

**OXFORD**

INTERNATIONAL  
AQA EXAMINATIONS

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# INTERNATIONAL A-LEVEL BIOLOGY

## **BL04 (9610)**

Unit 4 Control

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Mark scheme

January 2023

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Version: 1.0 Final



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Question	Marking guidance	Mark	Comments
01.1	1. Movement towards <b>OR</b> away from; 2. A chemical (stimulus);	2	2. Ignore examples

Question	Marking guidance	Mark	Comments
01.2	Dots moved towards/along length of green alga filament;	1	

Question	Marking guidance	Mark	Comments
01.3	1. Alga (photosynthesise) producing oxygen; 2. Bacteria (are aerobic so) move towards the oxygen; 3. Need oxygen for respiration;	3	3. Allow substance named in mp2

Question	Marking guidance	Mark	Comments
01.4	(Light is uncontrolled variable) Bacteria could be phototactic/be moving towards/away from light (rather than showing chemotaxis); <b>OR</b> (Temperature is uncontrolled variable) Slide is dried out killing the alga and/or bacteria;	1	Naming the uncontrolled variable alone is not enough Allow increased light intensity causes increased oxygen production causes increased movement  Allow increased temperature caused the bacteria to move faster (to same position as without lamp on)

Question	Marking guidance	Mark	Comments
01.5	(rapid) involuntary/automatic response (to a stimulus);	1	

Question	Marking guidance	Mark	Comments
01.6	Receptor → sensory neurone → relay neurone → motor neurone → Effector;	1	

Question	Marking guidance	Mark	Comments
02.1	So direction of light does not affect the direction of growth; <b>OR</b> so gravity is the only stimulus;	1	Allow so only one variable affecting growth

Question	Marking guidance	Mark	Comments
02.2	(Positive) (Geo)tropism/(gravi)tropism;	1	Do not accept incorrect qualification

Question	Marking guidance	Mark	Comments
02.3	1. Gravity causes auxin/IAA to settle on lower side of root; 2. (High) auxin/IAA inhibits growth/cell elongation of root; 3. Upper side of root grows more/more cell elongation (so root bends down) <b>OR</b> Lower side of root grows less/less cell elongation (so root bends down);	3	

Question	Marking guidance	Mark	Comments
02.4	1. Water and gravity in same direction so don't know which is having effect <b>OR</b> Testing more than 1 variable (water and gravity) at same time; 2. Only 1 seed/may be anomalous/no replicates; 3. Only testing mustard seeds/1 species/type /may not be true for all species;	3	1. Allow other <u>named</u> uncontrolled variables, eg minerals in soil

Question	Marking guidance	Mark	Comments
02.5	1. ( <b>P</b> and <b>R</b> show mustard and cucumber) roots grow towards source of gravity; 2. ( <b>Q</b> shows) mustard roots grow towards the water; <b>OR</b> ( <b>S</b> shows) cucumber roots do not grow towards the water; 3. Cucumber seeds more sensitive to gravity than direction of water; <b>OR</b> Mustard seeds more sensitive to direction of water than to gravity; <b>OR</b> Mustard seeds equally sensitive to direction of water as to gravity;	3	Allow geotropism/hydrotropism throughout  3. Allow cucumber seeds insensitive to direction of water

Question	Marking guidance	Mark	Comments
03.1	Any two from: Too much insulin taken; Not enough food eaten/meal late; (Too much) exercise; Stress/high alcohol intake;	2 max	

Question	Marking guidance	Mark	Comments
03.2	2;;;	3	1 mark for $4 \times 0.22/0.88$ ie how much in 1 tablet, 1 mark for $4.7-3.6/1.1$ ie how much needed to raise it. 2 marks for 1.25 2 marks for 3 tablets as still in normal range (failed to read minimum)

Question	Marking guidance	Mark	Comments
03.3	1. (Glucagon) binds to receptors on (cell surface of) target cells/liver cells; 2. Activates enzymes; 3. (Enzymes) Convert glycogen to glucose / glycogenolysis; 4. (Enzymes) Convert glycerol / amino acids into glucose / gluconeogenesis;	4	2. Allow correctly named enzymes 3. Allow glucose phosphate 4. Allow fats/proteins

Question	Marking guidance	Mark	Comments
03.4	Negative feedback;	1	

Question	Marking guidance			Mark	Comments
04.1	Temp / °C	Time / s	Reason why this temperature is needed	3	Allow denature DNA
	95	30	(High temperature) to break H-bonds (between strands)/to separate the DNA strands;		
	55	45	To allow primers to anneal/bind (so that nucleotides can be attached);		
	72	90	(Optimum temperature) for DNA/Taq polymerase to (join nucleotides to) make new DNA strand/form phosphodiester bonds;		

Question	Marking guidance	Mark	Comments
04.2	55 minutes;;	2	Allow 1 mark for 3300 (seconds) Allow 1 mark for showing it needs 20 cycles

Question	Marking guidance	Mark	Comments
04.3	1. C (complementary) base pairs with G (so has 3 hydrogen bonds); 2. More H-bonds requires longer to break them all	2	

Question	Marking guidance	Mark	Comments
04.4	To prevent contamination of the sample with DNA from the scientist;	1	Contamination alone is not enough



Question	Marking guidance	Mark	Comments
05.1	1. To allow comparison; 2. (as) the sizes of the retinas are different in the different species;	2	Allow idea becomes too many to count if area bigger for 1 mark

