OXFORD

INTERNATIONAL
AQA EXAMINATIONS

INTERNATIONAL A-LEVEL

BIOLOGY

9610

BL04 Control

Mark scheme

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196XBL04/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 oxfordaqaexams.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	Time taken to cross right atrium to AVN = 0.07 – 0.02 = 0.05 s ; Impulse appears beyond AVN after 0.16 – 0.07 = 0.09 s **or** takes 0.04 s longer ;	2	Allow 0.07 s from SAN
01.2	Allows atria to empty / to send (all) blood to ventricles/ventricles to fill ; Before ventricles (are stimulated to) contract ;	2	
01.3	Use of numbers to show electrical impulse reaches base before it reaches top of ventricles – reaches base at 0.18 s and top at 0.21 / 0.23 s or reaches base 0.03 / 0.05 s before reaching top ;	1	
01.4	Can pump all / most / maximum amount of the blood out ;	1	Allow pushes blood to arteries
01.5	Carbon dioxide ;	1	

Question	Marking guidance	Mark	Comments
02.1	1. Actin in thin filaments **and** Myosin in thick filaments ; 2. Light band / I-band = only actin / only thin filaments ; 3. Dark band / A-band = both actin / thin filaments **and** myosin / thick filaments ; 4. Except H-zone = only myosin / only thick filaments ;	4	Allow ecf in mp 2, 3 & 4 if actin and myosin incorrect filaments in mp1 (for thick and thin)
02.2	3 ;;	2	Allow 2 marks for answer in range 2.87 – 3.14 (ie $\pm$ 0.5mm on each measurement) Allow 1 mark for $\frac{\text{sarcomere length}}{\text{scale bar length}}$
02.3	88 ;;	2	Allow 2 marks for answer in range 87 – 89 Allow 2 marks for ecf from 02.2 Allow 1 mark for $\frac{80 \times \text{(02.2 answer)}}{100}$ but incorrect / no answer Allow 1 mark for 2.4 (μm) but incorrect / no answer

Question	Marking guidance	Mark	Comments
02.4	1. Rise in Ca^{2+} (in myofibril / sarcoplasm / cytoplasm) **or** release of Ca^{2+} (from sarcoplasmic reticulum/T tubule) 2. Causes movement of blocking molecules / tropomyosin to expose binding sites on <u>actin</u> / on <u>thin</u> filament 3. Allows actin-myosin interaction **or** cross-bridge formation **or** myosin head to bind ; 4. Actin / thin filament slides/pulled along myosin / thick filament ; 5. Activation of ATP-ase (on myosin) ;	4 max	Ignore Ca^{2+} entering motor neurone for release of acetylcholine Allow troponin Ignore further details re. ADP binding and recovery stroke

Question	Marking guidance	Mark	Comments
03.1	1. Maintenance of (approximately) constant/set level/norm **or** maintaining a level within restricted limits **or** maintenance of a constant internal environment ; 2. By physiological processes **or** by negative feedback ;	2	Allow examples in the context of temperature Allow by a metabolic processes
03.2	<u>Wet clothing:</u> 1. Water evaporates ; 2. (Evaporation) uses body heat / causes cooling ; <u>Dry clothing:</u> 3. Insulates / helps to retain heat **or** insulation described re. trapped air close to skin ;	3	Allow converse re. wet clothing

Question	Marking guidance	Mark	Comments
03.3	<u>Pro:</u> 1. No initial temperature drop / no delay in warming ; 2. Less risk of cardiac arrest ; 3. Steady / more gradual temperature rise ; 4. No decrease after 30 mins ; <u>Con:</u> 5. Blanket method raises (core) temperature to a higher level ; 6. Blanket method raises (core) temperature more rapidly (after 20 min) ; 7. Data for only 2 people so may not be representative / not valid **or** insufficient data for statistical test ;	4 max	For full marks must have at least one Pro and one Con Allow less risk of shock Allow may not have access to warm moist air ventilator

