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BIOLOGY

BL04 (9610)

Unit 4 Control

Mark scheme

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Question	Marking guidance	Mark	Comments
01.1	1. Dendrons/dendrites; 2. Myelin (sheath);	2	1. Reject axon 2. Allow Schwann cells 2. Allow myelinated neurone

Question	Marking guidance	Mark	Comments
01.2	1. (Increased permeability to sodium ions as) sodium (ion) channels/gates open; 2. Sodium ions diffuse in and cause depolarisation / inside (of neurone) becomes less negative / becomes positive / increase in membrane potential; 3. (Decreased permeability of sodium ions and increased permeability of potassium ions as) sodium (ion) channels/gates close and potassium (ion) channels/gates open; 4. Potassium ions diffuse out and cause repolarisation / inside (of neurone) becomes less positive / more negative / decrease in membrane potential;	4	2 & 4. Reference to ions or Na ⁺ and K ⁺ is required. If the answer doesn't mention ions penalise just once. 2. Ignore movement of ions into the membrane 2 & 4. Allow movement for diffusion 4. Allow hyperpolarisation for repolarisation

Question	Marking guidance	Mark	Comments
01.3	233;;	2	Answer involves: • Readings from graph • Calculation (time ÷ duration of refractory period) • Conversion of units • Answer to the nearest whole number Each incorrect step negates one mark

Question	Marking guidance	Mark	Comments
01.4	1. Action potential can only pass to the next region that is polarised/at resting potential; 2. (Action potential cannot pass backwards as) membrane not permeable to sodium ions / sodium (ion) channels/gates are closed/unresponsive to another stimulus;	2	1. Allow action potentials can only pass from an active region to a resting region

Question	Marking guidance	Mark	Comments
02.1	Idea of transfer/carry a gene from one organism to another OR Idea of transfer/carry a gene into yeast/cells;	1	

Question	Marking guidance	Mark	Comments
02.2	1. Restriction enzyme cuts (bacterial) chromosome to remove (PETase) gene; 2. Cuts (PETase) gene and plasmid with the <u>same</u> restriction endonuclease; 3. Creates complementary sticky ends/(overhanging) ends with complementary single strands; 4. DNA ligase to anneal/join the plasmid and (PETase) gene OR DNA ligase forms phosphodiester bonds between the plasmid and (PETase) gene;	4	1. Accept DNA/recognition sequence for chromosome 4. Reject reference to formation of hydrogen bonds 4. Reject reference to phosphodiester bonds between (complementary) bases

Question	Marking guidance	Mark	Comments
02.3	Suitable suggestions eg could produce (more) PETase so faster/more breakdown of plastic waste/less plastic in landfill OR could survive better in natural conditions (outside of laboratory) so can breakdown plastic waste in the environment;	1	

Question	Marking guidance	Mark	Comments
03.1	Any one from: 1. Concentration/volume of anethole/caryophyllene; 2. Conditions that the beetles are stored in before the start of the experiment; 3. Age/sex of the beetles; 4. Volume of water/solution;	1 max	1. Ignore amount 1. Accept chemical(s) for anethole/caryophyllene; 1. Accept volume of solutions 3. Ignore species of beetle Ignore pH, carbon dioxide/oxygen concentration, humidity

Question	Marking guidance	Mark	Comments
03.2	Any one from: 1. Idea of behaviour of the beetle would be typical of that condition; 2. Insects no longer affected by handling;	1 max	

Question	Marking guidance	Mark	Comments
03.3	1. Beetles will move slower in the control area; 2. They will turn less frequently in the control area;	2	1 & 2. Allow converse 1 & 2. Needs to be comparative

Question	Marking guidance	Mark	Comments
03.4	For - Significantly lower (mean) time for anethole compared to the control for concentrations above 0.01 g OR Significant difference between anethole and control for concentrations above 0.01 g; - Significantly lower (mean) time for caryophyllene compared to the control for concentration of 1 g; OR No significant difference in (mean) time between caryophyllene and control at concentration of 0.1 g; - Correct statement made about probability and chance OR Correct statement made about overlapping / non-overlapping error bars; - At equal concentration(s) (between the two chemicals) eg 0.1 g / 1 g anethole had lower (mean) time than caryophyllene; Against - Only under experimental conditions in the laboratory/choice chamber; - Only used 30 insects / small sample size; - Only investigated one species; OR Might find different responses from other species of insects; - Possible effect on food eg taste/toxicity;	5 max	- eg probability of the difference between anethole and control due to chance is less than 0.001 / 0.1% - Reject reference to significant/non-significant results - Accept correct use of data to illustrate this point - Accept only observed behaviour for a short period of time/10 minutes - Allow, no information about the cost of either chemical

