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Unit 2 Biological Systems and Disease

Mark scheme

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Question	Marking guidance	Mark	Comments
01.1	Maltose;	1	

Question	Marking guidance	Mark	Comments
01.2	6.8;	1	Allow 6.80-6.84

Question	Marking guidance	Mark	Comments
01.3	Any one from: Temperature; Concentration enzyme; Concentration substrate;	1	Ignore amount Allow volume enzyme Allow volume substrate

Question	Marking guidance	Mark	Comments
01.4	1. Starch (is large molecule so) not in mouth long enough/only 0.5–1 minutes for salivary amylase to digest it all OR In small intestine for long time/180–300 minutes so time for digestion; 2. In stomach (pH 1–2.5) salivary amylase would be denatured; 3. Need amylase secreted after stomach/into small intestine to continue digestion/to maltose; 4. pH of small intestine (and mouth) close to optimum/suitable for amylase;	4	

Question	Marking guidance	Mark	Comments
01.5	Type of enzyme: 1. Disaccharidase or maltase; Precise location of enzyme: 2. Membrane-bound in small intestine or bound to epithelial cells/microvilli;	2	

Question	Marking guidance	Mark	Comments
01.6	Kills pathogens/bacteria (ingested with food); Activation of enzymes / optimum pH for proteases;	2	Allow example like pepsinogen to pepsin. Ignore incorrect named enzyme

Question	Marking guidance	Mark	Comments
02.1	RNA; Lipid / phospholipid; Protein;	3	Reject mRNA Allow protein / glycoprotein / carbohydrate (for envelope) Allow amino acid

Question	Marking guidance	Mark	Comments
02.2	A. Reverse transcriptase; C. Integrase; T. Protease;	3	Allow phonetic spelling T. Allow peptidase T. Reject dipeptidase

Question	Marking guidance	Mark	Comments
02.3	1. (Mutation) change in shape of active site (so drug cannot bind/inhibit); 2. Unlikely mutations/change in active site in all enzymes occur at same time; 3. (so at least) some drugs/the combination remain effective/prevents the HIV developing resistance;	3	

Question	Marking guidance	Mark	Comments
02.4	Any one from: Drugs do not cure patient; Can still pass HIV on; (A vaccine) prevents infection in the first place; Cheaper (to give vaccine) than drugs (for life); Avoids (possible) side effects of taking drugs (for a long time); Avoids HIV developing resistance;	1 max	Ignore to make money / become famous

Question	Marking guidance	Mark	Comments
03.1	Increase;	1	

Question	Marking guidance	Mark	Comments
03.2	1. (Maybe) different numbers in each group; 2. Allows comparison;	1 max	

Question	Marking guidance	Mark	Comments
03.3	Number of cases decreased <u>in all age groups</u> ;	1	Ignore incorrect values from graph

Question	Marking guidance	Mark	Comments
03.4	Advantage: Large sample; Long time/12 years; Sample a (large) range of ages; Disadvantage: Only women; Actual age divisions of groups unknown/how young is young; Don't know if they smoke/exercise/other named risk factors;	2 max	Must have 1 advantage and 1 disadvantage for full marks

Question	Marking guidance	Mark	Comments
03.5	1. Less red meat / high fat dairy products results in less saturated fat/saturated fatty acids/cholesterol/LDL; 2. (Food high in saturated fat/saturated fatty acids/cholesterol/LDL may) cause/increase risk of CHD;	2	Penalise fat unqualified once only 2. Allow description of CHD e.g. atheroma formation

Question	Marking guidance	Mark	Comments
03.6	<i>Formation</i> 1. Fatty deposits/plaques/cholesterol/LDL; 2. Under lining/in wall of artery; <i>How causes CHD</i> 3. Blocks coronary artery; 4. Reduced oxygen/glucose to heart muscle/cells/tissue; 5. Reduced respiration in heart muscle/cells/tissue;	3 max	Must have at least 1 marking point from each section for full marks. 4. and 5. Only needs to refer to heart muscle/cells/tissue once

Question	Marking guidance	Mark	Comments
04.1	Vector;	1	Allow example e.g., aphids

Question	Marking guidance	Mark	Comments
04.2	18;;;	3	1 mark if correctly rearranged equation shown but wrong answer 1 mark for correct substitution of values but wrong answer 1 mark for correct rounding to whole number 2 marks for 9 nm i.e. giving radius not diameter 2 marks if not to the nearest whole number

Question	Marking guidance	Mark	Comments
04.3	1. Via cytoplasm (of one cell to cytoplasm of next cell); 2. Via gaps in cell wall;	2	1. Ignore reference to osmosis/water potential 2. Allow plasmodesmata

Question	Marking guidance	Mark	Comments
04.4	1. (Leaf curled so) less (surface) area to absorb/exposed to light; 2. Lower rate of photosynthesis; 3. Less sugar/protein/starch/biomass (so slower growth) 4. (Leaf curled so) stomata more exposed; 5. Higher rate of transpiration;	3 max	1. Allow less leaf/part for area 3. Allow organic molecules

