

**INTERNATIONAL AS
BIOLOGY (9610)**

BL02

Unit 2 Biological Systems and Disease

Mark scheme

June 2025

Version: 1.0 Final



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.

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Question	Marking guidance	Mark	Comments
01.1	<p>1. Long/extension so increases surface area; 2. Thin cell wall/surface layer so diffusion rapid</p> <p>OR</p> <p>Thin cell wall/surface layer so diffusion pathway short;</p> <p>3. (Cells have) a <u>water potential</u> that is low(er) (than the water potential of the soil) so water moves in by osmosis/diffusion;</p>	2 max	

Question	Marking guidance	Mark	Comments
01.2	<p>1. Waterproof/waxy band; 2. Prevents water moving along cell walls</p> <p>OR</p> <p>Forces water to only move via cytoplasm (so symplastic pathway only);</p>	2	1. Allow Casparian strip

Question	Marking guidance	Mark	Comments
01.3	Guard cell(s)	1	Ignore stomata

Question	Marking guidance	Mark	Comments
01.4	<p>Any one from:</p> <ul style="list-style-type: none"> • Low temperature • Low wind • High humidity; 	1	

Question	Marking guidance	Mark	Comments
01.5	1. Shoots have different (total) surface area/different size/number of leaves so use shoots with same size/number of leaves OR Shoots have different (total) surface area/different size/number of leaves so calculate the rate per unit area; 2. Water on leaves so dry all leaves (at start); 3. Different (species of) plants so use same plant/plant species;	2	Error and how to reduce it must match. 3. Allow reference to different number of stomata

Question	Marking guidance	Mark	Comments
01.6	1. After set time measure how far bubble has moved OR Time how long it takes for bubble to move set distance; 2. (Each student does) replicates and calculates mean (for their distance/intensity of light bulb); 3. Calculate rate by dividing distance (mm) over time (s) OR Calculate rate by dividing volume (mm ³) over time (s) OR All (students) use same units (so can compare);	3	2. Minimum of 3 repeats or twice more

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Question	Marking guidance	Mark	Comments
02.1	(Phe – Gly – Leu – Ala) Thr – Val – Lys – Ser – Arg – Trp;	1	

Question	Marking guidance	Mark	Comments
02.2	1. <u>Substitution</u> (of T to A in middle of triplet 6); 2. Changes (the 6th amino acid/from Val) to Glu;	2	1. Allow missense 2. Accept valine, glutamic acid

Question	Marking guidance	Mark	Comments
02.3	1. Undergoes same mutation as human (at triplet 6); 2. Difference at triplet 4 would be a silent mutation OR Difference at triplet 4 would not change primary/tertiary structure of protein OR Difference at triplet 4 would still code for alanine;	2	

Question	Marking guidance	Mark	Comments
02.4	1. Malignant tumours invade (nearby) tissue (but benign tumours do not); 2. Malignant tumours spread to other parts of the body (but benign tumours do not); 3. Malignant tumours have fast rates of cell division/mitosis; 4. Malignant tumours are difficult to remove (surgically) (but benign tumours are (often) easier to remove (surgically)); 5. Malignant tumours can recur (but benign tumours tend not to); 6. Malignant tumours are harmful (but benign tumours may not be);	3 max	6. Allow benign tumours are not harmful

Question	Marking guidance	Mark	Comments
03.1	Mark in pairs 1 and 2 OR 3 and 4 1. Lower chromosome number than <i>Tulipa</i> ; 2. So get better spread/easier to see individual chromosomes; OR 3. Roots grow quickest; 4. So likely to be a lot of cells in mitosis;	2 max	4. Allow high mitotic index/more frequent mitosis

Question	Marking guidance	Mark	Comments
03.2	A, D, E, B;;	2	3 correct = 1 mark 0, 1 or 2 correct = 0 marks

Question	Marking guidance	Mark	Comments
03.3	1. Cell membrane pinches/moves/extends inwards (into middle of cell); 2. Two cells are produced OR Cell cytoplasm is divided (in half) OR Cells of equal size formed;	2	

Question	Marking guidance	Mark	Comments
03.4	1. Plant cells do not pinch in (but animal cells do); 2. Cell wall/dividing line grows from the middle (in plant cells); 3. Plant cells stay attached but animal cells separate;	1 max	

