

# INTERNATIONAL AS BIOLOGY (9610)

## BL02R

Unit 2 Biological Systems and Disease

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Mark scheme

January 2024

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Version: 1.1 Final



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Question	Marking guidance	Mark	Comments
01.1	1. RNA; 2. Reverse transcriptase / integrase / protease;	2	Reject mRNA/tRNA

Question	Marking guidance	Mark	Comments
01.2	67;;	2	Award <b>one mark</b> for: Working that shows 120 (nm) and 8000 (nm) <b>OR</b> 0.12 (µm) and 8 (µm) <b>OR</b> Answers not to 2 significant figures eg 66.7

Question	Marking guidance	Mark	Comments
01.3	1. Viral RNA used to make cDNA using reverse transcriptase; 2. Viral/HIV DNA used to form mRNA; 3. (Viral mRNA) translated into viral/HIV proteins; 4. (Translation) takes place at ribosomes; 5. Protease use to modify viral/HIV proteins;	4 Max	

Question	Marking guidance	Mark	Comments
<p><b>01.4</b></p>	<p>Any <b>three</b> from the following:</p> <p>1. (Both have a similar structure so) AZT competes with (the nucleotide containing) thymine/thymidine;</p> <p><b>OR</b></p> <p>AZT could be used as a nucleotide;</p> <p>2. AZT does not have the hydroxyl/OH group needed for it to join with another nucleotide;</p> <p>3. Formation of viral DNA strand is stopped</p> <p><b>OR</b></p> <p>Reverse transcription is stopped</p> <p><b>OR</b></p> <p>Prevents transcription of viral/HIV DNA</p> <p><b>OR</b></p> <p>Prevents the synthesis of viral/HIV proteins;</p> <p>4. Viral replication is prevented <b>so</b> prevents an increase in the number of HIV (particles in the blood plasma);</p>	<p>3 max</p>	<p>2. AZT unable to form sugar-phosphate backbone</p> <p><b>OR</b></p> <p>DNA polymerase is unable to join new adjacent nucleotides to AZT</p>

Question	Marking guidance	Mark	Comments
02.1	1. Pulse rate recorded at rest <b>and</b> after exercise; 2. Repeats <b>and</b> calculation of mean; 3. Detail of exercise carried out including at least one control variable; 4. Suitable safety precaution identified;	4	

Question	Marking guidance	Mark	Comments
02.2	1. Independent variable in the 1 <sup>st</sup> column and dependent variables in the remainder of the table; 2. Suitable headings in table with correct units in column headings only;	2	Ignore any additional data

Question	Marking guidance	Mark	Comments
02.3	1. Appropriate statistics test e.g. t-test <b>OR</b> Standard error and 95% confidence; 2. Looking at the difference between 2 sets of data/means; 3. Calculated value greater than critical value at 0.05 significance level <b>OR</b> Calculated probability less than critical value at 0.05 <b>OR</b> No overlap between SD / SE	3	3. Allow $P < 0.05$ so reject null hypothesis

Question	Marking guidance	Mark	Comments
02.4	1. Release of hormones / emotional state e.g. stress/fear; 2. Medication; 3. Caffeine; 4. Smoking;	2 max	Allow any <b>two</b> suitable examples e.g. gender, age, health conditions

Question	Marking guidance	Mark	Comments
03.1	<ul style="list-style-type: none"> <li>• <b>Aphids</b> e.g. same number/age/species/type of aphids;</li> <li>• <b>Crop plant</b> e.g. same species/variety of plants/seeds, same space for each plant e.g. seed density;</li> <li>• <b>Named environmental factors</b> e.g. growth medium, type of soil, mineral ion concentration, volume of water, concentration of carbon dioxide, pH, humidity;</li> </ul>	2	<p>Allow <b>two</b> variables from the same category</p> <p>Ignore fungal pathogen</p> <p>Allow same size of plants</p> <p>Ignore light, temperature, wind, air movement</p>

