OXFORD
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INTERNATIONAL A-LEVEL

BIOLOGY

BL04 (9610)

Unit 4 Control

Mark scheme

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201XBL04/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 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.

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	Correct answer: 31.25 or 32.5;;	2	Evidence of measurement of B - C divided by 0.8 = 1 mark (Allow 25mm or 26mm for the measurement)
01.2	Correct answer: 1.56 or 1.63;;	2	Allow ecf from 01.1 156/163 gains 1 mark **OR** Incorrect significant figures gains 1 mark
01.3	Purkinje / purkyne fibres / bundle of His;	1	
01.4	1. Chemoreceptors in aorta/carotid arteries detect increase in carbon dioxide concentration; 2. Action potentials/nerve impulses to medulla/cardio acceleratory centre; 3. Increased frequency of action potentials/nerve impulses along cardiac nerve/sympathetic nerve fibres;	3	1. Allow chemoreceptors detect decrease in pH 2. Reject messages. Accept cardiovascular centre. Do not accept an impulse (once for MP2 and MP3)

Question	Marking guidance	Mark	Comments
02.1	Sodium ions actively removed/pumped out (by sodium-potassium pumps); Potassium ions diffuse (out) more rapidly (than sodium ions in) /membrane more permeable to potassium ions (than sodium ions);	2	Reject sodium/potassium once. Allow active transport by pumps. Allow Na^+/K^+ for both. Idea of more potassium sufficient for comparison.
02.2	Stretch mediated sodium gates/channels open; Sodium ions move in/membrane depolarised;	2	
02.3	125%; Correct readings from graph from 40 to 90;	2	125% scores 2 marks Allow reasonable readings divided by 40 x100 for 1
02.4	Action potentials/impulses jump from node to node/depolarisation only occurs at nodes/saltatory conduction; Fewer jumps/depolarisations needed to travel the same distance/length of axon;	2	
02.5	Greater pressure results in greater deformation of layers/membranes/lamellae in the pacinian corpuscle/more sodium channels open; Greater pressure produces a higher frequency of action potentials/impulses;	2	

Question	Marking guidance	Mark	Comments
03.1	No rods or cones/no light receptors;	1	
03.2	1. More cones at point **Y** and more rods at point **Z**; 2. Cones provide high visual acuity; 3. Each cone has its own connection to the optic nerve/brain **or** rods share connections;	2 max	
03.3	There are more rods at point **Z**; Rods are more sensitive to light than cones;	2	 Accept not seen at Y as cones need bright light
03.4	There are no/few cones **Or** Only one type of rod/rods cannot distinguish between different wavelengths/colours	1	

03.5	**Similarity** Both have three types of cells/three peaks of absorption **OR** Two types are very similar, around 445-450 nm and 525-550 nm **Difference** Human types at 590-600nm/humans can detect this wavelength and moths cannot **OR** Moth type at 350nm/moths can detect this wavelength and humans cannot;	2 max	Must have one similarity **and** one difference for 2 marks Accept blue and green Accept red and UV Accept any valid numerical comparison

03.6	Provide flowers of different colours; Count the number of visits/time spent at each flower;	2	Accept specific colours or wavelengths

03.7	Chi-squared;	1	Do not accept 'Chi test'

Question	Marking guidance	Mark	Comments
04.1	Any **two** from: 1. Light band smaller/narrower; 2. H zone is smaller/narrower; 3. Z lines closer together/sarcomere shortened; 4. More overlap between filaments;	1 max	Must have 2 differences for the mark. 1. Accept I band 2. Reject disappears 4. Allow thick filaments move inwards
04.2	Antagonistic muscle contracts;	1	
04.3	1. Reference to troponin/tropomyosin moved from binding sites by calcium ions; 2. Myosin head binds to actin; 3. Breakdown of ATP provides energy to move myosin head; 4. Myosin head moves and pulls actin past; 5. Binding of ATP releases myosin head from actin; 6. Myosin head returns to original position;	5 max	1. Reject active site 2. Accept cross bridge formation/actomyosin bridge 3. Allow ATP provides energy to re-cock myosin head 4. Accept power stroke 6. Accept “re-cocks”/ratchet mechanism

