
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.

Further copies of this mark scheme are available from oxfordaqaexams.org.uk

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Level of response marking instructions

Level of response mark schemes are broken down into levels, each of which has a descriptor. The descriptor for the level shows the average performance for the level. There are marks in each level.

Before you apply the mark scheme to a student's answer read through the answer and annotate it (as instructed) to show the qualities that are being looked for. You can then apply the mark scheme.

Step 1 Determine a level

Start at the lowest level of the mark scheme and use it as a ladder to see whether the answer meets the descriptor for that level. The descriptor for the level indicates the different qualities that might be seen in the student's answer for that level. If it meets the lowest level then go to the next one and decide if it meets this level, and so on, until you have a match between the level descriptor and the answer. With practice and familiarity you will find that for better answers you will be able to quickly skip through the lower levels of the mark scheme.

When assigning a level you should look at the overall quality of the answer and not look to pick holes in small and specific parts of the answer where the student has not performed quite as well as the rest. If the answer covers different aspects of different levels of the mark scheme you should use a best fit approach for defining the level and then use the variability of the response to help decide the mark within the level, ie if the response is predominantly level 3 with a small amount of level 4 material it would be placed in level 3 but be awarded a mark near the top of the level because of the level 4 content.

Step 2 Determine a mark

Once you have assigned a level you need to decide on the mark. The descriptors on how to allocate marks can help with this. The exemplar materials used during standardisation will help. There will be an answer in the standardising materials which will correspond with each level of the mark scheme. This answer will have been awarded a mark by the Lead Examiner. You can compare the student's answer with the example to determine if it is the same standard, better or worse than the example. You can then use this to allocate a mark for the answer based on the Lead Examiner's mark on the example.

You may well need to read back through the answer as you apply the mark scheme to clarify points and assure yourself that the level and the mark are appropriate.

Indicative content in the mark scheme is provided as a guide for examiners. It is not intended to be exhaustive and you must credit other valid points. Students do not have to cover all of the points mentioned in the Indicative content to reach the highest level of the mark scheme.

An answer which contains nothing of relevance to the question must be awarded no marks.

Question	Marking guidance	Mark	Comments
01.1	<p>Two from the following:</p> <p>1. (Circular) DNA (and plasmids) replicate;</p> <p>2. Cytoplasm divides (to produce two daughter cells); OR Cell membrane grows inwards / new cell wall synthesis (to produce two daughter cells);</p> <p>3. Each daughter cell receives one copy of the circular DNA;</p> <p>4. Each daughter cell receives variable numbers of plasmids;</p>	2 max	<p>1. For DNA allow (bacterial) chromosome or nucleoid</p> <p>Reject one mark for reference to mitosis or meiosis</p> <p>Reject reference to capsid</p>

Question	Marking guidance	Mark	Comments
01.2	(Random) mutation;	1	

Question	Marking guidance	Mark	Comments
01.3	<p>1. Horizontal transmission;</p> <p>2. Plasmid/DNA/gene (for resistance);</p> <p>3. (Plasmid/gene/DNA) passed on by conjugation;</p>	3	3. Accept description of conjugation

Question	Marking guidance	Mark	Comments
01.4	1024 or 1.024×10^3 ;;	2	Allow one mark for: 512 or 2^9

Question	Marking guidance	Mark	Comments
02.1	Two from: 1. Light (intensity); 2. (Air) temperature; 3. Humidity/moisture in the air;	2	Ignore references to fan and the plant shoot 3. Ignore water / pH / concentration of carbon dioxide

Question	Marking guidance	Mark	Comments
02.2	Two from: 1. Seal joints / ensure airtight / ensure watertight; 2. Cut shoot (under water) at an angle; 3. Ensure no air bubbles are present; 4. Shut tap; 5. Note where bubble is at start / move bubble to the start position; 6. Ensure that the leaves are dry;	2	

Question	Marking guidance	Mark	Comments
02.3	82;;;	3	<p>length = $\frac{776.4 \times 4}{12 \times 3.14}$</p> <p>Allow two marks for: Correct answer not given to 2 significant figures e.g. 82.42 / 82.417 / 82.379</p> <p>OR</p> <p>Answer per hour e.g. 990 or use of diameter e.g. 21 (both given to 2 significant figures)</p> <p>Allow one mark for answers either per hour e.g. 989 or use of diameter e.g. 20.6 (both not to 2 significant figures)</p>

Question	Marking guidance	Mark	Comments
02.4	<p>(The closer the fan to the plant shoot)</p> <p>1. (More air movement so) more water vapour/moisture/saturated air removed (from around stomata/leaves);</p> <p>2. Increases water potential gradient;</p> <p>3. More transpiration/evaporation/diffusion (of water vapour);</p>	3	<p>Accept converse answers</p> <p>1. Allow wind speed instead of air movement</p> <p>2. Allow reference to concentration gradient for water potential gradient</p>

Question	Marking guidance	Mark	Comments
02.5	(Total) surface area of all the leaves (on the plant shoot);	1	Accept answers that relate to stomatal density or number of stomata per unit area Ignore reference to number/size of leaves or size of the plant shoot

