

**INTERNATIONAL AS  
BIOLOGY (9610)  
BL02**

Unit 2 Biological Systems and Disease

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Mark scheme

June 2024

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Question	Marking guidance	Mark	Comments
01.1	Any 2 from: 1. Gas-exchange/respiratory (system); 2. Digestive (system); 3. Reproductive (system); 4. Excretory (system);	2 max	4. Accept urinary (system)

Question	Marking guidance	Mark	Comments
01.2	1. Receptors; 2. Engulfed; 3. Lysosomes; 4. Lysozyme / hydrolytic enzymes;	4	1. Accept (glyco)proteins 2. Accept taken up by endocytosis 4. Accept any correct named enzyme

Question	Marking guidance	Mark	Comments
01.3	1. Helper T cells activate B cells/phagocytes; 2. Cytotoxic T cells/T killer cells – kill infected/abnormal host cells; 3. B cells/plasma cells secrete antibodies; 4. Memory cells (stay in circulation) for secondary response / faster response; 5. Antigen presenting cell – present antigens for T/B cell to bind to;	3 max	1 or 2 Accept T cells unqualified for cell-mediated immunity (once only) 3. Accept B cells for humoral immunity  Accept other named cell types with correct function

Question	Marking guidance	Mark	Comments
01.4	1.15;;	2	Accept 115 or 0.00000115 or $515 \div (4.47 \times 10^8)$ for <b>one mark</b> Accept 1.2 for <b>two marks</b>

Question	Marking guidance	Mark	Comments
01.5	1. Most cases are mild/low risk of serious illness/death so vaccine uptake likely to be low; 2. (Idea of) high cost to company / hard to make a profit	1 max	1. Ignore only 1% develop meningitis unless qualified

Question	Marking guidance	Mark	Comments
02.1	1. <u>Stylet</u> ; 2. Into phloem; 3. Pressure forces sap into aphids;	3	

Question	Marking guidance	Mark	Comments
02.2	Any <b>one</b> from Sucrose; Amino acid;	1	Accept suitable named soluble organic molecule Ignore sugar/carbohydrate

Question	Marking guidance	Mark	Comments
02.3	<b>2 marks</b> for calculated size of <u>both</u> trichomes or gives difference in length;; <b>1 mark</b> for states non-glandular/N longer than glandular/G;	2	

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Question	Marking guidance	Mark	Comments
02.4	<p><b>For</b></p> <p>1. Varieties with G trichomes OR both types of trichomes have low numbers of aphids;</p> <p>2. XT4 has the most G trichomes and lowest number of aphids;</p> <p><b>Against</b></p> <p>3. Variety with most total trichomes/XT1 has most aphids</p> <p>OR</p> <p>Varieties with most/only N OR no G trichomes have most/more aphids;</p> <p>4. Some varieties have similar numbers of aphids but different numbers of trichomes;</p> <p>5. WT has least trichomes but is resistant;</p>	2 max	<p>1. Accept WT or XT3 or XT4 or XT6 for varieties</p> <p>3. Accept CT, XT1 or XT2 or XT5 for varieties</p> <p>4. Accept any 2 from WT, XT3, XT4 or XT6</p>

Question	Marking guidance	Mark	Comments
02.5	<p>1. Total and N show weak (positive)/no correlation</p> <p><b>OR</b></p> <p>G shows (strong) negative correlation;</p> <p>2. Total and N have P-values &gt;0.05 / of 0.5 and 0.08 so correlation not significant / likely due to chance</p> <p><b>OR</b></p> <p>G has P-value &lt;0.05/0.04 so correlation significant or correlation unlikely due to chance;</p>	2	Do not accept results are due to chance

Question	Marking guidance	Mark	Comments
03.1	(Most) mitosis at root tip;	1	Accept cell division

Question	Marking guidance	Mark	Comments
03.2	(Suitable as) stains chromosomes or makes chromosomes visible;	1	Accept DNA

Question	Marking guidance	Mark	Comments
03.3	1. Count all the cells in metaphase/with chromosomes aligned in the middle (of the spindle) <u>and</u> all the cells in mitosis (to get a total number of cells in mitosis); 2. Divide the number of cells in metaphase by the total number of cells in mitosis then $\times 100$ (to get %);	2	

