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INTERNATIONAL A-LEVEL

BIOLOGY (9610)

BL04

Unit 4 Control

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 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 oxfordaqa.com

Mark scheme instructions to examiners

1. General

The mark scheme for each question shows:

- the marks available for each part of 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.

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 <u>not</u> 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. Sensory neurone (ending); 2. Surrounded by layers of (connective) tissue/cells/lamellae (separated by viscous gel);	2	

Question	Marking guidance	Mark	Comments
01.2	1. (Pressure) stretches/deforms the membrane/lamellae/layers of tissue; 2. Opens the (stretch-mediated) sodium ion channels **and** sodium ions diffuse/move in; 3. Inside of neurone becomes less negative **OR** (membrane) depolarises **OR** generator potential produced **OR** generates action potential/impulse in sensory neurone;	3	2. Must refer to sodium ions at least once

Question	Marking guidance	Mark	Comments
01.3	**For** 1. More/higher % PC in front of foot **so** putting it to ground helps detect rumbles/pressure **OR** front of foot more sensitive; **Against** 2. Only three elephants **so** not representative **OR** only one species of elephant **so** not representative; 3. Only one foot tested **OR** might be different in other feet; 4. Don't know if the elephant is listening **OR** elephant could (just) be resting leg; 5. Areas of foot arbitrary **OR** back/front look bigger than middle; 6. No statistical test **so** difference (in percentage/number of PC) might not be significant;	3	Must have mp 1 for full marks

Question	Marking guidance	Mark	Comments
02.1	1. Adrenaline binds to (complementary) receptors on cell membrane; 2. Activates adenyl cyclase (inside cell) which converts ATP to cAMP; 3. (cAMP) activates protein kinase; 4. (protein kinase) causes glycogenolysis **OR** hydrolysis of glycogen into glucose 5. Stimulates gluconeogenesis/described; 6. Glucose moves by diffusion/facilitated diffusion into blood	4	4. Allow phosphorylase 4. Allow glucose phosphate

Question	Marking guidance	Mark	Comments
02.2	1. Larger sample size **so** reduces effect of outliers/chance (variation) **OR** Larger sample size **so** can calculate more reliable <u>mean</u>; 2. (All patients) eat the same/no food before both appointments **as** some foods (contain more sugar so) increase blood glucose level more; 3. All patients) allow same length of time after eating before appointment **so** same amount of time to remove sugar; 4. Put in **L** and **L+A** at first appointment at random **to** (idea of) prevent previous experience of tooth removal influencing stress level; 5. Similar size/position of tooth removed **as** (idea of) difficulty of removing tooth could impact stress level; 6. Measure blood glucose level at set times after being given **L+A**/adrenaline/drugs **as** time after **L+A**/adrenaline/drugs would affect blood glucose concentration;	2	1. Allow representative/accurate/significantly different 1. Ignore valid 5. Allow example, eg molar

Question	Marking guidance	Mark	Comments
02.3	1. With **L** blood glucose normal before and after tooth extraction but with **L+A** above normal during and after **OR** only normal before; 2. With both **L** and **L+A** see increase in blood glucose above normal during tooth removal; 3. With **L** blood glucose returns to normal after but with **L+A** still above normal; 4. With **L** blood glucose similar at 15 and 30 minutes after but **L+A** is higher at 15 minutes than at 30 minutes **OR** is reducing by 30 minutes; 5. Maximum blood glucose concentration higher for L+A;	3 max	

Question	Marking guidance	Mark	Comments
02.4	1. (Patients with diabetes) blood glucose levels would not be brought down (quickly)/likely to stay higher than normal; 2. High blood glucose lowers blood water potential, so water moves out of cells by osmosis (causing dehydration);	2	Accept other symptoms of hyperglycaemia eg blurred vision

Question	Marking guidance	Mark	Comments
02.5	1. Acts on sympathetic neurones to send (more) impulses to SAN/pacemaker **OR** (More) binds to (receptors on) SAN/pacemaker; **OR** Opens (more) calcium ion channels; 2. Increases impulses (to atria which increases heart rate);	2	