Question	Marking guidance	Mark	Comments
04.1	Any two from the following: 1. Wavelength/duration of light; 2. Concentration of mineral ions; 3. Volume of water given; 4. Humidity;	2 max	Ignore temperature / light intensity / number of shoot tips / age/type/species of shoots / pH / carbon dioxide/oxygen concentration

Question	Marking guidance	Mark	Comments
04.2	1. IAA produced in the shoot tip; 2. (If shoot tips not removed) would affect the IAA concentration OR Idea that the (shoot) length/growth would be affected by existing IAA present in the shoot tissue OR Idea that the (shoot) length/growth is only affected by the added IAA solutions;	2	1 – 2. Accept auxin for IAA 1. Accept source/release for produced but ignore contains/stores IAA 2. Accept would affect the independent variable but ignore affects the results

Question	Marking guidance	Mark	Comments
04.3	1. To prevent/reduce evaporation (of water from the seedlings/IAA solution); 2. So the concentration of IAA solution is not changed OR So the water potential of the solution is not changed;	2	Ignore references to avoid contamination or to avoid shoots drying out 2. Accept evaporation would change the concentration of the (IAA) solution/water potential of the (IAA) solution

Question	Marking guidance	Mark	Comments
04.4	Idea that the (IAA) concentrations used are over a large range;	1	Allow the idea of fitting all the data into a single graph

Question	Marking guidance	Mark	Comments
04.5	1. As the IAA concentration increases the higher/greater the mean change in length; 2. IAA stimulates shoot cell elongation;	2	1 & 2. Accept auxin for IAA 2. Do not allow cell divisions or mitosis

Question	Marking guidance	Mark	Comments
05.1	18.75 – 20;;	2	One mark for: • (440 to 460 – 140) ÷ 16 • 27.5 to 28.75 and 8.75 • (540 to 560 – 240) ÷ 16

Question	Marking guidance	Mark	Comments
05.2	2.81×10^{14} ;;	2	One mark for: • incorrect answer but shows 48 divisions / 384 divided by 8 • correct answer not to 3 significant figures

Question	Marking guidance	Mark	Comments
05.3	Any one from the following: 1. (Measurement of volume accounts for) tumours of different depths; 2. Volume considers depth; 3. Tumours are 3D;	1	2. Accept converse

Question	Marking guidance	Mark	Comments
05.4	1. siRNA bind to mRNA (produced from target gene(s); 2. (Gene not expressed so) protein not produced OR mRNA is broken down (into fragments); 3. Leads to increased cell death/apoptosis of tumour cells so reduces volume of the tumour (compared to control) / reduces the growth of tumour;	3	

Question	Marking guidance	Mark	Comments
05.5	1. Increased methylation/hypermethylation (of the tumour suppressor gene) OR Methyl groups added (to the tumour suppressor gene); 2. Transcription of the (tumour suppressor gene) is inhibited; 3. Leads to uncontrolled cell division;	3	2. Accept transcription factor unable to bind (to the (promotor region of the gene)

Question	Marking guidance	Mark	Comments
06.1	Answer in range of 28,800 – 30,000;;	2	One mark for: - incorrect answer but clearly shows measured width by actual width - incorrect calculation but with correct conversion of units

Question	Marking guidance	Mark	Comments
06.2	Any two from the following: - Length of the sarcomere decreases; - Length of the H zone decreases; - Length of the I band decreases; - Z-lines move closer together;	2 max	Maximum one mark if answer refers to decrease in the length of the A band 2. Accept greater proportion of the A band appears darker

Question	Marking guidance	Mark	Comments
06.3	40 (nm);	1	

Question	Marking guidance	Mark	Comments
06.4	(Phosphocreatine) donates phosphate / phosphorylates (ADP); - Produces ATP;	2	1. Reject phosphorus but accept P _i