Question	Marking guidance	Mark	Comments
03.5	1. (In plants) cell wall rigid (so cannot pinch in at the middle); 2. Plant cells have a cell wall OR Animal cells do not have a cell wall;	1	

Question	Marking guidance	Mark	Comments
04.1	1. Active transport (of sucrose into phloem) by companion cells/at source; 2. Lowers water potential (in phloem) so water enters by diffusion/osmosis from xylem (into phloem); 3. Increases/causes (hydrostatic) pressure/creates pressure gradient (so movement to sink);	3	1. Allow co-transport of hydrogen ions

Question	Marking guidance	Mark	Comments
04.2	1. Passive means not using metabolic energy/ATP/energy from respiration; 2. Pressure from plant forces (phloem) sap into aphid gut OR Aphid does not suck/cause pressure gradient;	2	

Question	Marking guidance	Mark	Comments
04.3	<p>Similarities</p> <ol style="list-style-type: none"> 1. Both (infected/not infected) increase in aphid number; 2. Both show smaller increases in number later in experiment <p>OR</p> <p>rate of increase increases then decreases;</p> <p>Differences</p> <ol style="list-style-type: none"> 3. Largest increase in aphid number on d6 in infected plant (162) but not until d9 on not infected (129); 4. Range in size of increase for not infected (45–129 or 84) smaller than range for infected (42–162 or 120); 5. More (total) aphids on not infected than on infected (by d15); 	2 max	

Question	Marking guidance	Mark	Comments
04.4	<ol style="list-style-type: none"> 1. Infected plant has less chlorophyll/chloroplasts so less photosynthesis; 2. Produce less sugars/amino acids; 3. Aphids have less energy/materials/food for reproduction; 	3	1. Allow leaves with lighter patches for infected plant

Question	Marking guidance	Mark	Comments
04.5	3.3 : 1;;	2	1 mark if not to one decimal place OR 0.3 : 1 OR 5.0 : 1

Question	Marking guidance	Mark	Comments
04.6	1. (<i>Advantage to aphid</i>) Aphids with wings can move to new plant where there is (likely to be) more food/less competition for food; 2. (<i>Advantage to virus</i>) Aphid acts as vector/spreads virus to infect new (living) host/plant;	2	

Question	Marking guidance	Mark	Comments
05.1	1. (New kidney) recognised as foreign/non-self; 2. (Because) it has different (shaped) antigens on cell (surface);	2	

Question	Marking guidance	Mark	Comments
05.2	(Idea of) Makes outcome more likely (but doesn't cause it);	1	

Question	Marking guidance	Mark	Comments
05.3	217.4 and 97.4;	1	

Question	Marking guidance	Mark	Comments
05.4	1. People who eat less fat have lower BMI; 2. The correlation is significant (as P value is less than 0.05) OR the correlation is unlikely due to chance (as P value is less than 0.05);	2	1. Accept correlation is positive 2. Reject results are significant

Question	Marking guidance	Mark	Comments
<p>05.5</p>	<p>Advantages of new method</p> <p>1. No rejection as now recognised as self; 2. No need for immunosuppressants long-term so none of problems caused by them</p> <p>OR</p> <p>No need for immunosuppressants long-term so less cost;</p> <p>Disadvantages of new method</p> <p>3. Longer OR more expensive (initial) treatment; 4. Need same donor for bone marrow and kidney</p> <p>OR</p> <p>Need living donor;</p> <p>5. Loss of immune system so increased risk of infection;</p>	<p>3 max</p>	<p>Must give at least one advantage and one disadvantage for full marks</p>

Question	Marking guidance	Mark	Comments
<p>05.6</p>	<p>1. Vaccination prompts memory cell production</p> <p>OR</p> <p>Vaccinated people have secondary response</p> <p>OR</p> <p>Girl would (otherwise) have primary response only;</p> <p>2. (Treatment before) bone marrow transplant would remove/destroy girl's (previous) memory cells;</p> <p>3. Donor/mum is not immune/does not have memory cells (so cannot pass protection to girl);</p>	<p>3</p>	

Question	Marking guidance	Mark	Comments
06.1	1. Less muscle contraction; 2. (so) less respiration/less ATP needed; 3. (Cells need) Less oxygen/glucose (for respiration); 4. Less carbon dioxide needs to be removed;	3	1. Allow other examples eg less brain activity, less digestion