Question	Marking guidance	Mark	Comments
05.1	Prevent evaporation from soil or allow only evaporation from plant;	1	

Question	Marking guidance	Mark	Comments
05.2	1. Method 1 measures loss/evaporation of water but method 2 measures water uptake; 2. Different variables measured or different units; 3. Method 1 uses whole plant or has many leaves or has roots but method 2 uses leafy shoot or has fewer leaves or has no roots;	2 max	2. Allow examples, e.g. mass v distance, mass v volume, mg v mm (in set time)

Question	Marking guidance	Mark	Comments
05.3	A factor that increases the rate of transpiration would also increase the rate of water uptake OR Because the rate of water uptake is <u>proportional</u> to the rate of transpiration;	1	Allow (positive) correlation

Question	Marking guidance	Mark	Comments
05.4	1. Size/surface area of leafy shoot or number/size/surface area of leaves/part of plant; 2. Size of box not standard or humidity/temperature differences (between boxes);	2 max	4. Allow examples, e.g. leaking/joints not sealed or shoot not cut underwater or air bubbles trapped in xylem/potometer

	3. Light bulb could give off heat/could increase temperature; 4. Poor set up of potometer qualified;		
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Question	Marking guidance	Mark	Comments
05.5	1.(Increasing light intensity means) more stomata open or stomata open more (fully); 2. Let in more CO ₂ or increases photosynthesis; 3. Faster transpiration/evaporation/diffusion of water (vapour) (so rate of water uptake increases);	3	

Question	Marking guidance	Mark	Comments
05.6	Any one from: All stomata open or stomata fully open; Air in box saturated with water vapour;	1 max	

Question	Marking guidance	Mark	Comments
06.1	1. Valid/accurate/reliable <u>mean</u> can be calculated; 2. So SD/SE can be calculated; 3. Anomalies can be identified OR Reduces effect of anomalies; 4. Check if repeatable; 5. So that data/sample/investigation is representative;	2 max	2. Allow statistical test can be done 3. Reject anomalies can be discarded 5. Allow generalised/generalisable

Question	Marking guidance	Mark	Comments
06.2	1. Randomly; 2. People are matched for e.g. BMI/resting heart rate/sex/age;	1 max	Allow description

Question	Marking guidance	Mark	Comments
06.3	1. HI lowers (mean) heart rate more than LI at rest and during exercise; 2. Difference between HI and LI (likely to be) not significantly different as error bars overlap; 3. (Idea that) Heart rate is not only measure of fitness;	3	2. Allow Difference could be due to chance as error bars overlap

Question	Marking guidance	Mark	Comments
06.4	1. $CO = SV \times HR$; 2. (Figure 11 shows that) HR decreases, so SV must increase (to maintain same CO);	2	2. Ignore HR increases so SV decreases as incorrect context.

Question	Marking guidance	Mark	Comments
06.5	1. Gets more oxygen/glucose to muscles (cells/tissue); 2. (As soon as exercise starts) respiration can increase so more energy released/more ATP (for muscle contraction);	2	2. Allow delays onset of anaerobic respiration/can respire aerobically for longer/reduces (build-up) of lactic acid

Question	Marking guidance	Mark	Comments
06.6	9.4;;	2	Allow 9 / 9.375 / 9.38 Allow 1 mark for correct sum using incorrect values from Figure 13

Question	Marking guidance	Mark	Comments
06.7	(Support) 1. Heart rate increases; (Do not support) 2. Only 1 subject / 1 study; 3. Could be higher before 7 days / do not know what normal heart rate is; 4. Different events have different levels of stress; 5. (Heart rate) only measured once per day or not mean; 6. (Heart rate) does not increase every day or is same on d6 and d5 or d4 and d3;	3 max	Need at least 1 support and 1 do not support for full marks. (Candidates might say 'Don't know health/age/heart problem of subject' – but they do as subject is from study) 2. Allow only male 5. Allow other named factor could increase heart rate (at the time of the measurement)

Question	Marking guidance	Mark	Comments
07.1	1. Binary fission; 2. Increase in (volume of) cytoplasm; 3. (Circular) DNA replicates; 4. Plasmids replicate; 5. Chromosomes/DNA move to the opposite ends of cell; 6. Cell membrane invaginates (to form two daughter cells); 7. New cell wall deposited;	4 max	1. Reject mitosis 2. Allow cytoplasm replicates 3. Allow (circular) chromosome 6. Allow description

Question	Marking guidance	Mark	Comments
07.2	1. Variable region/binding site has a specific (3D) shape/tertiary structure; 2. (Due to) different sequences of amino acids; 3. (so) is complementary/specific to one type of antigen or can form an antigen-antibody complex with (only) one type of antigen; 4. Two variable regions/binding sites; OR 4. Hinge (region); 5. (so) agglutination/clumping is possible; 6. Constant region binds to B-cell surface/membrane or determines type of antibody;	6	