Question	Marking guidance	Mark	Comments
05.1	Any **three** from: 1. Insulin binds to specific/complementary receptors on membranes; 2. Increases the number of glucose channel proteins in membranes; 3. Increased uptake of glucose by facilitated diffusion; 4. Stimulates conversion of glucose to glycogen/fat (in liver);	3 max	 1. Reject active site 2. Accept GLUT4 3. Allow glucose concentration in liver cells reduced, so glucose diffuses in down concentration gradient 4. Accept glycogenesis/conversion to glucose phosphate/UDP glucose. Reject glucogen
05.2	13.9; 0.0139/1.39;	2	2 marks for correct answer Allow 1 mark for incorrect SF **OR** Allow 1 mark for evidence of 25 AND divided by 1800
05.3	Any **two** from: 1. Glucose used in respiration/as energy source/in metabolism; 2. Glucose enters cells/converted to glycogen/fats/amino acids; 3. Glucose excreted in urine; 4. He injected insulin;	2 max	
05.4	1. Antibody too large to fit through holes; 2. Glucose small enough to enter (through holes); 3. Insulin able to leave box (through holes);	3	Holes mentioned at least once for maximum marks

05.5	**Advantages** 1. Implant reduces need to inject insulin/produces insulin; 2. More normal diet/lifestyle; 3. (Implant not destroyed by patient's immune system) no need for immunosuppressive drugs; **Disadvantages** 1. Embryonic stem cells unethical/embryos destroyed; 2. Stem cells may not produce enough hormones/cause cancer/expensive/new technology; 3. Only tested in rats; 4. Surgery needed for transplant;	4 max	1. Allow glucose concentration more stable/kept in normal range. 1. Reject unethical unqualified

Question	Marking guidance	Mark	Comments
06.1	1. Human gene removed using restriction endonuclease (RE); 2. Same enzyme used to cut plasmid, leaving complementary sticky ends; 3. Ligases used to seal gene into plasmid;	3	
06.2	Base sequence of tetracycline resistance gene disrupted/gene cut/no longer able to produce protein/enzyme to destroy tetracycline;	1	Ignore base sequence changed
06.3	**Velvet surface** 1. Bacteria stick to it/transfer of bacteria; **Agar plate containing ampicillin** 2. Identifies bacteria with **plasmid**; 3. Bacteria without plasmid/ampicillin resistance gene killed; **Agar plate containing tetracycline** 4. Identifies which bacteria have the GM-plasmid/human gene present; 5. Bacteria with GM-plasmid/human gene killed by tetracycline;	5	2. Accept bacteria with recombinant DNA/foreign DNA 4. Allows identifies the bacteria we want
06.4	Colony present on ampicillin plate, but not on tetracycline plate;	1	

Question	Marking guidance	Mark	Comments
07.1	Large range of concentrations;	1	Ignore large numbers
07.2	**Roots:** Inhibits by 85%; **Shoots:** Stimulates by 155%;	2	
07.3	1. IAA accumulates on lower side of roots/shoots (due to gravity); 2. High concentrations stimulate cell elongation/growth on the lower side of shoots, so they grow upwards; 3. High concentrations inhibit cell elongation/growth on the lower side of roots, so they grow downwards;	3	3. Allow upper side of root grows faster due to less inhibition
07.4	Size/age/species/temperature/time;	1	Do not accept type of plant
07.5	**Against hypothesis 1** Similar amounts of IAA in dark/D/E and light/F/G; **For hypothesis 2** F has more IAA on shaded side AND total amount of IAA is similar to others;	2	
07.6	Drawing showing shoot bending to the right;	1	

07.7	Carbon/^{14}C;	1	Accept N/O/H

07.8	Ensure there is no oxygen/anaerobic conditions;	1	Allow prevent aerobic respiration

07.9	1. Processes require <u>aerobic</u> respiration; 2. Release of energy/formation of ATP; 3. For active transport;	3	1. Allows needs oxygen for respiration 2. Reject energy produced