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INTERNATIONAL QUALIFICATIONS

INTERNATIONAL AS **BIOLOGY (9610)**

BL02

Unit 2 Biological Systems and Disease

Mark scheme

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Mark schemes are prepared by the Lead Assessment Writer and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation events which all associates participate in and is the scheme which was used by them in this examination. The standardisation process ensures that the mark scheme covers the students' responses to questions and that every associate understands and applies it in the same correct way. As preparation for standardisation each associate analyses a number of students' scripts. Alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, associates encounter unusual answers which have not been raised they are required to refer these to the Lead Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of students' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

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Mark scheme instructions to examiners

1. General

The mark scheme for each question shows:

- the marks available for each part of the question
- the typical answer or answers which are expected
- extra information to help the examiner make his or her judgement and help to delineate what is acceptable or not worthy of credit.

The extra information in the 'Comments' column is aligned to the appropriate answer in the left-hand part of the mark scheme and should only be applied to that item in the mark scheme. At the beginning of a part of a question a reminder may be given, for example: where consequential marking needs to be considered in a calculation; or the answer may be on the diagram or at a different place on the script.

In general the right-hand side of the mark scheme is there to provide those extra details which confuse the main part of the mark scheme yet may be helpful in ensuring that marking is straightforward and consistent.

2. Emboldening

- 2.1 In a list of acceptable answers where more than one mark is available 'any **two** from' is used, with the number of marks emboldened. Each of the following bullet points is a potential mark.
- 2.2 A bold **and** is used to indicate that both parts of the answer are required to award the mark.
- 2.3 Alternative answers acceptable for the same mark are indicated by the use of **OR**. Different terms in the mark scheme are shown by a/; eg allow smooth/free movement.

3. Marking points

3.1 Marking of lists

This applies to questions requiring a set number of responses, but for which students have provided extra responses. The general principle to be followed in such a situation is that 'right + wrong = wrong'.

Each error/contradiction negates each correct response. So, if the number of errors/contradictions equals or exceeds the number of marks available for the question, no marks can be awarded.

However, responses considered to be neutral (often prefaced by 'Ignore' in the 'Comments' column of the mark scheme) are not penalised.

3.2 Marking procedure for calculations

Full marks can be given for a correct numerical answer, without any working shown.

However, if the answer is incorrect, mark(s) can usually be gained by correct substitution/working and this is shown in the 'Comments' column or by each stage of a longer calculation.

3.3 Interpretation of 'it'

Answers using the word 'it' should be given credit only if it is clear that the 'it' refers to the correct subject.

3.4 Errors carried forward, consequential marking and arithmetic errors

Allowances for errors carried forward are most likely to be restricted to calculation questions and should be shown by the abbreviation ECF or consequential in the mark scheme.

An arithmetic error should be penalised for one mark only unless otherwise amplified in the mark scheme. Arithmetic errors may arise from a slip in a calculation or from an incorrect transfer of a numerical value from data given in a question.

3.5 Phonetic spelling

The phonetic spelling of correct scientific terminology should be credited **unless** there is a possible confusion with another technical term.

3.6 Brackets

(.....) are used to indicate information which is not essential for the mark to be awarded but is included to help the examiner identify the sense of the answer required.

3.7 Ignore/Insufficient/Do not allow

Ignore or insufficient is used when the information given is irrelevant to the question or not enough to gain the marking point. Any further correct amplification could gain the marking point.

Do **not** allow means that this is a wrong answer which, even if the correct answer is given, will still mean that the mark is not awarded.

Question	Marking guidance	Mark	Comments
<p>01.1</p>	<p>1. Make sure all joints are sealed (with petroleum jelly/ Vaseline) / make sure base of the stem is (slightly) wider than the hole through the rubber bung;</p> <p>2. So air-tight / prevents air from entering;</p> <p>OR</p> <p>3. Set up the potometer submerged underwater;</p> <p>4. To prevent air bubbles / air locks / to make sure that capillary tube is completely filled with water;</p> <p>OR</p> <p>5. Cut the stem of the shoot submerged in water;</p> <p>6. To prevent air entering the <u>xylem</u> / to prevent air bubbles in the <u>xylem</u> that would stop the movement of water;</p> <p>OR</p> <p>7. Dry the leaves of the shoot / keep the leaves of the shoot dry (whilst setting up the potometer);</p> <p>8. Water droplets on the leaves will reduce transpiration/block stomata;</p>	<p>6</p>	<p>Mark in pairs</p> <p>1. Allow equipment/potometer is sealed</p> <p>1. Do not allow seal with a bung</p> <p>1. Allow cover for seal</p> <p>2. Allow so that no water leaks/evaporates out</p> <p>2. Do not allow 'prevents leaks'</p>

Question	Marking guidance	Mark	Comments
<p>01.2</p>	<p>To return the water surface in the capillary tube to the start of the scale</p> <p>OR</p> <p>To refill the capillary tube (to allow further measurements);</p>	<p>1</p>	<p>Allow references to air bubble instead of water level</p>

Question	Marking guidance	Mark	Comments
02.1	1. Active immunity: (stimulation of) the production of antibodies; 2. Passive immunity: introduction of antibodies (from another source);	2	1. Allow production of memory cells. Allow descriptions for both.