Question	Marking guidance	Mark	Comments
03.4	1. Prophase <b>or</b> metaphase; 2. Proportion of cells in prophase increases (so cells starting mitosis cannot progress to metaphase);	2	

Question	Marking guidance	Mark	Comments
03.5	(If prophase ) formation of the spindle is prevented <b>OR</b> (If metaphase) the chromosomes cannot attach to the spindle/line up on equator;	1	

Question	Marking guidance	Mark	Comments
03.6	1. (Minimum amount of) time needed to get (almost) all cells in prophase/stops mitosis; 2. Longer time might slow enzyme reactions (too much) <b>OR</b> kill cells;	2	1. Accept the percentage of cells in each stage (of mitosis) remains constant 2. Do not accept enzymes denatured

Question	Marking guidance	Mark	Comments
03.7	<b>For</b> 1. These stages showed similar trend/pattern (in <b>Figure 5</b> ); 2. Makes graph easier to read; <b>Against</b> 3. Do not know if this is also true for heating/might miss something;	3	

Question	Marking guidance	Mark	Comments
03.8	(Effect is not permanent as) exposure to 23 °C / higher temperature restores mitosis/cell division (and therefore growth);	1	

Question	Marking guidance	Mark	Comments
04.1	1. Smoking can change heart rate; 2. (idea of) gives a base line or exercise/movement increases heart rate;	2	1. Accept other relevant health issues, eg smoker can have higher blood pressure 2. Accept gives resting heart rate

Question	Marking guidance	Mark	Comments
04.2	1. Ventricular systole / LV contracts; 2. (so) pressure increases; 3. (Forces) AV valve shut and semi lunar valve open; 4. Blood moves into aorta/out of LV (so volume decreases);	4	

Question	Marking guidance	Mark	Comments
04.3	4930 - 4960;;;	3	<b>One mark</b> for idea of $CO = SV \times HR$ <b>One mark</b> for $SV = 74 \text{ cm}^3$ <u>and</u> 1 beat in 900 ms /0.9 s (ie readings from graph) <b>One mark</b> for calculate $HR = 67/66.7 \text{ bpm}$ or shows 60/0.9s <b>Two marks</b> for idea of $CO = SV \times HR$ plus one correct value (either $74 \text{ cm}^3$ for SV <b>OR</b> 67/66.7 bpm for HR)

Question	Marking guidance	Mark	Comments
<b>04.4</b>	Any <b>2</b> from Length of time each sport session; Frequency of sport/rest between; Time of day doing sport; Age; Gender; Diet; Size of people; Same level of fitness at start; Any additional sports/exercise;	2 max	

Question	Marking guidance	Mark	Comments
<b>04.5</b>	1. All/Any of the sports significantly increase LV mass (compared with start); 2. Significant difference in mass of LV between running and other sports; <b>OR</b> 2. No significant difference in mass of LV between handball and football;	2 max	Accept error bars do not overlap as equal to significant Accept error bars overlap as equal to not significant Accept significant difference or significant increase Do not accept results/data are (not) significant OR are (not) due to chance

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Question	Marking guidance	Mark	Comments
04.6	1. (increase in mass of LV means) more muscle/thicker walls in LV; 2. (so) more powerful contraction of LV/increased stroke volume; 3. (so) more oxygen to (body) muscles for respiration/energy to contract;	3	3. Accept: more oxygen for aerobic respiration so less lactic acid (and less muscle fatigue) OR less anaerobic respiration

Question	Marking guidance	Mark	Comments
05.1	Oesophagus	1	

Question	Marking guidance	Mark	Comments
05.2	Causes the stomach to churn/mixes food with enzymes/gastric juice; <b>OR</b> Physical digestion/breaks larger pieces of food into smaller pieces;	1 max	Do not accept incorrect named enzyme

Question	Marking guidance	Mark	Comments
05.3	1. Patients with <i>H. pylori</i> have higher (mean) gastrin production <b>so</b> higher (mean) pepsin; 2. Pepsin (is protease enzyme, so) could digest (lining/wall of) stomach (as stomach is muscle/ made of protein) <b>OR</b> Acid could break down stomach (lining/wall);	2	