Question	Marking guidance	Mark	Comments
06.2	(Coffee) could increase heart rate (above normal) OR (Coffee) is stimulant/could allow concentration for longer OR (Coffee) could prevent decrease in heart rate;	1	Allow caffeine for coffee Allow feel more awake/not feel tired

Question	Marking guidance	Mark	Comments
06.3	(Method) is subjective OR (idea that) driver might be tired before scientist can see signs;	1	

Question	Marking guidance	Mark	Comments
06.4	(Concentrating on) normal driving increases heart rate but tired driving decreases heart rate (compared to other normal daytime activity);	1	

Question	Marking guidance	Mark	Comments
06.5	(-) 8 (%);;	2	Answer of (-) 7.95 = 1 mark

Question	Marking guidance	Mark	Comments
06.6	<p>Supports</p> <p>1. 82 beats minute⁻¹ suitable (from this data) as heart rate when tired driving is below 82;</p> <p>Against</p> <p>2. (Idea of using mean so) not suitable value for all individuals</p> <p>OR</p> <p>Drivers' heart rates vary</p> <p>OR</p> <p>Percentage decrease might be more appropriate;</p> <p>3. Drivers were showing obvious signs of tiredness so alarm should be before that;</p> <p>4. Only men so not representative</p> <p>OR</p> <p>Only 30–45 (years old) so not representative</p> <p>OR</p> <p>Small sample/only 6 drivers so not representative</p> <p>OR</p> <p>In simulator so not representative of (normal) driving;</p>	3 max	<p>Must have marking point 1 for full marks</p> <p>2. Allow normal heart rate could be below 82 beats minute⁻¹</p>

Question	Marking guidance	Mark	Comments
06.7	Tired driving (on real roads) is dangerous;	1	

Question	Marking guidance	Mark	Comments
07.1	<ol style="list-style-type: none"> 1. (HIV) binds to (complementary) receptors/proteins on (CD4/helper) T-cells; 2. (Envelope) fuses with cell surface membrane and virus enters/releases contents into cell; 3. Reverse transcriptase uses HIV/viral RNA to make (single-stranded) DNA/cDNA; 4. DNA polymerase used to make double-stranded DNA; 5. Integrase inserts (new/viral/ds) DNA into host cell chromosomes/DNA; 6. HIV/viral DNA transcribed/used to make (new viral) RNA; 7. HIV/viral DNA transcribed/used to make (new) viral proteins/enzymes; 8. Protease/peptidase (involved in) production/modification of viral proteins/enzymes; 9. HIV/viral particles packaged and released from host cell; 10. Uses (host) cell surface membrane to make viral/lipid envelope; 	5 max	<p>Allow one mark for all 3 named enzymes: reverse transcriptase and integrase and protease if none of 3, 4 or 7 awarded because no function given</p> <p>3. Do not allow double-stranded DNA</p>

Question	Marking guidance	Mark	Comments
07.2	<p>3 marks max for symptoms and 3 marks max for treatment.</p> <p>Symptoms</p> <ol style="list-style-type: none"> 1. Symptoms are diarrhoea/dehydration; 2. Cholera bacteria secrete toxins that increase chloride ion secretion (into lumen); 3. (Chloride ions) decrease water potential in (lumen of) small intestine; 4. (causing) more water to move by osmosis/diffuse/down the water potential gradient into lumen <p>OR</p> <p>(causing) less water to be reabsorbed from lumen (of ileum);</p> <p>Treatment</p> <ol style="list-style-type: none"> 5. Oral rehydration therapy/drinking oral rehydration solution contains sodium ions and glucose; 6. Sodium ions (in ORS) reduce water potential gradient/lower water potential of (epithelium) cells; 7. <u>More</u> water enters cells by osmosis/diffusion <p>OR</p> <p><u>More</u> water leaves lumen (of small intestine) by osmosis/diffusion;</p> <ol style="list-style-type: none"> 8. Glucose (in ORS) as energy source; 	5 max	<p>5. Allow electrolytes and glucose</p> <p>6. Allow sodium ions increase co-transport of glucose</p> <p>8. Allow glucose increases co-transport/active transport of sodium ions</p>