AQA

AS
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 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.

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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.

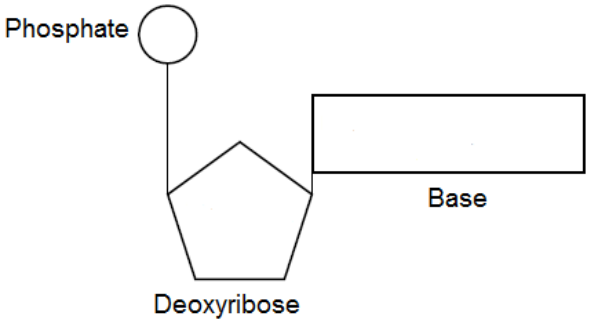
You may well need to read back through the answer as you apply the mark scheme to clarify points and assure yourself that the level and the mark are appropriate.

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	D; G; F;	3	
01.2	Coronary arteries;	1	Accept coronary artery Ignore aorta, arteriole and capillary Reject coronary veins Do not accept coronary by itself Accept phonetic spelling
01.3	1. No sketched / hanging / crossing lines / shading; 2. Must look similar; 3. Matrix **and** crista correctly labelled; 4. Correct scale stated (x 62 800);	4	1. Ignore stippling 3. Ignore any other labels 4. Accept other suitable scale given

Question	Marking Guidance	Mark	Comments
02.1	(a monomer is a smaller / repeating) unit / molecule from which larger molecules / polymers are made;	1	Reject atoms / elements / 'building blocks' for units / molecules Ignore examples
02.2	**Similarity** 1. Both contain galactose / a glycosidic bond; **Difference** 2. Lactulose contains fructose, whereas lactose contains glucose;	2	1. Ignore references to hydrolysis and / or condensation 2. Ignore alpha / beta prefix for glucose 2. Difference must be stated, not implied
02.3	1. (Lactulose) lowers the water potential of faeces / intestine / contents of the intestine; 2. Water retained / enters (due to osmosis) **and** softens the faeces;	2	1. Accept Ψ for water potential 2. Accept descriptions of soft faeces, eg faeces is less dry / less hard
02.4	(-) 84.1(%);;	2	Accept (-) 84.15(%) Allow 1 mark for 84 **OR** $\frac{2.82 \times 10^{-7} - 4.47 \times 10^{-8}}{2.82 \times 10^{-7}}$ **OR** $\frac{2.37 \text{ x } 10\text{-}7}{2.82 \times 10^{-7}}$

Question	Marking Guidance	Mark	Comments
03.1	1. Phosphate, deoxyribose and base correctly labelled; 2. Correct shapes **and** bonds in the correct positions (as shown below);  	2	1. Accept P in a circle / P_i / PO_4^{3-} for phosphate. 1. Do not accept phosphorus for phosphate. 1. Do not accept **only** pentose for deoxyribose. 1. Ignore references to sugar. 1. Accept a named base, (eg adenine, thymine, guanine, cytosine). 1. Do not accept uracil or **only** letters (eg A, T, G or C). 1. Ignore labelled bonds 2. Accept correct shapes with incorrect labels 2. Accept any orientation of diagram, eg inverted / mirror image 2. Accept any pentagon for deoxyribose
03.2	1. Weak / easily broken hydrogen bonds between bases allow two strands to separate / unzip; 2. Two strands, so both can act as templates; 3. Complementary base pairing allows accurate replication;	2 max	1. and 2. may appear in the same feature 3. Allow description of complementary base pairing and accurate replication.
03.3	C. 550 seconds;	1	

Question	Marking Guidance	Mark	Comments
04.1	W – (cell surface) membrane X – cell wall Y – capsule Z – flagellum	2	Four correct = 2 marks. Three or two correct = 1 mark. Y - Ignore references to slime/mucus Y - Reject capsid Z - accept flagella
04.2	W - Phospholipids; X - Murein / glycoprotein;	2	X - Accept peptidoglycans. Accept phonetic spellings
04.3	Binary fission;	1	Reject binary fusion
04.4	8.64×10^5;;	2	Accept 864 000 however expressed, e.g. 864×10^3 Allow one mark for $2^6 = 64$ **OR** $64 / 2^6 \times (1.35 \times 10^4)$

Question	Marking Guidance	Mark	Comments
05.1	P – glycerol Q – fatty acid (chains)	2	Accept phonetic spelling
05.2	Ester (bond);	1	
05.3	1. (Mix / shake sample) with ethanol, then water; 2. White / milky (emulsion);	2	1. Sequence is important 2. Ignore cloudy 2. Reject precipitate

Question	Marking Guidance	Mark	Comments
06.1	1. (It shows) smaller groups within larger groups / larger groups containing smaller groups; 2. With no overlap (between groups);	2	1. Accept groups within groups
06.2	Family;	1	Accept phonetic spellings
06.3	1. Sine song is (very) similar / same length (for both, so closely related). 2. (But) have different peaks / pulses (in pulse song);	2	2. Must give a difference, not just state they are different 2. Accept suitable differences eg number / length / amplitude / interval
06.4	1. (Three) peaks (in pulse song) occur at the same time (since both female) / songs identical / male peaks are different; 2. (Therefore) no male (song) to stimulate / cause mating; **OR** Nothing to stimulate / cause mating;	2	1. Accept suitable differences in male peaks eg number / length / amplitude / interval