Question	Marking guidance	Mark	Comments
06.5	Any five from the following: For 1. Decreased mean force of contraction (at pH 6.2) for both fast and slow fibre (at 15 °C and 30 °C); 2. No overlap in SD bars (between pH 7 and pH 6.2) for slow fibres at 15 °C so (likely to be) a significant difference; Against 3. Overlapping of SD bars (between pH 7 and pH 6.2) for slow fibres at 30 °C so not (likely to be) a significant difference; OR Overlapping of SD bars (between pH 7 and pH 6.2) for fast fibres (at 15 °C and 30 °C) so not (likely to be) a significant difference; 4. Only four rats used/small sample size; 5. Only used (muscle tissue from) rats; 6. Only pH 7 and pH 6.2 / only two pH values investigated OR Only 15 °C and 30 °C / only two temperatures investigated; 7. Only used isolated muscle tissue/skeletal muscle tissue; 8. No statistical test to check if differences are <u>significant</u>;	5 max	To gain full marks answer must include points from both for and against 2 & 3. Reject if reference to significant/non-significant results 4. Only one investigation

Question	Marking guidance	Mark	Comments
06.6	1. Less tropomyosin moves away from the binding sites on actin; 2. Less (actinomyosin) cross bridges form; 3. Less activation of ATPase so less movement of actin over myosin;	3	1 – 3. Don't allow reference to 'no' but penalise only once 1. Allow less calcium ions bind to troponin so (more) binding sites on actin stay blocked 1. Instead of 'moves away', accept changes shape

Question	Marking guidance	Mark	Comments
07.1	So insulin release/concentration will be low; OR So blood glucose concentration will be low/within normal range/similar for all mice; OR So that measurements are not affected by any food recently eaten;	1	Do not accept so mice have zero blood glucose concentration

Question	Marking guidance	Mark	Comments
07.2	Any three from: 1. CD group peaks at the lowest concentration / has the lowest concentration throughout / has the lowest concentration at the end / has the slowest increase in concentration; 2. CD group decrease in concentration started sooner/after 30 minutes / decreases the most; 3. HSHF group peaks at the highest concentration / has the highest concentration throughout / highest concentration at the end / has the fastest increase in concentration; 4. HS and HF groups concentration is similar (in pattern throughout);	3 max	2. The other groups decrease in concentration later eg HSHF decreases from 45 minutes

Question	Marking guidance	Mark	Comments
07.3	1. Insulin secreted (into blood) by pancreas; 2. Insulin binds to receptors; 3. Causes an increase in the number of channel proteins/opens channel proteins (in surface membrane of target cells) so (increased) glucose uptake; 4. Enzymes activated that convert glucose to glycogen/fat (in liver/muscle cells); OR Causes an increase in the respiratory rate (of cells);	4	1. Allow from beta cells/islets of Langerhans; 3. Allow increased permeability to glucose but must indicate movement into cells 3. For channel proteins allow carrier/transport proteins 4. Allow reference to glycogenesis

Question	Marking guidance	Mark	Comments
07.4	1. Glucagon caused the fastest/greatest/75% decrease in glycogen remaining; 2. Increased concentration of Cpd 1 gave a higher percentage of remaining glycogen; OR Increased concentration of Cpd 1 causes a lower percentage decrease in the remaining glycogen; 3. 50 μm Cpd 1 the percentage of glycogen remaining stayed (relatively) the same/around 100% throughout/had the lowest rate of decrease; 4. After 20 minutes the rate of decrease slows (for all 4 groups);	3	Must include correct data for 3 marks 2. Accept converse 3. Accept slight decrease after 10 minutes

Question	Marking guidance	Mark	Comments
07.5	1. (Cpd 1 binds to same receptors as glucagon so) less glucagon attaches; 2. Less adenyl cyclase activated to convert ATP to cAMP; 3. (Less cAMP) so less protein kinase activated; 4. Less <u>hydrolysis</u> of glycogen to glucose; OR Less glycogenolysis;	4	1 – 4. Don't allow reference to 'no' but penalise only once 2. Ignore less adenyl cyclase produced 4. Reject reference to glycogenesis