 1. Lowers activation energy;<br>2. Induced fit **causes** active site (of enzyme) to change shape;<br>3. (So) enzyme-substrate complex **causes** bonds to form/break; | 3 | 3. Accept: description, of induced fit<br>3. Accept: enzyme-substrate complex causes stress/strain on bonds. |
| **07.2** | Size/dimensions /mass/variety of potato<br>**OR**<br>Temperature (of solution/flask)<br>**OR**<br>pH (of solution); | 1 | Accept : weight of potato<br>Ignore : amount of potato<br>Ignore concentration/ volume of catalase |
| **07.3** | 0.33, 0.60, 0.86, 1.0, 1.0 = 2 marks;;<br>$\frac{6}{time}$<br>2 significant figures<br><br>If answer incorrect accept for 1 mark,<br>Correct values but incorrect number of significant figures<br>**OR**<br>1.0 written on row for hydrogen peroxide 2.0/2.5 in Table 5<br>**OR**<br>Answers showing correct division, eg 0.3, 0.6, 0.9<br>**OR**<br>Answers showing correct significant figures using incorrect calculation (÷18) 1.0, 0.56, 0.39, 0.33, 0.33 | 2 | |

| | | | |
|---|---|---|---|
| **07.4** | 1. Hydrogen peroxide concentration on x axis **and** rate of reaction on Y axis, linear number sequence **and** appropriate scale;<br><br>2. Correct units /mol $dm^{-3}$ **and** /arbitrary units/au;<br><br>3. All co-ordinates plotted accurately **with** point-to-point or smooth curve; | 3 | 1. Graph should cover half or more of the grid; eg reject if Y axis covers only three big squares<br><br>2. Accept brackets instead of solidus<br><br>3. Accept accurate plotting of co-ordinates given in 07.3<br><br>3. Reject: bar chart<br>3. Reject: if ruled straight line of best fit<br>3. Accept: if x axis starts at 0.5<br><br>3. Accept: if line is extended to (0,0)<br><br>Plot coordinates must be processed data, hydrogen peroxide vs time = 0 |
| **07.5** | Cut up/use discs/homogenise/increase surface area (of potato chips)<br>**OR**<br>Use bigger chips<br>**OR**<br>Increase temperature<br>**OR**<br>Change pH; | 1 | Reject answer if the temperature is above 40°C<br><br>Ignore: more/increase heat |
| **TOTAL** | | **10** | |

| Question | Marking Guidance | Mark | Comments |
|---|---|---|---|
| **08.1** | 1. Add biuret (reagent);<br>2. (Positive result) purple/lilac/violet /mauve; | 2 | 1. Accept sodium hydroxide (solution) and copper sulphate (solution)<br>1. Reject addition of other incorrect chemicals<br>2. Reject other colours<br>2. Ignore references to heating |
| **08.2** | Similarities<br>1. Amine/$NH_2$ (group at end);<br>2. Carboxyl/COOH (group at end);<br>3. Two R groups;<br>4. All contain C **and** H **and** N **and** O;<br>Difference<br>5. Variable/different R group(s); | 3 | 2 max for similarities<br>Accept for three marks, a labelled diagram of a dipeptide showing $NH_2$/$NH_3^+$, COOH/$COO^-$ and different R groups.<br>1. Accept amino/$NH_3^+$<br>2. Accept carboxylic / $COO^-$<br>4. Accept examples of different R groups |
| **08.3** | 1. Moved to negative (electrode) **because** positive(ly charged);<br>2. (Spots move) different distances/rates **because** (amino acids) different charge/mass;<br>3. Two spots (not three) **because** (amino acids) same charge/mass<br>**OR**<br>One spot has 2 amino acids **because** (amino acids) same charge/mass; | 3 | 2 **and** 3. Accept size for mass. |
| **TOTAL** | | **8** | |

| Question | Marking Guidance | Mark | Comments |
|---|---|---|---|
| **09.1** | 1. Chromosomes/centromeres cannot attach (to spindle)<br>**OR**<br>Chromosomes cannot line up (on spindle);<br>2. (So, no) metaphase;<br>**OR**<br>3. Chromatids cannot separate (on spindle);<br>4. (So, no) anaphase; | 2 | Mark in pairs as (1 and 2 **OR** 3 and 4)<br>3. Accept description of 'cannot separate' e.g cannot move to poles<br>3. Ignore 'split' |
| **09.2** | 1. Cancer cells divide more/uncontrollably/rapidly<br>**OR**<br>Healthy cells divide less/slowly; | 1 | |
| **09.3** | 1. (ABZ) increases/maintains Cyclin B;<br>2. (So) mitosis (starts but) does not end (no tumour growth);<br>3. (ABZ) lowers ratio of Bcl-2 to Bax;<br>4. (So) apoptosis occurs/cells die (no tumour growth); | 4 | Ignore references to spindle fibres<br>2. Ignore mitosis will continue<br>2. Ignore mitosis stops without qualification.<br>3. Accept (ABZ) decreases Bcl-2 **and** increases Bax |
| **09.4** | **In support of suggestion**<br>1. Stops mitosis (at metaphase/anaphase)/cell division (so no tumour growth)<br>**OR**<br>Promotes apoptosis/programmed cell death (so tumour destroyed);<br>**Against suggestion**<br>2. Healthy cells (are) damaged/affected<br>**OR**<br>Causes side effects; | 3 max | 2 max for points "Against suggestion" |

| | | | |
|---|---|---|---|
| | 3. Results from laboratory tests/tests on (isolated) cells<br>**OR**<br>No clinical trials/tests on patients/people;<br>4. Dosage unknown;<br>5. Effectiveness unknown; | | |
| **TOTAL** | | **10** | |