Question	Marking guidance	Mark	Comments
<b>05.4</b>	<ol style="list-style-type: none"><li>1. Individual patients with <i>H. pylori</i> have similar levels of gastrin to not infected (patients);</li><li>2. Don't know that patients with high gastrin are the same ones that have high pepsin;</li><li>3. Overlap in levels of pepsin with and without <i>H. pylori</i>;</li><li>4. Gastrin production could vary/be affected by diet/time since food <b>or</b> might need it to be high for a long time to get ulcer;</li><li>5. If gastrin stimulates pepsin then it might also stimulate mucus production which would protect stomach lining;</li><li>6. High gastrin levels and pepsin could provide more suitable conditions for <i>H. pylori</i>;</li></ol>	1 max	1. Accept correct description, eg only a small number of <i>H. pylori</i> infected patients have higher gastrin (than not infected)

Question	Marking guidance	Mark	Comments
<b>06.1</b>	1. Sodium ions absorbed by epithelium cells/cells lining ileum; 2. Reduces water potential of cells; 3. Water <u>diffuses</u> into cells OR leaves lumen of ileum by <u>osmosis</u> (reducing diarrhoea so less dehydration);	3	1. Accept sodium ions increase cotransport of glucose 3. Accept water moves down water potential gradient into cells

Question	Marking guidance	Mark	Comments
<b>06.2</b>	Reason for: 1. (Dilution with orange juice/sports drink) reduces the concentration of Na <sup>+</sup> ions; Reasons against: 2. (Investigation in lab so) don't know effect in human / might work as well; 3. Adding juice/sports drink could add sugars/other minerals (making ORS more effective);	2 max	

Question	Marking guidance	Mark	Comments
06.3	1. (Mix of adults and children but) should just test with children / ORS intended for children; 2. (Volunteers do not have condition) having condition/being dehydrated could affect taste (perception); 3. Taste is subjective or ratings are vague/could represent range; 4. (Opinion) could be affected by order of tasting <b>OR</b> preconception of taste of orange juice/sports drink <b>OR</b> which dilution tasted <b>OR</b> not washing away previous solution;	2 max	1. Accept adults have different taste to children

Question	Marking guidance	Mark	Comments
06.4	1. (In all dilutions) sodium ion concentration below 75 (mmol dm <sup>-3</sup> ) <b>so</b> recovery slower; 2. (In some dilutions) sodium ion concentration below 60 (mmol dm <sup>-3</sup> ) <b>so</b> would not help recovery (at all); 3. (Most people think that) the dilutions taste worse than standard ORS (so children less likely to drink dilution);	2 max	For 1 and 2 must say sodium ion concentration at least once  2. Accept 1 : 1 or 2 : 1 orange juice or 1 : 1 sports drink

Question	Marking guidance	Mark	Comments
07.1	1. <u>Many</u> root hair cells <u>so</u> large surface area (to absorb the water); 2. Water moves by osmosis/diffuses/down water potential gradient; 3. Water enters apoplastic pathway/moves through cell walls; 4. Water enters symplastic pathway/moves via cell cytoplasm; 5. (In symplastic pathway) there is a continuous link between cytoplasm of (adjacent) cells; 6. At endodermis, Casparian/waxy/suberin strip forces water in apoplastic pathway/in cell walls into symplastic pathway; 7. Active transport of minerals (by endodermal cells) into xylem lowers water potential (so water diffuses in by osmosis);	5 max	5. Accept plasmodesmata

Question	Marking guidance	Mark	Comments
07.2	1. Villi <u>and</u> microvilli OR folds OR long <b>so</b> large surface area; 2. Thin walls of villi/capillaries <b>so</b> reduced diffusion pathway; 3. Villi/ileum have (smooth) muscle <b>so</b> can move food OR mix food OR move to maintain concentration gradient; 4. Many capillaries/good blood supply maintains concentration gradient; 5. Many mitochondria (in cells) <b>so</b> can produce ATP / <b>for</b> active transport/cotransport; 6. Channel/carrier proteins (in cell membranes) <b>for</b> facilitated diffusion/cotransport; 7. Carrier proteins (in cell membranes) <b>for</b> active transport; 8. Ileum is (very) long <b>so</b> long time for absorption; 9. Lacteals for lipid absorption	5 max	2. Do not accept ileum  4. Accept blood vessels