Question	Marking guidance	Mark	Comments
03.1	P - Nucleus Q - Axon R - Dendrite S - Node of Ranvier	2	4 correct labels = 2 marks 3 correct labels = 1 mark 0, 1 or 2 correct labels = 0 marks

Question	Marking guidance	Mark	Comments
03.2	1. Mitochondria release ATP (by aerobic respiration); 2. ATP needed for (active) transport of (3) Na^+ out and (2) K^+ in;	2	

Question	Marking guidance	Mark	Comments
03.3	Arrange numbers in order of (increasing) size/from smallest to largest then pick middle value;	1	

Question	Marking guidance	Mark	Comments
03.4	1. As frequency (of stimulation) increases more mitochondria move; 2. As frequency (of stimulation) increases the mitochondria move faster;	2	

Question	Marking guidance	Mark	Comments
03.5	1. Only tested low and high frequencies **OR** don't know what happens between (tested frequencies); 2. Only tested on mice **so** might not be representative; 3. Only tested myelinated neurones; 4. (Idea of) did not measure ATP/energy release **OR** do not know how much ATP/energy neurone needs 5. (Idea of) unclear where mitochondria moving to **OR** mitochondria may not be moving to where energy needed **OR** (Idea that) energy needed to move mitochondria; 6. No statistical test **so** do not know if differences are significant	2	4. Accept Mitochondria could be different sizes

Question	Marking guidance	Mark	Comments
04.1	Forms the sugar-phosphate backbone **OR** joins nucleotides to each other (by phosphodiester bonds);	1	Do not allow forms H-bonds between strands

Question	Marking guidance	Mark	Comments
04.2	To break H-bonds **OR** to separate strands;	1	Allow to denature the DNA

Question	Marking guidance	Mark	Comments
04.3	Optimum temperature for DNA polymerase;	1	

Question	Marking guidance	Mark	Comments
04.4	(DNA) Nucleotides;	1	

Question	Marking guidance	Mark	Comments
04.5	67;;	2	1 mark for 27 (did not use 3 steps per cycle) 1 mark for 60 (forgot to add additional 7 minutes) 1 mark for 4020 (in seconds not minutes)

Question	Marking guidance	Mark	Comments
04.6	**Agree** 1. *Pwo* gives highest score at all blood concentrations; 2. *Pwo* band score only lowered when blood concentration is 20%/high **Disagree** 3. Band scoring is subjective; 4. Strength of band could depend on other conditions, eg room temperature, time for gel to run; 5. (Idea that) *Taq/HiF* might work better than *Pwo* if sample contaminated with substances other than red blood cells; 6. Cost of each polymerase could vary; 7. Only 3 polymerase enzymes tested;	3 max	Must have at least one agree for full marks

Question	Marking guidance	Mark	Comments
04.7	1. Primer provides a (short) starting sequence for (DNA) polymerase to join nucleotides to **OR** (DNA) polymerase can only join bases to existing chain/cannot start a chain **OR** Primer marks the start (for polymerisation); 2. A primer stops the separated strands of DNA joining back up (with each other);	2	

Question	Marking guidance	Mark	Comments
04.8	**In support** 1. (At 52 °C) more mass DNA than at any other temperature; **Against** 2. True maximum could be higher than 48 °C but lower than 56 °C **OR** Intervals are large at 4^{o}C **OR** Test intervals of 1 or 2^{o}C; 3. Mass of DNA produced could be affected by other factors such as primer concentration **OR** number of PCR cycles **OR** use of different polymerase **OR** pH **OR** temperature of other stages;	3	

Question	Marking guidance	Mark	Comments
05.1	1. Gravity causes auxin/IAA to settle on lower side of root and on lower side of shoot; 2. (High) auxin/IAA stimulates growth/cell elongation of shoot but inhibits growth/cell elongation in root; 3. Lower side of shoot grows more; 4. Lower side of root grows less;	4	