Question	Marking Guidance	Mark	Comments
07.1	(The proteome is the full) range of / number of different proteins that a cell is able to produce (at a given time); **OR** (The proteome is the full) range of / number of different proteins the genome / DNA is able to code for;	1	Do not accept number of proteins unqualified
07.2	1. mRNA does not have hydrogen bonds / base pairing, tRNA does; **OR** mRNA is linear / straight chain, tRNA is cloverleaf; 2. mRNA does not have an amino acid binding site, tRNA does; 3. mRNA has more nucleotides; 4. (Different) mRNAs have different lengths, all tRNAs are similar / same length; 5. mRNA has codons, tRNA has an anticodon;	2 max	Statements must be comparative 2. Accept mRNA cannot carry an amino acid, tRNA can 3. Accept mRNA is longer or converse

07.3	1. mRNA associates with a ribosome / ribosome attaches to mRNA; 2. Ribosome moves to / finds the <u>start</u> codon / AUG; 3. tRNA brings / carries (appropriate / specific) amino acid; 4. Anticodon (on tRNA complementary) to codon (on mRNA); 5. Ribosome moves along to next codon; **OR** Ribosome 'fits' around two codons / can fit two tRNAs; 6. (Process repeated and) amino acids join by peptide bonds / condensation reaction (to form polypeptide); **OR** (Process repeated and) amino acids joined using (energy from) ATP (to form polypeptide);	5 max	1. Idea of association is required 3. and 5. Must be explicitly stated and not inferred.

Question	Marking Guidance	Mark	Comments
08.1	1. (water has a relatively) high (specific) heat capacity; 2. Can gain / lose a lot of heat / energy without changing temperature; **OR** Takes a lot of heat / energy to change temperature;	2	1. Ignore numbers relating to heat capacity 2. Accept due to H bonding between water molecules
08.2	Adenosine diphosphate **and** (inorganic) phosphate;	1	Accept ADP for adenosine diphosphate Accept Pi / PO_4^{3-} / P in a circle for inorganic phosphate Reject adenine diphosphate Reject phosphorus / P for phosphate
08.3	1. Species / organism the muscle tissue came from; **OR** Thickness / type / source of the muscle tissue; 2. Temperature of the muscle tissue / <u>ATP</u> solution / slides; 3. pH of the <u>ATP</u> solution;	2 max	1. Ignore surface area of muscle tissue 2. and 3. Need to be qualified Reject concentration / volume of ATP hydrolase

08.4	Description 1. As concentration of ATP increases, length of muscle decreases; Explanation 2. More ATP (hydrolysed by ATP hydrolase), **so** more energy released, **so** more muscle contraction / shortening of muscle;	2	1. Accept negative correlation 2. Accept more ATP available for correct/named aspect of muscle contraction 2. Idea of more is required once. 2. Reject energy produced

08.5	4.88×10^{-6} ;;; If answer incorrect **EITHER** Allow 1 mark for 0.244 Allow 1 mark for 1.22×10^{-5} **OR** Allow 1mark for 12200 / 1.525 Allow 1 mark for 0.61	3	Accept 5×10^{-6} Accept correct answer however expressed Max 2 for incorrect final answer

Question	Marking Guidance	Mark	Comments
09.1	1. (Across) alveolar epithelium; 2. Endothelium / epithelium of capillary;	2	Incorrect sequence = maximum of 1 mark
09.2	1. (The alveolar epithelium) is one cell thick; 2. Creating a short diffusion pathway / reduces the diffusion distance;	2 max	1. Reject thin membrane
09.3	**For** 1. Significantly higher concentrations of CO (compared with no smoking) with closed window (as no overlap in 2 x SD); 2. Any increase in CO could be dangerous; **OR** CO causes less oxygen to be carried / provided (which could be deadly in children); 3. (significantly) higher levels after (just) 5 minutes (with closed windows supporting short journey statement); **Against** 4. No idea if (roughly) 5ppm is 'deadly'; 5. No significant difference with open window (as 2 x SD overlaps); 6. No data on child breathing rates; **OR** Idea that children breathe faster but have smaller lung volume, **so** overall volume of CO inhaled could be similar;	4 max	1. Accept higher concentrations of CO with closed window are not due to chance 1. and 3. Idea of higher is required, not just difference 5. Accept difference with open window could be due to chance

Question	Marking Guidance	Mark	Comments
10.1	1. (Presence of) antigen of the (pathogenic) bacteria; 2. (Causes) more T cells produced / faster T cell production; 3. Against (the pathogen and) normal bacteria; 4. (Long lasting as) cells do not die / live for longer; 5. (More) cytokines / chemicals causing swelling are produced;	3 max	1. Assume bacteria are pathogenic unless otherwise stated
10.2	1. (Some people) have a mutation / allele / gene; 2. (That) increases the chances / risk / makes it more likely for / causes them to have an unusually large T cell response; **OR** (That) lowers / removes tolerance to (normal) intestinal bacteria;	2	
10.3	1. (Some people might) produce (very) large amounts of cytokine / have large amounts of swelling; 2. (That) 5-ASA drugs cannot control / reduce; **OR** 3. Some people may be allergic to / cannot tolerate 5-ASA; 4. So cannot take it;	2	Award 1 and 2 **OR** Award 3 and 4

10.4	1. (Lack of adenine and guanine) will slow / stop DNA synthesis / replication (in T cells); 2. Affects T cells **more** as they cannot recycle nucleotides; 3. (6-MP therefore) suppresses / slows the (unusually large) T cell / immune response **OR** (6-MP causes) fewer / no T cells (to be) produced; 4. (So) less cytokine is produced (and therefore less swelling);	3 max	2. Needs idea of more / greater effect. 2. Accept converse idea that 'other' cells not as affected as they can recycle nucleotides. 3. Accept (6-MP) acts as an immunosuppressant drug