Question	Marking guidance	Mark	Comments
04.1	A = Sodium / Na / Na^+ **and** B = Potassium / K / K^+ ;	1	
04.2	1. Above threshold stimulation / raising potential above threshold **or** positive feedback during Na^+ entry ; 2. (Causes) Na^+ gates to open or increases permeability to Na^+; 3. Na^+ enters axon causing rising membrane potential 4. (Then) Na^+ gates close **and** K^+ gates open / increased permeability to K^+ ; 5. (So) K^+ leaves axon causing lowering of membrane potential; 6. Reference to ion movements by <u>diffusion</u> **or** down concentration gradient ;	6	Reject sodium/potassium in context of ions once only 3. Allow depolarisation / decrease in potential difference 5. Allow repolarisation / increase in potential difference

Question	Marking guidance	Mark	Comments
04.3	1. Refractory period = 4 ms ; 2. $\frac{1000}{4}$ = 250 ;	2	If no other mark, allow 1 mark for neurone cannot produce an action potential during the refractory period

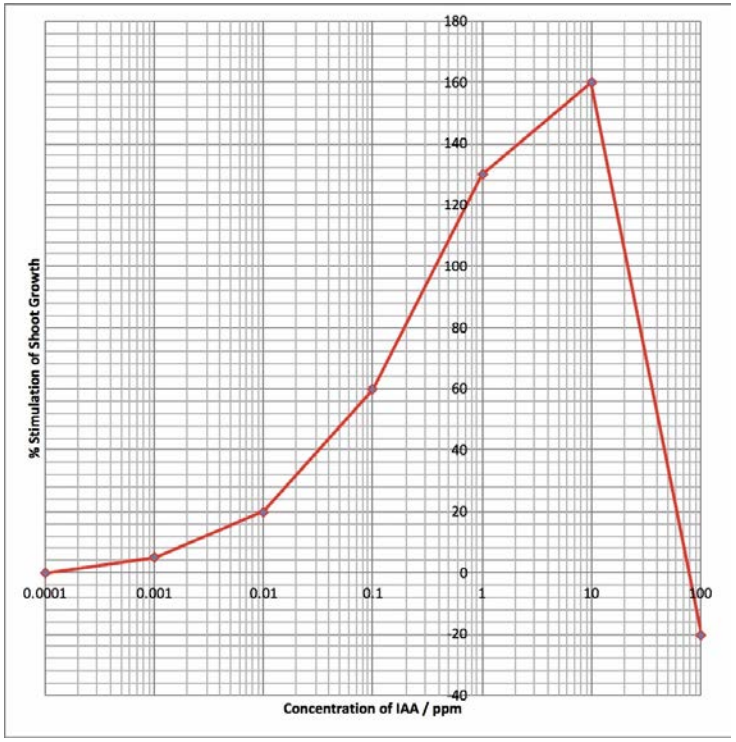
04.4	Inhibitor prevents: 1. ATP-ase breaks down/hydrolyses ATP releasing energy ; 2. (Energy) for active transport ; 3. (Transport of) Na^+ out of **and** K^+ into the axon ; 4. Restoring resting potential (for next action potential) ;	4	1. Allow reference to conformation change to active site of ATP-ase

Question	Marking guidance	Mark	Comments
05.1	1. Can kill weeds (growing with crop) without killing / harming crop ; 2. Therefore reduced competition for named factor – e.g. light / water / ions ; 3. Leading to increased crop yield ;	3	
05.2	(Base sequence) has specific shape which fits <u>active site</u> of enzyme ; **or** Base sequence / shape is complementary to <u>active site</u> of enzyme ;	1	
05.3	1. Produces complementary sticky ends ; 2. Hence the 2 pieces of DNA can <u>hydrogen bond</u> together ;	2	Allow description of sticky ends
05.4	(DNA) ligase ;	1	
05.5	Binary fission ;	1	Reject mitosis
05.6	1. Cells must have kan^r gene since not killed by kanamycin ; 2. (And) gly^r gene is joined to this / is in the same plasmid ;	2	