Question	Marking guidance	Mark	Comments
02.2	Mass per volume eg, mg cm ⁻³ ;	1	Allow suitable alternatives and solidus eg, g/ml

Question	Marking guidance	Mark	Comments
02.3	1. Secondary response is faster; 2. Clonal selection has already occurred / memory cells are present; OR 3. Secondary response produces higher amount of antibody; 4. More clonal expansion / memory cells are present; OR 5. Secondary response maintains amount of antibody for longer time; 6. More antibody produced / memory cells are present;	4 max	Mark in pairs Allow converse for primary response 2. Allow descriptions of clonal selection. 4. Allow descriptions of clonal expansion

Question	Marking guidance	Mark	Comments
02.4	Spike/attachment/surface proteins;	1	Do not allow 'proteins' unqualified Allow glycoproteins / antigens / coat protein / capsid proteins

Question	Marking guidance	Mark	Comments
02.5	Allow the viral mRNA to pass through the cell membrane of the human cell; OR Allow the viral mRNA to enter the human cell;	1	Allow idea of nanoparticle protecting viral mRNA from host reaction/described

Question	Marking guidance	Mark	Comments
02.6	Antigen-presenting cell;	1	Allow phagocytes / macrophages / dendritic cells / B cells/lymphocytes.

Question	Marking guidance	Mark	Comments
03.1	Right atrium;	1	

Question	Marking guidance	Mark	Comments
03.2	To allow the atria to empty / ventricles to fill (before the ventricles contract);	1	

Question	Marking guidance	Mark	Comments
03.3	1. (In order to pump the) blood upwards out of the heart; 2. Into the aorta / pulmonary artery;	2	

Question	Marking guidance	Mark	Comments
03.4	80 - 81;	1	

Question	Marking guidance	Mark	Comments
03.5	Correct answer of 69(.135802);;	2	Allow one mark for 0.069 OR $5.6 \div$ answer from 03.4 Allow two marks from ECF

Question	Marking guidance	Mark	Comments
03.6	1. Atrioventricular valve opens; 2. Pressure in atrium is higher than the pressure in the ventricle OR Blood flows from (left) atrium into (left) ventricle;	2	Allow bicuspid/mitral valve. Do not allow tricuspid valve.

Question	Marking guidance	Mark	Comments
03.7	1. Ventricle walls have thicker muscle (layer); 2. Contracts with greater force;	2	Need at least one comparative point for two marks 2. Allow strong(er) contraction 2. Ignore 'more contraction'

Question	Marking guidance	Mark	Comments
04.1	1. HIV contains RNA; 2. Needed to synthesize cDNA/DNA (from RNA);	2	

Question	Marking guidance	Mark	Comments
04.2	1. Stimulate B cells to (form plasma cells that) produce antibodies; 2. Activates cytotoxic T cells; 3. Stimulates phagocytes;	2 max	1. Allow to stimulate B cells to develop into memory cells

Question	Marking guidance	Mark	Comments
04.3	Viral load stable/level then increases (rapidly);	1	If time specified then ignore descriptions of the first 12 weeks

Question	Marking guidance	Mark	Comments
04.4	1. Patient questionnaire/survey; 2. Idea of subjective;	2	1. Allow description / oral questioning.

Question	Marking guidance	Mark	Comments
04.5	35254(%);;	2	Allow one mark for: <ul style="list-style-type: none"> • correct calculation but not given to nearest whole number • correct calculation but not x100 given to nearest whole number e.g. 353 • correct answer but given as a negative number (-35254%)

Question	Marking guidance	Mark	Comments
04.6	1. Decrease in number of Helper T-cells; 2. (So) fewer B cells to produce antibodies / fewer memory cells produced / less phagocytosis / fewer cytotoxic T-cells; OR (So) pathogens/cancer cells not killed by antibodies/phagocytes/cytotoxic T-cells;	2	

Question	Marking guidance	Mark	Comments
05.1	(Prokaryotic cells) binary fission and (eukaryotic cells) mitosis;	1	Allow meiosis instead of mitosis