Question	Marking guidance	Mark	Comments
03.1	(Blood) plasma;	1	

Question	Marking guidance	Mark	Comments
03.2	Any two from the following: (Fluid Z has a): 1. More (larger) proteins; 2. More glucose / amino acids / fatty acids / oxygen; 3. Less carbon dioxide / urea;	2 max	Must be a comparative statement. 1. Allow has (larger) plasma proteins

Question	Marking guidance	Mark	Comments
03.3	1. (Hydrostatic) pressure lower in (venous end of) capillary; 2. <u>Water</u> (returns) by diffusion/osmosis; 3. <u>Water potential</u> lower/more negative (in blood/capillary) OR (Water moves) down a <u>water potential</u> gradient; 4. Due to proteins (in blood);	4	1. Do not accept reference to arterial end

Question	Marking guidance	Mark	Comments
<p>04.1</p>	<p>(Uses tissue only from the tip of the onion root)</p> <p>1. Where dividing cells are found / mitosis occurs; OR No dividing cells/mitosis in tissue further away/more than 5 mm from tip; OR To get (soft) tissue that will squash;</p> <p>(Adds a stain)</p> <p>2. To distinguish chromosomes/chromatids OR Chromosomes/chromatids not visible without stain;</p> <p>(Presses downwards on the cover slip)</p> <p>3. Single/thin layer (of cells/tissue) / spread out cells so light passes through (making cells/nuclei visible);</p>	<p>3</p>	<p>Max one mark per step</p> <p>1. Accept location of meristem 1. Ignore reference to growth</p>

<p>04.2</p>	<p>Mark in pairs</p> <ol style="list-style-type: none"> 1. Examine a large number of fields of view / many cells; 2. (This ensures a) representative sample of cells; <p>OR</p> <ol style="list-style-type: none"> 3. Description of a method to take into account fields of view with part cells shown at edge eg only record/count whole cells; 4. (This ensures a) standardised approach to counting; <p>OR</p> <ol style="list-style-type: none"> 5. (When recording result for a field of view) repeat (the count); 6. (Idea that this ensures that the initial) figures are correct / check count is accurate; <p>OR</p> <ol style="list-style-type: none"> 7. Described method of using a counting grid; 8. (This ensures that) cells are not counted more than once; 	<p>4</p>	<ol style="list-style-type: none"> 1. For a 'large number' accept answers that give a number but this must be at least 10 fields of view
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Question	Marking guidance	Mark	Comments
<p>04.3</p>	<p>Cell would contain (two groups of) V-shaped (sister) chromatids/chromosomes;</p>	<p>1</p>	<p>Accept (annotated) diagram</p>

Question	Marking guidance	Mark	Comments
04.4	32 (minutes);;	2	$(5 \div 150) \times 960 \text{ minutes} =$ $\frac{5 \times 16 \times 60}{150}$ One mark for 0.53 / 0.533 (hours)

Question	Marking guidance	Mark	Comments
04.5	Any two from the following: 1. Chance; 2. Age of root tip; 3. Genetic differences between plants; 4. Suitable named factor affecting source of plant tissue eg water / mineral ion availability / temperature / light; 5. Suitable factor relating to incorrect step in the method eg pushing the cover slip sideways / counting at different distances from the root tip / insufficient staining of tissue; 6. Suitable factor relating to differences in the way the raw data was collected eg one counts only whole cells, the other included part cells / one repeated the count but the other did not;	2 max	1. Allow idea of the field of view not being representative (of the rest of the root tip). 2. Allow investigated at different times of the day 4. Ignore plants grown in different conditions

Question	Marking guidance	Mark	Comments
<p>05.1</p>	<p>Any two from the following:</p> <ol style="list-style-type: none"> 1. Thick wall withstands/maintain (high blood) pressure / stops the aorta from bursting; 2. Elastic tissue to allow stretching / recoil / smoothes out flow of blood / maintains pressure; 3. Smooth endothelium reduces friction; 4. Aortic valve / semi-lunar valve prevents backflow (into ventricle); 5. Large/wide lumen so large volume of blood (can pass through) 	<p>2 max</p>	<p>Allow one mark for two features without suitable description</p> <p>2. Ignore elastic tissue contracts</p>

Question	Marking guidance	Mark	Comments
<p>05.2</p>	<p>Correct answer in the range 80 – 82;</p>	<p>1</p>	

Question	Marking guidance	Mark	Comments
05.3	6 (hours);;	2	Allow ecf Time for one ventricular contraction = 0.19 – 0.20 Time for one whole cycle 0.73 – 0.75 If 0.20 and 0.73 used award 2 marks for 7 hours Allow one mark for: Incorrect answer but shows correct working out eg $\frac{(\text{Time for one contraction}) \times (\text{answer to 5.2}) \times 60 \times 24 \text{ h}}{60 \times 60}$ OR $\frac{\text{Time for one contraction}}{\text{Time for one whole cycle}} \times 24$ OR Answers not to the nearest hour eg 6.156 / 6.16 / 6.2