Question	Marking guidance	Mark	Comments
03.2	<ol style="list-style-type: none"> <li>1. Weigh the plants (in each group) at intervals (during the drying process);</li> <li>2. (Repeat until a) constant mass is achieved;</li> </ol>	2	Allow <b>two</b> marks for 'heat until constant mass is achieved'

Question	Marking guidance	Mark	Comments
03.3	<ol style="list-style-type: none"> <li>1. (Individual effects of) aphids (<b>B</b>) and fungal pathogen (<b>C</b>) both decreased mean dry mass;</li> <li>2. Combined effects of aphids and fungal pathogen (<b>A</b>) has the <u>largest</u> decrease in mean dry mass;</li> <li>3. Effect of fungal pathogen greater than aphids (as mean dry mass for <b>C</b> is lower compared to <b>B</b>);</li> <li>4. No overlapping of SD bars between groups so likely to be a <u>significant difference</u> <b>OR</b> overlapping of SD bars between groups <b>A</b> and <b>C</b> so not likely to be a <u>significant difference</u>;</li> </ol>	4	4. Reject 'results are significant'

Question	Marking guidance	Mark	Comments
03.4	1. Aphids have stylets that are inserted into <u>phloem</u> vessels; 2. Aphids (feed on the sap and) remove photosynthetic products/sugars/amino acids from plant; 3. Less sugars for respiration / less amino acids for protein synthesis (leading to less plant biomass produced); <b>OR</b> Aphids as vectors of plant pathogens/viruses (which results in decrease in crop production/quality of produce);	3	1. Allow descriptions of stylets          3. Allow diseases for pathogens/viruses

Question	Marking guidance	Mark	Comments
04.1	1. Cut the shoot underwater <b>OR</b> Submerge apparatus in water for assembly;  2. Cover any joints in the equipment with petroleum jelly/Vaseline/wax;  3. (Turn the tap to) allow water (from the reservoir) to move air bubble back (to the start of the scale);	3	3. Allow idea of not leaving the experiment to run for too long



Question	Marking guidance	Mark	Comments
04.2	2.7/2.72;;;;	3	<p>Allow <b>two marks</b> for:</p> <p><math>3.14 \times 0.25 \times 104/30</math></p> <p><b>OR</b></p> <p>Correct rate of water uptake for 10 cm and 50 cm</p> <p>3.14/3.1 <b>and</b> 0.4/0.42</p> <p><b>OR</b></p> <p>Use of diameter:</p> <p>10.9/10.89 / 12.6/12.56 <b>and</b> 1.7/1.67</p> <p><b>OR</b></p> <p>Use of radius not squared:</p> <p>5.5/5.4/5.44 / 6.3/6.28 <b>and</b> 0.8/0.84</p> <p><b>OR</b></p> <p>Not converted to <math>\text{min}^{-1}</math></p> <p>81.6/81.64</p> <p>Allow <b>one mark</b> for:</p> <p>Difference in distance (120 – 16 = 104)</p> <p><b>OR</b></p> <p>Volumes correct 94.2 and 12.56</p> <p><b>OR</b></p> <p>For a combination of two errors eg 326.6/326.56 (use of diameter and not converted to <math>\text{min}^{-1}</math>)</p>

Question	Marking guidance	Mark	Comments
<p><b>04.3</b></p>	<p>1. (Potassium ions) lower the <u>water potential</u> of the guard cells and cause water to enter by <u>osmosis</u></p> <p><b>OR</b></p> <p>(Potassium ions) cause water to move into the guard cell down a <u>water potential</u> gradient by <u>osmosis</u>;</p> <p>2. Guard cells become turgid and stoma opens;</p> <p>3. (Higher light intensity would cause) more stomata to open</p> <p><b>OR</b></p> <p>Stomata to open wider;</p> <p>4. Higher light intensity results in higher rate of transpiration so higher rate of water uptake;</p>	<p>3 max</p>	<p>2. Allow guard cells increase in volume or swell up</p> <p>3 &amp; 4. Allow converse</p> <p>4. Allow evaporation for transpiration</p>

Question	Marking guidance	Mark	Comments
05.1	Artery wall is thicker (so keeps circular shape when cut into thin section);	1	Allow converse for vein Allow idea of more muscle/elastic tissue in artery wall