Question	Marking guidance	Mark	Comments
05.2	1. Conditions to exclude effect of light eg plants on side in light compared to plants on side in dark **OR** Repeat the experiment in the dark to compare with **Figure 7**; 2. Leave for set time and compare appearance of plants; 3. (Idea of) Replicates/repeat 3x (or more); 4. One (relevant) control variable, eg type of plant/water content/temperature/humidity/pH of soil/minerals in soil/age of plant;	3 max	1. Ignore attempts to exclude gravity

Question	Marking guidance	Mark	Comments
06.1	Maintaining (approximately) constant internal environment (despite a changing external environment);	1	

Question	Marking guidance	Mark	Comments
06.2	1. Sweating results in water loss reducing total blood volume; 2. Low blood volume detected by receptors; 3. So more hormone released causing kidney to reabsorb more water; 4. Once blood volume back to normal no/less release of the hormone;	3	

Question	Marking guidance	Mark	Comments
06.3	1660-1671;;;	3	1 mark for correct BMI (24.6875–25) 2 marks correct total blood volume (4150–4176) (forgot 40%) If BMI incorrect 1 mark for correct total blood volume using incorrect BMI 2 marks for correct 40% using incorrect BMI If BMI correct, but total blood volume incorrect 2 marks for correct 40%

Question	Marking guidance	Mark	Comments
06.4	1. Blood clotting is positive feedback as variable is moved away from set point/change is amplified 2. Blood volume is negative feedback as variable is moved back to set point/change is reduced;	2	If no other marks allow 1 mark for **Figure 8** is negative feedback and **Figure 9** is positive feedback

Question	Marking guidance	Mark	Comments
07.1	1. (Step 1) Epidermis is thin so light will pass through for microscopy **OR** Lower epidermis is where (most) stomata are; 2. (Step 2) Light ensures stomata are open before treatments;	2	

Question	Marking guidance	Mark	Comments
07.2	1. With ABA the stomata close 2. With ABA + inhibitor of NO, the stomata stay open/do not close as much as ABA alone;	2	

Question	Marking guidance	Mark	Comments
07.3	1. (In normal plants) Increasing concentration of ABA causes stomata to close more; 2. (In normal plants) Significant difference/decrease in size of opening at 10 (and 50) μmol dm^{-3} of ABA compared with at (0, 0.1) 1.0 μmol dm^{-3} of ABA); 3. (In plants with mutation) Stomata do not close/no significant difference in size of stomata at any concentration of ABA; 4. In normal plants 1.0 (and higher) μmol dm^{-3} of ABA decreases stomatal opening significantly compared to plants with mutation;	4	

Question	Marking guidance	Mark	Comments
07.4	1. (Treatment) ABA + nitrite; 2. (Result) Stomata open;	2	

Question	Marking guidance	Mark	Comments
07.5	1. (10 μmol dm^{-3}) is the (lowest) concentration that causes significant decrease in size of stomatal opening;	1	

Question	Marking guidance	Mark	Comments
07.6	As a control to show the effect of ethene **OR** As a control to show that ABA has the expected effect (of closing the stomata in this system/at this dose in this time period);	1	

Question	Marking guidance	Mark	Comments
07.7	1. Ethene inhibits/reduces the effect of ABA on stomatal closing; 2. Ethene works rapidly/within 5 mins and effect remains same for at least 30 min; 3. Ethene added externally is not as effective/doesn't stop the stomata closing by as much **OR** allows the stomata to close more (than that produced inside plants with mutation) **OR** Plants with mutation produce more ethene than the concentration given;	2 max	

Question	Marking guidance	Mark	Comments
07.8	Stops stomata shutting completely/quite as much **so** still let CO_2 in for photosynthesis **OR** Stops stomata shutting completely/quite as much **so** let in O_2 for respiration;	1	Allow Stops stomata shutting completely/quite as much **so** permits gas exchange