Question	Marking guidance	Mark	Comments
05.4	1. (Muscle in wall of) left ventricle is contracting causing a high pressure (in the ventricle); 2. (So) semilunar valve/aortic valve forced open; 3. Atrioventricular valve closed by the high pressure in left ventricle;	3	3. Reject tricuspid valve

Question	Marking guidance	Mark	Comments
05.5	1. Blood flows from left ventricle to right ventricle; OR Mixing oxygenated and deoxygenated blood; 2. Lower volume of (oxygenated) blood leaves left ventricle / flows into aorta OR Lower pressure in blood leaving left ventricle / flowing into aorta OR Less oxygen in blood leaving left ventricle / aorta;	2	1. Reject movement of blood from right to left ventricle

Question	Marking guidance	Mark	Comments
06.1	Any six from the following: 1. Reverse transcriptase uses HIV / viral RNA to make a DNA (copy); 2. DNA polymerase used to make this double-stranded viral DNA; 3. Then integrase enables HIV / viral DNA to be integrated into a host cell DNA; 4. HIV / viral DNA transcribed / used to make new HIV / viral RNA (copies); 5. HIV / viral DNA used to make a new HIV (capsid) proteins / enzymes; 6. Made at (host cells) ribosomes; 7. Lipid envelope / membrane acquired from plasma membrane of infected cell;	6 max	1. Reject if viral RNA turned into viral DNA 3. Accept other words for integrated 4. Accept RNA only in the context of copied from viral DNA

Question	Marking guidance	Mark	Comments
06.2	Mutation causes: 1. Different amino acid(s) / sequence of amino acids in receptor proteins; 2. Change in tertiary structure; 3. No longer complementary shape to virus attachment proteins / virus cannot bind; 4. Viral contents/RNA cannot enter cell;	3 max	1. Accept changes the primary structure 2. Allow change in shape of receptors 3. Reject references to active site 4. Allow HIV cannot enter cell

Question	Marking guidance	Mark	Comments
07.1	1. (Tumour suppressor) gene inactivated so not able to control/slow down cell division; 2. Rate of cell division too rapid / uncontrolled cell division OR Cells continue to divide;	2	1. Accept converse 1 and 2. Accept mitosis 1 and 2. Reject: meiosis once only

Question	Marking guidance	Mark	Comments
07.2	More likely to grow slowly;	1	

Question	Marking guidance	Mark	Comments
07.3	Any two from: 1. (Cases) Numbers of males with lung cancer has decreased and numbers of females with lung cancer has increased; 2. Incidence rate in females slowly increases and males sharp decrease (until 2003) then a more gradual decrease; 3. Larger change in incidence rate in males;	2 max	1. Allow the difference in incidence rate (between males and females) has decreased over time; 1. Accept suitable use of data to illustrate this point

Question	Marking guidance	Mark	Comments
07.4	<ol style="list-style-type: none"><li data-bbox="264 300 1178 469">1. Significant difference in the survival rate of males and females for 1 year and 5 years (after diagnosis); OR Significantly higher survival rate for females after 1 year and 5 years (after diagnosis);<li data-bbox="264 501 1178 571">2. No significant difference in the survival rate of males and females for 10 years (after diagnosis);<li data-bbox="264 603 1178 673">3. Reference to no overlap in SE for 1 year and 5 years / overlap in SE for 10 years;	3	1 & 2. Reject reference to significant results once

Question	Marking guidance	Mark	Comments
<p>08.1</p>	<p>Digestion</p> <p>1. (Pancreatic / salivary) amylase converts starch to maltose;</p> <p>2. Maltase converts maltose to glucose;</p> <p>3. Reference to hydrolysis / breaking of glycosidic bonds;</p> <p>Absorption</p> <p>4. Glucose moves into epithelial cell by facilitated diffusion / co-transport with sodium ions;</p> <p>5. Via co-transport/carrier/channel <u>protein</u>;</p> <p>6. Active transport of sodium ions (from epithelial cell) into blood;</p> <p>7. Maintenance of a low concentration of sodium ions in epithelial cell OR Maintenance of sodium ion concentration gradient (between lumen and epithelial cell);</p> <p>8. Glucose moves into blood by (facilitated) diffusion;</p>	<p>5 max</p>	<p>1. Reject reference to incorrect location of digestion</p> <p>2. For maltase accept reference to disaccharidase enzyme or another named example eg sucrase</p> <p>Max 3 marks for points on absorption</p> <p>4. For glucose allow references to monosaccharides / simple sugars</p>

Question	Marking guidance	Mark	Comments
08.2	<ol style="list-style-type: none">1. (At source / leaves) sucrose is actively transported into the phloem/sieve element/sieve tube;2. By companion cells;3. Lowers water potential (in phloem/sieve element/sieve tube) and water enters by diffusion/osmosis;4. Increase in (hydrostatic) pressure/(produces) high (hydrostatic) pressure/pressure gradient;5. Mass flow/movement/transport towards sink/roots/storage tissue;6. At sink/roots sucrose is removed and used for respiration/stored;	5 max	1. Accept: co-transport with H ⁺ ions