Question	Marking guidance	Mark	Comments
05.2	Mean length x total cross-sectional area;	1	

Question	Marking guidance	Mark	Comments
05.3	778;	1	

Question	Marking guidance	Mark	Comments
05.4	Allows more time for exchange of materials (by diffusion);	1	

Question	Marking guidance	Mark	Comments
05.5	1. Bars decreasing in height; 2. Line decreasing in height;	2	Allow bars touching

Question	Marking guidance	Mark	Comments
05.6	As mean diameter decreases, flow rate decreases;	1	Allow positive correlation Reject negative correlation

Question	Marking guidance	Mark	Comments
06.1	A (foreign) substance which produces an immune response;	1	Allow correct named substance e.g. protein, glycoprotein

Question	Marking guidance	Mark	Comments
06.2	<p><b>Stage 1</b></p> <p>1. B cell engulfs pathogen by phagocytosis/endocytosis;</p> <p><b>Stage 2</b></p> <p>2. B cell presents the antigens on its surface;</p> <p>3. Helper T cells binds to antigens (on surface) of B cell;</p>	3	

Question	Marking guidance	Mark	Comments
06.3	<p><b>Name of cells:</b></p> <p>Memory cells;</p> <p><b>Function:</b></p> <p>Remain to provide rapid response (if the same pathogen enters the body again);</p>	2	

Question	Marking guidance	Mark	Comments
06.4	<p>1. Two heavy and two light chains shown;</p> <p>2. Antigen binding sites labelled;</p> <p>3. Disulfide bridge/s labelled;</p> <p>4. Constant/variable region labelled;</p>	4	2. Reject 'active site'

Question	Marking guidance	Mark	Comments
06.5	$3.5 \times 10^8$ ;;	2	Allow <b>one mark</b> for correct answer, but incorrect number of significant figures/not in standard form

Question	Marking guidance	Mark	Comments
06.6	<ol style="list-style-type: none"><li>1. Many mitochondria;</li><li>2. To release energy/produce ATP;</li><li>3. Lots of rough endoplasmic reticulum / many ribosomes;</li><li>4. For protein/antibody synthesis;</li><li>5. Lots of Golgi bodies;</li><li>6. For export/exocytosis/modification of antibody;</li></ol>	4 max	Mark in pairs Idea of many needed at least once for full marks

Question	Marking guidance	Mark	Comments
<b>07.1</b>	<ol style="list-style-type: none"><li>1. Bile salts associate with monoglycerides/fatty acids to form micelles;</li><li>2. Micelles carry monoglycerides/fatty acids to membrane of epithelial cells;</li><li>3. Monoglycerides and fatty acids <u>diffuse</u> into epithelial cells;</li><li>4. Monoglycerides and fatty acids recombine to form triglycerides in the endoplasmic reticulum;</li><li>5. Triglycerides combine with cholesterol/(lipo)proteins to form <u>chylomicrons</u> at the <u>Golgi body/apparatus</u>;</li><li>6. Chylomicrons leave epithelial cells by <u>exocytosis</u> and enter lacteals/lymph vessels;</li></ol>	5 max	

Question	Marking guidance	Mark	Comments
07.2	<ol style="list-style-type: none"> <li>1. Saturated fats increase LDL (in the blood);</li> <li>2. High LDL increases cholesterol level in the blood;</li> <li>3. White blood cells take up LDLs/cholesterol;</li> <li>4. Accumulation of lipid-containing material within the wall of coronary artery;</li> <li>5. (Leads to formation) of <u>atheroma</u>;</li> <li>6. Atheroma narrows lumen of coronary artery;</li> <li>7. Reduced blood flow to heart muscle cells/tissue;</li> <li>8. Reduced supply of oxygen/glucose <b>so</b> less respiration/ATP;</li> <li>9. (Atheroma leads to) blood clot/thrombus which blocks coronary artery;</li> <li>10. Weakened artery wall can lead to <u>aneurysm</u>;</li> </ol>	5 max	Coronary artery must be mentioned at least once before awarding mp4, 6 & 9