Question	Marking guidance	Mark	Comments
05.7	deaths correlate with % GM crops ;	1	Allow description – e.g. deaths increase as % GM crops increase ignore same / similar 'pattern'
05.8	1. lack of controls / control group ; 2. correlation does not prove a causal link ; 3. example of another factor as the cause ; 4. no evidence that kidney patients actually consumed GM crops / crops treated with glyphosate **or** no evidence about amount consumed **or** graph shows data only for maize and soya / not for other (GM) crops ; 5. could be effect of glyphosate rather than GM-crops ; 6. data have been manipulated by carefully chosen scales to make it look like they coincide ; 7. no data for the dosage of herbicide used ; 8. death rates are very low and increase only slightly ; 9. 1999-2000 % of GM crops planted decreases, but deaths from kidney disease increased **or** 2005-2007 deaths from kidney disease remained constant while % GM crops planted increased ; 10. No statistical analysis to see if correlation is significant	3 max	3. Accept obesity / infection / diet **or** better diagnosis of kidney disease as the cause of death 8. Allow use of figures – 1.4 to 2.8 per 100 000 Allow kidney disease has been around for much longer than GM crops

Question	Marking guidance	Mark	Comments
06.1	1. (Plant shoots can detect direction of light and) grow towards light / positively phototropic ; 2. The tip detects the direction of light ; 3. The region of response is (just) below/behind the tip ; 4. The response is a growth response ;	3 max	Accept: (grass shoot) bends towards the light.
06.2	(Grass) shoot with tip removed (in presence of light) **or** (Intact) shoot in complete darkness **or** (Intact) shoot with all-round light ;	1	

Question	Marking guidance	Mark	Comments
06.3	<u>Valid conclusion because:</u> 1. (From Experiment 4) Idea that shoot is (still) phototropic (when an agar block is inserted between the tip and rest of the shoot suggesting diffusion of a chemical through the agar) ; 2. (From Experiment 5) Agar block stimulated growth in (cut) shoot ; 3. (From Experiment 6) Idea that when agar block was placed asymmetrically on cut shoot, the shoot bent away from the agar block/side with agar grew more; <u>Not valid because:</u> 4. (No control so) result may be due to the agar itself;	3 max	Must include both pro and con points for full marks Idea that result is due to another factor is insufficient

Question	Marking guidance	Mark	Comments
06.4	Appropriate scale used and axes correctly labelled. IAA concentration on the x-axis. % stimulation of shoot growth on the y-axis ; Data points plotted accurately, using the logarithmic scale ; Points joined point to point ;	3	Accept -½ square to the left Reject +½ square to the right Accept if appropriate curve of best fit is drawn Reject any straight line of best fit  Accept y axis in any vertical position (at right angles to x axis) and x-axis in any position

Question	Marking guidance	Mark	Comments
06.5	1. Increasing concentrations up to approx.10 ppm stimulate growth ; 2. Higher than 10 ppm stimulates growth less ;	2	Allow correct value from graph line Allow negative effect/inhibits growth below approx. 70 ppm / correct value from graph

06.6	1. Not all plant species may respond to different IAA concentrations in the same way ; 2. Individual plant could be atypical/anomalous **or** different parts of one shoot may respond differently ; 3. Prevents the use of a statistical test to see whether effects on growth are significant ;	3	3. Reject any reference to “significant results” Allow a named and appropriate statistical test

Question	Marking guidance	Mark	Comments
07.1	<u>Figure 15 shows:</u> 1. Methylation of DNA in cancer cells is generally significantly greater than methylation in normal cells ; 2. Because (for most) $P < 10^{-2}$ / < 0.01 / < 0.05 ; <u>Figure 12 shows:</u> 3. Exposure to Cd^{2+} increases methylation of DNA ; <u>Figure 13 shows:</u> 4. Exposure to Cd^{2+} increases production of methyl transferase RNA; 5. (And therefore) increases production of methyl transferase ; 6. Which transfers methyl groups to DNA / to promoter of p16 gene ; 7. Further detail – e.g. inhibits p16 transcription / mRNA production <u>Figure 14 shows :</u> 8. Exposure to Cd^{2+} decreases production of p16 (protein) / translation of p16 <u>gene</u> ; 9. Therefore decreases suppression of tumour growth ;	5 max	6. Allow RNA polymerase cannot bind to p16 promoter