Question	Marking guidance	Mark	Comments
05.2	1. Prokaryotic cells replicate circular DNA and eukaryotic cells replicate linear DNA; 2. Prokaryotic cells replicate plasmids (and eukaryotic cells do not); 3. Prokaryotic cells do not replicate mitochondria / membrane-bound organelles (and eukaryotic cells do); 4. Prokaryotic cells do not use spindle (fibres);	2 max	Allow other suitable differences e.g. no breakdown/formation of nuclear envelope 3. Allow other suitable named organelles but do not allow e.g. ribosomes

Question	Marking guidance	Mark	Comments
05.3	3.0 / 3.2 / 3.24×10^{19} ;;	2	One mark for: <ul style="list-style-type: none"> evidence of 48 (divisions) correct answer not in standard form

Question	Marking guidance	Mark	Comments
05.4	1. Number of living bacteria decreases; 2. Levels out at / after $50 \mu\text{g cm}^{-3}$ OR Larger difference in the number living bacteria from concentrations 0-50 ($\mu\text{g cm}^{-3}$) than from concentrations 50-100 ($\mu\text{g cm}^{-3}$);	2	

Question	Marking guidance	Mark	Comments
05.5	Intervals in the vancomycin concentrations are too large; OR Only 4 different concentrations of vancomycin used; OR Optimum concentration could be between 10-100 $\mu\text{g cm}^{-3}$; OR Only done once / no repeats (so not valid/reliable/representative);	1	Allow other suitable suggestions e.g. <ul style="list-style-type: none"> only tested on one species of bacteria only tested on bacteria in containers (not in an organism) number of bacteria only an estimate (not an actual number)

Question	Marking guidance	Mark	Comments
05.6	1. Horizontal (gene) transmission; 2. Plasmid/DNA/gene replicated; 3. Plasmid/DNA/gene transferred through <u>conjugation</u> ;	2 max	3. Allow reference to <u>pilus</u> instead of conjugation

Question	Marking guidance	Mark	Comments
06.1	<p>1. Protein/p53 is faulty so (p21) gene not activated; OR Protein/p53 not produced so (p21) gene not activated;</p> <p>2. p21 (protein) not produced so DNA not repaired / cells still have damaged DNA OR p21 (protein) not produced so cells with damaged DNA continue to divide;</p> <p>3. Cell division not stopped / uncontrolled cell division;</p>	3	If no marking points awarded, allow one mark for: (tumour suppressor) gene inactivated so not able to control/slow down cell division

Question	Marking guidance	Mark	Comments
06.2	S-phase / Synthesis phase;	1	Allow interphase

Question	Marking guidance	Mark	Comments
06.3	<p>1. Non-senescent cells use ³H-thymine to make new DNA (as they can divide);</p> <p>2. Only non-senescent cells (take in ³H-thymine and) become radioactive;</p>	2	1 & 2 Allow converse

Question	Marking guidance	Mark	Comments
07.1	<p>1. Hydrolysis of peptide bonds;</p> <p>2. Stomach secretes protease/endopeptidase/pepsin;</p> <p>3. Endopeptidases/pepsin break peptide bonds within the polypeptide;</p> <p>OR</p> <p>Endopeptidases/pepsin produces shorter (poly)peptides;</p> <p>4. Pancreas secretes (more) endopeptidases;</p> <p>5. Pancreas secretes exopeptidases;</p> <p>6. (Pancreatic enzymes) operate in the small intestine/duodenum/ileum;</p> <p>7. Exopeptidases break peptide bonds on the ends of the polypeptides;</p> <p>OR</p> <p>Exopeptidases produce amino acids/dipeptides;</p> <p>8. Membrane bound dipeptidases;</p> <p>9. Dipeptidases produce amino acids;</p>	5 max	<p>For MP1, 3 and 6 peptide bonds needed once only</p> <p>4. Allow named examples e.g. trypsin, chymotrypsin</p> <p>5. Allow named examples</p> <p>7. Allow dipeptidases within epithelial cells of small intestine;</p> <p>If MP7 or MP8 not awarded then give one mark for 'peptidases' in membrane produce amino acids</p>

Question	Marking guidance	Mark	Comments
<p>07.2</p>	<p>1. Bacteria produce toxin/protein;</p> <p>2. Binds to (complementary) receptors on the cell membrane of cells lining the small intestine;</p> <p>3. Opens chloride ion channels (in the membrane) allowing chloride ions to enter (the lumen of) the small intestine;</p> <p>4. Chloride ions lower the water potential in (the lumen of) small intestine;</p> <p>5. Water leaves the cells by osmosis/down a water potential gradient;</p> <p>OR</p> <p>Water enters (the lumen of) small intestine by osmosis/down a water potential gradient;</p> <p>6. (Increased) water in (the lumen of) the small intestine leads to diarrhoea;</p>	<p>5 max</p>	<p>1. Accept 'cholera toxin'.</p> <p>MP3 – MP5 Direction is important</p> <p>4. Allow converse for epithelial cells</p>