Question	Marking guidance	Mark	Comments
05.2	76800;	1	

Question	Marking guidance	Mark	Comments
05.3	As the maximum depth of water these fish are found at increases the mean number of rod cells in their retinas increases;	1	Allow positive correlation Allow ratio of rods:cones increases

Question	Marking guidance	Mark	Comments
05.4	1. (Strong) positive <u>correlation</u> ; 2. P value (very much) less than <u>0.05</u> so correlation is significant / not due to chance;	2	

Question	Marking guidance	Mark	Comments
05.5	1. Cone cells contain different pigments; 2. Each pigment absorbs (range of) different wavelengths;	2	

Question	Marking guidance	Mark	Comments
05.6	1. Light can't penetrate deep into sea/light intensity too low (in sea); 2. Need bright light to stimulate cone cells <b>OR</b> rod cells function at low light intensity;	2	

Question	Marking guidance	Mark	Comments
05.7	(Yes), 1. These fish have high proportion of rod cells; 2. Rod cells give black and white image/cannot differentiate colour; (No), 3. These fish have some cone cells so can see colour; 4. Depth given is maximum so might spend most of time in less deep water so could see colour; 5. Only 6 species; 6. Sample size unknown;	4 max	Must give at least 1 yes and 1 no

Question	Marking guidance	Mark	Comments
05.8	U has more cones/lives in shallower water so more likely to differentiate colour;	1	

Question	Marking guidance	Mark	Comments
06.1	Point where <u>motor</u> neurone meets (a skeletal) muscle (fibre/tissue/cell);	1	

Question	Marking guidance	Mark	Comments
06.2	<ol style="list-style-type: none"> <li>1. ACh diffuses across the synapse;</li> <li>2. Binds to (complementary shaped) receptors/sodium ion channel (protein) on post-synaptic membrane/muscle fibre;</li> <li>3. Opens sodium ion channels/sodium ions enter which sets up action potential/depolarises (post-synaptic membrane/muscle fibre);</li> </ol>	3	

Question	Marking guidance	Mark	Comments
06.3	<ol style="list-style-type: none"> <li>1. Succinylcholine (has similar shape to acetylcholine so) binds/fits to ACh receptors/depolarises post-synaptic membrane;</li> <li>2. But succinylcholine will not fit into active site of acetylcholinesterase, so not broken down/remains bound to receptor;</li> <li>3. Post-synaptic membrane remains depolarised/membrane does not return to resting potential/cannot generate (new) action potential/respond to subsequent ACh/impulses (so muscle stays relaxed);</li> </ol>	3	<p>Allow</p> <ol style="list-style-type: none"> <li>2. Succinylcholine binds/fits into active site of acetylcholinesterase/blocks active site/is competitive inhibitor;</li> <li>3. ACh cannot bind so cannot cause muscle contraction;</li> </ol>

Question	Marking guidance	Mark	Comments
07.1	(For) 1. BSO increases the number of cells in apoptosis/dying (so might kill cancer cells); 2. (Increases apoptosis/cell death so) works in <u>human</u> cells; 3. BSO used for thousands of years so side effects known/not toxic overall; (Against) 4. Only tested on breast cancer cells/might only work on breast cancer; 5. Might kill non-cancerous cells; 6. Cells in culture so might not be the same as in the body; 7. Maximum dose does not kill all cancer cells/may only reduce rate of growth;	4 max	

Question	Marking guidance	Mark	Comments														
07.2	1. Reduces viability/kills both/different kinds of cancer cells; 2. Quote suitable values for 5 and 10 $\mu\text{mol dm}^{-3}$ for either breast cancer or leukaemia from graph; <b>OR</b> The higher the dose, the lower the viability;	2 max	<table border="1"> <tr> <td></td> <td colspan="2">Dose of TQ</td> <td rowspan="3">Example values (for mp2)</td> </tr> <tr> <td></td> <td>5</td> <td>10</td> </tr> <tr> <td>Breast cancer cells</td> <td>0.60</td> <td>0.27</td> </tr> <tr> <td>Leukaemia cells</td> <td>0.65</td> <td>0.35</td> <td></td> </tr> </table>		Dose of TQ		Example values (for mp2)		5	10	Breast cancer cells	0.60	0.27	Leukaemia cells	0.65	0.35	
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Question	Marking guidance	Mark	Comments
07.3	mRNA shows if (onco)gene is transcribed/switched on/active; <b>OR</b> mRNA is needed to make enzymes/proteins for cell division;	1	

Question	Marking guidance	Mark	Comments
07.4	1. TQ reduces mRNA production (compared with control) for all 3 genes; 2. Highest dose reduces it most for all 3 genes; 3. TQ causes most reduction in DNMT1 <b>OR</b> TQ causes least reduction in HDAC1 (at each dose); 4. Double the TQ dose reduces mRNA production by (approx) half for all genes; 5. Error bars do not overlap so suggests <u>differences</u> are significant/not due to chance;	3 max	5. Allow standard deviation bars

Question	Marking guidance	Mark	Comments
07.5	1. (Less mRNA from UHRF1 means less protein) so DNMT1 gene is not expressed/switched on; 2. (So less mRNA from DNMT1 gene so) less DNA methyltransferase enzyme made; 3. Less methylation of the tumour suppressor gene; 4. (So transcription factors/RNA polymerase can bind) so tumour suppressor gene is expressed preventing uncontrolled growth of cells/tumour formation;	3 max	

Question	Marking guidance	Mark	Comments
07.6	1. (Enzyme) deacetylates histones; 2. Tumour suppressor gene is not transcribed/is switched off (so cells divide uncontrollably);	2	